THE

GAME

OF

BEING

THE UNIVERSE: AN EXPLANATION

MESSENGER

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For homo sapiens sapiens - - -

may you live long and prosper.

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For thousands of years humans have
asked, “Why are we here?”
What follows is a brief attempt
to answer this question.

PROLOGUE

* * * * * *

The foundations of the ideas which play out within the pages of this book are very much informed by the work of many others. It touches on the topics of history, theology, philosophy, physics, astronomy, cosmology, psychology, sociology, politics, and economics. It relies heavily on the work of experts and scholars in all of these fields. Apart from an undistinguished Bachelor's degree from a small university, its author can lay claim to no scholarly credentials of any kind. At best, we might be regarded as the quintessential 'arm-chair' philosopher. We can, however, honestly say that we have spent some four decades thinking deeply about the ideas expressed herein, and we hope that our readers will find some value in them.

Even though the final section of this book is fictional, the purpose of the book is not to entertain (although we hope that you may find the tickling of your brain to be entertaining.) The purpose of this book is to inform. It is thus best approached as a textbook; a textbook which contains a description of the inner workings of the universe, a book which reveals the secrets of space and time, of darkness and light. As such, it will challenge assumptions and long-held beliefs. It will require - - - in some sections more than others - - - your active concentration.

Human understanding of the nature of God is completely hypothetical. No one *knows* what God is actually like. Indeed, no

one *knows,* with certainty, whether or not God actually exists. Humanity's picture of God rests entirely upon various sets of *assumptions.* Typically, these assumptions include, among other things, the propositions that God is omnipotent and omniscient. This book asks: what if these assumptions are incorrect?

1543, the year in which Copernicus published his *De Revolutionibus Orbium Coelestium,* presaged the birth of the scientific method, a framework for understanding the workings of the universe which is less 'assumption dependent' than the theological models of earlier times. The scientific method is not, however, assumption free. From the mid 17th Century to the early days of the 20th Century, the practitioners of science have made three key assumptions concerning the fundamental basis of the universe. These three assumptions have served as the lens through which the mountains of scientific data collected in the intervening years and right up to the present time have been interpreted. Current human understanding of the fundamental characteristics of the universe rests upon these three assumptions. In the order in which they have appeared in the historical record, the first of these assumptions is that the ether, the theorized substance between material bodies which was held to make possible the transmission of light is, in some sense, *material.* The second of these assumptions is that gravity is an *attractive force* that each material body in the universe exerts on all other material bodies. The third assumption is that the speed of light is *constant*. In this book we will demonstrate that each of these assumptions is, in fact, *invalid.*

Close to the end of *Mostly Harmless*, the fifth book in the renowned series *The Hitch Hiker's Guide to the Galaxy,* the author, Douglas Adams, has a character named Trillian say:

> "The missing [space] ship I was just talking about. The people of that ship . . . don't know where they are from. They don't even have any memory of who they are or what they are for. They are very lost and very confused and very

> frightened. They are here in this solar system, and they are about to do something very . . . misguided because they are so lost and confused." (1)

For reasons which are entirely unclear, and much to our own astonishment, it appears that the task of explaining to the human passengers aboard Spaceship Earth what they are, and why they are here, has fallen to us, of all people. The task before us is immense, and time is short. We are convinced that humans are deeply confused about the fundamental nature of the universe, in terms both theological and phenomenological, and in its confusion humanity is careening headlong towards catastrophe. We believe that human civilization is stumbling blindly into oblivion, and that only a profoundly radical restructuring of our civilization can save us from disaster. Such a restructuring will only become possible through a new understanding of the fundamental nature of the universe.

Therefore, our goal herein is, to paraphrase the philosopher Bertrand Russell who wrote of the necessity of the reconstruction of human character, nothing less than the complete spiritual, psychological, and social evolution of the entire human race. We are keenly aware that our meagre skills are wholly inadequate to the successful achievement of such a monumental undertaking. Furthermore, we are also keenly aware of the likelihood that such a quest is the errand of a fool . . . . . Nevertheless, we feel compelled to make an attempt upon the summit.

One more thing. When reading this book we urge the reader to pay attention to the commas, for their placement is by no means random or haphazard. While in most instances their function is the standard one of separating one word or phrase from another, in some cases they are intended as a signal to the reader to pause for a moment, and to ponder carefully the significance of the word or the phrase they have just read.

Now, shall we begin . . . . .

PART ONE

BEGINNINGS

"I don't believe you.
You have the whole damn thing all wrong."
--- Ian Anderson
(from the Jethro Tull album *Aqualung)*

Long, long, long ago, before there were stars and planets in galaxies a-whirling, before there were protons and neutrons with electrons a-twirling, back before the beginning of space-time, there was God, the Creator. God: formless, shapeless, featureless; a nebulous, non-corporeal field of Pure Consciousness, devoid of substance or foundation. And God was bored, and lonely.

And God thought, 'I shall *do something* about my boredom and loneliness. I will create a game. In this game my mind will be manifest as space-time and energy-matter. Through my playing of this game *I* shall experience existence, in all its myriad forms, and I will name it the Game of Being. In the Game of Being there will be many rules, required to govern the game's progress. In particular, and in deliberate contrast to my own current and ongoing state of eternal immateriality, there shall be, by design, two general rules which will characterize my playing of this Game: one, that everywhere within the boundary of the Game, *change shall be unceasing*; and two, that in the Game *all beginnings must have an ending.'*

So the Creator set to work and, taking a portion of God's immaterial mind, fashioned from it the Primordial Atom. The Creator endowed the Primordial Atom with the Rules of the Game, and then subjected the Atom to immense pressure. As it was squeezed ever smaller, the density of the Atom grew ever greater, and its temperature soared to billions of trillions of degrees. When the *necessary condition* had been achieved, God thought, 'Let the Game of Being begin!' and abruptly removed the pressure which had been confining the Primordial Atom, which instantaneously began to rapidly expand and cool. That hot, dense state, during which a portion of the immaterial Mind of God underwent a *transmutation* into what modern cosmology has termed a 'space-time foam,' but which we refer to simply as the 'necessary condition,' and its subsequent rapid expansion, occurred many billions of earth-years ago. This beginning of the Game of Being is known presently by humans as the 'Big Bang' plus 'Cosmic Inflation.' What humans commonly refer to as the 'universe,' is more aptly described as the

Game's *Field of Play*; and the *Rules of the Game* are known to humans as the laws of nature.

PART TWO

TEACHINGS

"God is with us."
---so sayeth a sign outside a church.

So near, and yet so far.

The Song of Being is a prayer and a meditation, the purpose of which is to teach that God is, quite literally, all around us. We recommend that you commit the Song of Being to memory, and that you recite it, ideally, three times each day. It is unnecessary for you to be facing in any particular direction whilst doing so; nor do you need to be within the walls of a building specifically designated for prayer; nor need you kneel or bow down, nor prostrate yourself. Furthermore, the timing of these thrice-daily recitations is flexible, and is entirely up to you. You may chant the Song of Being together with others in gatherings large or small, or you may say the Song silently to yourself as you go about your daily routine. Be that as it may, if you perform this simple ritual mindfully three times each day, it will soon become possible for you to perceive the world around you as it actually is: a world in which every, single, thing, animate and inanimate alike, *will be revealed to you,* as being a direct manifestation of the Mind of God.

THE SONG OF BEING

O God!
Magister of the Game of Being,
Creator of all that is,
We thank thee
For Thy precious gift:
This miraculous illusion,
This condition we name 'existence,'
And for allowing us,
Awareness of Thy presence,
As all transitory phenomena.

Wherever we look,
We see Thy face.
Whenever we listen,
We hear Thy voice.
In all that we touch, taste, or scent,
We find the essence of Thy being.

Our journey of experience is Thy journey,
Our quest for happiness, Thy quest.
And our grateful acceptance
Of its joys and sorrows, toil and wonder,
Revealing our deep devotion
To one another,
And to all that exists
Not least,
The manifestation we call our 'self,'
Is the fulfillment of Thy desire.

For Thee are we,
And we are Thee,
Burst forth from singularity.
Each being all,
All beings each,
A continuum, complex, ever-changing yet,
'Tis within our reach
To understand the purpose of
And, to grasp that logic,
Shall lead to love.

May our path be traced by wisdom.
Peace be upon us for all our days.

Amen

PART THREE

ILLUMINATIONS

"There is a crack, a crack in everything.
That's how the light gets in."
---Leonard Cohen
(from his album *The Future*)

Chapter One

GOD, THE CREATOR:

SOME ASSUMPTIONS

* * * * * *

In Part Three, we will shed light and expand upon the ideas introduced in Parts One and Two.

We have stated previously that before the beginning of the universe there was a state of (non)being in the form of a field of Pure Consciousness: formless, shapeless, featureless, devoid of substance or foundation. We have assigned to this field of Pure Consciousness the name of 'God, the Creator'. It is important to bear in mind that the words 'God, the Creator' are not the actual thing of which we speak. They are mere words, a symbol, created by the human intellect in an effort to come to grips with the mystery of (non)being. They are elements of the veil of names.

We begin with a basic attempt to understand the nature of consciousness. In their book *A Universe of Consciousness*, the authors Gerald M. Edelman, Nobel Laureate, and Giulio Tononi, state ". . . consciousness is not an object but a process . . ." (2) We

concur with this position. From this perspective we see that God is the process by which the universe came into being. As we shall see, while the Game of Being appears to consist of a large number of 'objects' moving about in space-time, the Game is actually made up of *an unfolding chain of events*, following inevitably one upon another, some of which last for extremely short periods of time, while others last for eons; and an event is not an object but rather is a process, a process made manifest by the immaterial Mind of God.

Given what has been stated thus far, what specific attributes can we assign to this particular notion of God, the Creator? This entity is "formless, shapeless, featureless," and therefore has no head or body, no arms or legs, nor hands or feet, no eyes to see, no ears to hear, no mouth with which to speak. The Creator has no genitals or reproductive organs, and is therefore neither male or female.

We suggest that this God possesses the capability of self-awareness, and is capable of experiencing the phenomenon known to humans as 'emotions.' We have said that the Creator was "bored and lonely," and indeed that it was this particular state of mind which prompted God to create the Game of Being. We may conclude that God possesses the power of imagination, for God created the Game of Being and before something can be deliberately created it first must be imagined. We may also conclude that the Creator is capable of acting with purpose and determination: we have said that "God thought, 'I shall *do something* about my boredom and loneliness, I will create a game.'"

The attributes assigned to God by humans are now, and have always been, based upon *assumptions* about the nature of God. No one *knows*, in the way that we know that the sky is blue, what the true nature of God is, or indeed, whether or not there actually is any such entity. Throughout the history of humanity, all of the beliefs and all of the statements made by humans about the nature of God are based upon nothing more than what amounts to a list of assumptions. What if some of these assumptions are invalid?

The three traditional monotheistic belief systems, Judaism,

Christianity, and Islam, all assume a God who is infinite and perfect, as well as being both omnipotent - - - capable of achieving any goal - - - and omniscient - - - all knowing. The theology of the Game of Being states that the assumptions that God possesses these latter two attributes are invalid.

In disputing these two assumptions, the Game of Being theology relies upon six assumptions of its own concerning the nature of God which are inherent in this belief system. These are:

1. God the Creator loves the Game of Being and all that it contains.
2. God the Creator experiences everything that all the manifestations of the Game experience, including the pain and suffering experienced by those manifestations which are animate (from the Song of Being: "Our journey of experience is Thy journey.")
3. God the Creator seeks happiness (from the Song of Being: "Our quest for happiness, [is] Thy quest.")
4. God the Creator is perfect, that is, without flaw.
5. God the Creator is eternal, that is, God has always been and always will be.
6. God the Creator is infinite, that is, there is no place where God is not; wherever there is place, there is God.

Dealing first with the assumption made by the traditional monotheistic belief systems that God is omnipotent, we base our analysis within the context of the existence of suffering. Since, according to the assumptions upon which the Game of Being theology is based, God loves all of the manifestations of the Game of Being; and since God experiences all that the manifestations of the Game of Being experience, including pain and suffering; and since God seeks happiness; if God is indeed omnipotent, then presumably God would spare humans and other lifeforms, and God, from pain and suffering if that were possible. Why, if God possesses the power to ordain otherwise, would God permit pain

and suffering to exist?

Traditionally, theologians who believe in God's omnipotence have answered this question in one of two ways. The first of these is that an angry God inflicts suffering as a punishment for sin. This is a recurring theme in the Old Testament in which the ancient Hebrew people are repeatedly punished by God for failing to properly observe God's laws. The idea that God would deliver punishment if displeased was a continuation of the pagan beliefs that were held by the ancient cultures of the Middle East and around the Mediterranean. But this idea of a punishing God contradicts three of the assumptions contained in the Game of Being belief system.

Our second assumption states that God experiences everything that all of the various manifestations of the Game experience. This means that if God purposely inflicts punishment upon humans, then God is purposely inflicting pain and suffering upon God. This would be contrary to our third assumption which states that God seeks happiness. An idea that could possibly resolve this dilemma would be to suggest that God is a masochist, a psychologically damaged entity that takes pleasure in self-harm. But this idea would contradict our fourth assumption which states that God is perfect and without flaw. Thus we can conclude that, given these three assumptions about the nature of God, God does not purposely inflict punishment for sin.

The second way in which traditional monotheistic theologians have answered the question of why an omnipotent God permits pain and suffering is to state that "God works in mysterious ways." The implication here is that the Mind of God is inscrutable, and that God has reasons for God's actions which are beyond human comprehension. But this statement is also inconsistent with our basic assumptions. If an omnipotent God has the power to prevent pain and suffering and chooses not to wield that power, then God is, at best, indifferent and uncaring, which contradicts our first assumption which states that God loves the Game of Being and all of its manifestations. At worst, it suggests that God is a

sadist, which would contradict our fourth assumption which states that God is perfect and without flaw.

Furthermore, the idea that the Mind of God is inscrutable and beyond human comprehension is questionable on other grounds. This idea was based upon human ignorance, upon humanity's inability to explain naturally occurring events. However, since the Enlightenment it has become clear that the universe is explainable through the application of rational analysis. This suggests, at the very least, the possibility that the Mind of the Creative Intelligence which brought the universe into being is also susceptible to rational analysis.

So the only logical conclusion which obtains - - - given our six basic assumptions - - - is that in fact God is incapable of preventing pain and suffering. Therefore there is something God cannot do, and therefore God is not omnipotent.

Considering this issue in more general terms, that is in contexts other than that of God's apparent inability to prevent pain and suffering, the Game of Being theology teaches that God is incapable of intervening in the ongoing events of the Game under any circumstances whatsoever. An act of God is, by definition, a miracle. The Game of Being theology states that there has only ever been one miracle, one instance when God acted, and that occurred when the Creator took a portion of God's immaterial Mind and fashioned from it the Primordial Atom, endowed the Atom with the Rules of the Game, and brought about the Big Bang / Cosmic Inflation events which gave birth to the Field of Play. Since that beginning of the Field of Play there have been no more miracles, no more acts of God. God has not intervened in the Game since its inception because God *cannot* intervene. As we have demonstrated, God is not omnipotent. God does not ever direct, control, or influence what happens within the Field of Play. The Rules of the Game (aka the laws of nature) determine what occurs within the Field of Play. In creating the Game of Being it was not God's purpose to be able to determine what would transpire moment by moment in the Game; rather, it was God's purpose to

experience whatever may happen in the Game, come what may, in accordance with what is allowed and determined by the Rules of Game. From the Creator's point of view, this is what keeps the Game interesting and exciting over the eons.

So why does existence include pain and suffering? Suffering is a consequence of two of the Game's rules, ordained by God: one, that in the Game change shall be unceasing; and two, that all beginnings must have an ending. These rules were included in the Creator's design for the Game of Being to insure that God's experience in the Game of Being would be different from God's experience as a state of eternal immateriality. Keeping in mind our second assumption which states that God experiences all that we experience, we may conclude that God's desire to experience constant change and endings is greater than God's desire to avoid pain and suffering.

We turn now to the claim that God is omniscient. There are two aspects to this idea: one, that God knows *everything that happens* in the universe; and two, that God knows *everything that is going to happen* in the universe. The Game of Being theology has no disagreement with the first of these two claims. Indeed, the belief that God is aware of, and directly experiences, simultaneously and instantaneously, everything that happens in the Game of Being is central to this theology. How the Creator achieves this wondrous feat will be explored in due course.

But the second aspect, that God knows, in advance, everything that is going to happen in the universe, cannot be true. Some people say that God knows what is going to happen because God possesses a plan that lays out what is to occur. If God has a plan which details all that is to take place, then that means that God has planned for a child to be born in Africa today, and planned for this child to die from malnutrition in eighteen months, something which happens to many children every single day. If God plans such horrors, then God is a monstrous sadist and is thereby psychologically flawed. But this explanation conflicts with our fourth assumption which states that God is perfect and without

flaw. Thus it cannot be that God has a plan for all that occurs within the Field of Play.

There is also another reason to doubt that God has a plan for everything that happens. To God the Game of Being is a game, created to relieve God's boredom and loneliness. Humans enjoy games and have invented many of them. No small part of the pleasure humans derive from playing games comes from the fact that we do not know in advance what their outcome will be. There is little point in playing a game if you know in advance all the actions which are going to happen in that game. Since we are direct manifestations of the Mind of God, we may safely assume that this statement holds true for God as well as for human beings. Thus we can conclude that God does not have a plan that details what will occur in the Game of Being.

But, some have argued, there is a malevolent force of evil existing in the universe that constantly works to hinder or thwart God's plan. Ironically, and rather illogically, those who maintain such a belief are often the same people who believe that God is omnipotent. If God is omnipotent, then obviously God would be capable of preventing this evil force from interfering with the Creator's plan. Of course, we have previously demonstrated that, given the Game of Being theology's basic assumptions, God cannot be omnipotent. So is it possible that there does exist in the Game of Being a malevolent entity which goes about sowing havoc and chaos? Does God have an 'opponent' in the Game of Being? We believe that this is highly improbable. The Game of Being is not a competitive contest between opposing sides. It is not that kind of game. Rather, it is the Creator's version of a game of 'make-believe,' in which God takes on the roles of the various manifestations which are brought into existence in accordance with the Rules of the Game. The Game of Being is more like theatre than it is like football.

Flood and drought, hurricane and earthquake, famine and disease, humanity has been afflicted by these events for our entire existence as a species. In the age prior to the rise of monotheism,

pagans believed that these events were caused by angry gods or evil spirits. But we now know that these are naturally occurring events and have a detailed understanding of their causes. As we shall see, while there is some scientific evidence which suggests that there is a Creative Intelligence which is responsible for the existence of the universe, there is no such evidence to support the idea that there exists a malevolent entity whose role in the Game of Being is to interfere with God's 'plan' and to afflict humanity.

What of the age-old question: "What came before God?" We take the position that God is infinite in time, that God is eternal, a "current and ongoing state of eternal immateriality," that always has been and always will be. This may look like an attempt to dodge the issue, but this is in fact the same position once taken by leading and respected scientists with respect to the existence of the universe, the so-called 'steady state' theory, that held the universe had no beginning and no end, and was eternal. In the 1960's the steady state theory was displaced in scientific circles by the Big Bang theory, when the evidence accumulated that the universe did in fact have a beginning. Ultimately, we take the position that the question "What came before God?" is fundamentally unanswerable and may therefore be ignored.

Finally, we may inquire as to the manner in which God's purposes were achieved. If God has no limbs, how did the Creator take "a portion of the immaterial Mind of God" and "fashion from it the Primordial Atom?" Concerning this matter humans can only speculate, but we suggest that the answer to this puzzle is: by the power of God's Mind. The Creator *thought* the Game of Being into existence.

When examined closely this idea is not as outlandish as it may first appear. Humans constantly create things through the power of thought. Consider the manufacture of a vehicle. At the beginning of the process the design team commits their ideas (their thoughts) regarding what the vehicle will look like and how it will be powered into a suitable format. Then the various parts of the vehicle are brought into being through the thoughts and skills of the

human labourers who manufacture them. Then the final product is assembled by the thoughts and skills of the workers on an assembly line. The entire process is made possible because humans, working with the materials which are available to them in the form of atoms of various substances, are capable of transforming their thoughts into things that exist. This process is very much an imitation of the process used by the Creator which, after first imagining the Game of Being, brought it into existence using the only 'material' available: the immaterial Mind of God.

The British astronomer Sir James Jeans has written that

> ". . . the stream of human knowledge is impartially heading toward a non-mechanical reality: the Universe begins to look more like a great *thought* than a great machine. Mind no longer appears as an accidental intruder into the realm of matter. We are beginning to suspect that we ought to hail it as the creator and governor of this realm." (3)

Chapter Two

THE FIELD OF PLAY

* * * * * *

We turn now to a discussion of the fundamental nature of the physical universe. In order to do this we must conduct an exploration into the fields of physics and astronomy. For those of you who avoided physics in high school do not be discouraged by this prospect. All of the ideas contained in the following discussion are simple and easy to understand, and there is very little mathematics, and what mathematics there is can be skipped over without losing the thread of the arguments made. However it is necessary to undertake this journey, for if we are to fully grasp what we humans are and what is our role in the Game of Being, we must attain at least a rudimentary knowledge of how the universe came to be and how it functions. In certain sections, particularly those which deal with Albert Einstein's Special Theory of Relativity, you will need to concentrate and pay attention to the details. But we promise you that if you can comprehend the sentence you are currently reading, there will be no physics within these pages which you will not be able to understand.

The Field of Play in the Game of Being, or the universe, (in

this discussion we will use the phrase 'the Field of Play' and the word "universe' interchangeably, as they both refer to the same collection of phenomena) consists of one fundamental kind of stuff. The word 'stuff' has been carefully chosen because of its vagueness. The current name for this stuff is 'space-time.'

The idea that the universe is a four-dimensional geometric construct (three dimensions of space and one dimension of time) known as space-time is a little over one hundred years old. Before then space and time were considered to be separate phenomena. Space was considered to be a void, an emptiness, a no-thing, whose only purpose was to separate one celestial body from another. As for time, it was assumed by most people, including Isaac Newton, the inventor of the mathematical tool known as 'calculus' and the discoverer of the laws of gravity, who perhaps possessed the most brilliant mind in human history, that time is absolute and the same everywhere in the universe; "that there is one clock ticking off the seconds by which the entire universe grows older." (4)

But in 1905, in his Special Theory of Relativity, Albert Einstein postulated that there exists a relationship between these two phenomena. In 1908 the idea of this relationship was put into a mathematical form by Hermann Minkowski, Einstein's former professor of mathematics, who once called Einstein "a lazy dog" for repeatedly skipping his classes. Minkowski declared that the ideas of a separate space and a separate time would disappear and be replaced by a union of the two to be known as 'space-time.' We shall see whether or not this union of space and time holds up under critical scrutiny, but for now we will continue to use the term 'space-time.'

Space-time is manifest in the Field of Play in two distinct states of being. The predominant state of being of space-time we will designate as its 'undifferentiated' state of being. Like the Mind of God from which it arose, it is *immaterial*. Undifferentiated space-time is flexible, capable of distortion and vibration, but it is fixed in place and does not travel. Undifferentiated space-time was the first of the two states of being of space-time to be made manifest in the Game of Being.

The second state of being of space-time we designate as 'differentiated' space-time. This state of being appeared sometime after the appearance of undifferentiated space-time in the evolution of the Game of Being. This state of being of space-time is known as 'energy-matter,' and is space-time which has become *material,* as opposed to the immateriality of undifferentiated space-time. Space-time in the energy-matter state of being is that which humanity has historically considered to be what the physical universe is made of. It is commonly referred to as 'matter.' Energy-matter consists of tiny perturbations of space-time, known in physics as 'sub-atomic' or 'quantum' *particles*, which are manifest in a wide variety of minuscule sizes, some of which last for only the very briefest periods of time, while others seemingly last forever. However, ultimately none of these differentiated perturbations are permanent; nor, as we shall see in the final analysis, is undifferentiated space-time. All beginnings must have an ending.

These differentiated perturbations of space-time can join together in forms that are both flexible and inflexible, depending on the type and strength of the bond they make with one another. These differentiated perturbations of space-time are said to 'carry mass,' which means that they are capable of distorting undifferentiated space-time. Differentiated perturbations of space-time travel about through undifferentiated space-time, and are, in fact, always in motion. Also, these differentiated perturbations generate, absorb, and reflect what is known as 'electromagnetic radiation,' of which visible light is one form, and which travels through undifferentiated space-time in the form of vibrations or light waves.

These two states of being of space-time which make up the Field of Play and its contents were brought into existence via the transmutation of the immaterial Mind of God during the Big Bang and subsequent Cosmic Inflation processes. More on that later. Henceforth in our explorations we shall refer to undifferentiated space-time simply as space-time, and differentiated space-time as energy-matter or just matter.

We have previously stated that the Creator took “a portion of

the immaterial Mind of God" and "fashioned from it the Primordial Atom." The use of the term "Primordial Atom" requires some explanation.

In 1927, Georges Lemaitre, mathematician, astronomer, and a Catholic priest, derived a solution to the equations of Albert Einstein's General Theory of Relativity which suggested that the universe is not static and eternal, as was generally believed at that time, but, rather, is expanding. This idea was apparently confirmed two years later by the American astronomer Edwin Hubble, who first identified that other galaxies exist in the universe, and who later concluded that most of these galaxies are receding at speeds which are proportional to their distance from us.

In 1931, Lemaitre published a paper entitled *The Beginning of the World from the Point of View of Quantum Theory.* (5) Reasoning that if the universe is expanding outwards in all directions now, it must have been smaller and denser at some point in the past, and that therefore it must have had a beginning, Lemaitre posited that the entire universe "arose from the decay of a singular atom." (6) Lemaitre called this theoretical manifestation the "Primeval Atom." His Primeval Atom is not to be thought of as the atoms that make up the matter in the present-day universe. Rather it was conceived as a single point into which all the matter and energy in the universe was concentrated. In Lemaitre's view it is what there was before space and time came into existence. Lemaitre thus anticipated by some thirty-five years the singularity theorems of Roger Penrose and Stephen Hawking, who demonstrated mathematically that the universe began as an infinitely dense and infinitely hot point, called the 'singularity.' Note that the ideas of Einstein, Lemaitre, Penrose, and Hawking all include the assumption that time is a phenomenon which is manifest in the universe. We will deal with this assumption later on in this discussion.

We have borrowed Lemaitre's idea and renamed it the 'Primordial Atom,' and have stated that the Primordial Atom consisted of the immaterial Mind of God, and that this entity preceded and gave rise to the Big Bang. We must pause here to make

clear what is meant by the terminology of the 'Big Bang.' People often think that this implies that the universe began in a large explosion that scattered matter outwards in all directions, but this is incorrect. Rather, the Big Bang was *a state of being* in which very high pressure, density, and temperature prevailed.

Although it involved much higher pressure, density, and temperature, the Big Bang state of being is analogous to what occurs in the centres of stars where one form of energy-matter, say hydrogen, undergoes a transmutation into another form of energy-matter, helium. During the Big Bang state of being the immaterial Mind of God (Pure Consciousness in the form of the Primordial Atom) was transmuted into the 'necessary condition' (what modern cosmology calls a 'space-time foam'), which in turn, through the event known as 'Cosmic Inflation,' gave rise to the Field of Play in the form of undifferentiated space-time.

Immediately after the Cosmic Inflation event, space-time underwent what is known as a 'phase transition,' which resulted in the creation of energy-matter. A phase transition occurs when an entity undergoes a change from one state of being to another. The theoretical physicist Lawrence Krauss has illustrated what a phase transition is with the following example:

> "The situation would not be unlike what may have happened to you if you have ever planned a big party and then forgotten to put the beer in the fridge in time. You put the beer in the freezer and forget about it during the party. The next day you discover the beer, open a bottle, and wham! The beer in the bottle suddenly freezes and expands, shattering the glass, and producing quite a mess. Before the top is taken off, the beer is under high pressure, and the beer at this pressure and temperature is liquid. However, once you open the top and release the pressure, the beer suddenly freezes. During the transition, energy is

> released as the beer relaxes to its new state - - - enough energy to cause the expanding ice to break the bottle." (7)

In Krauss's example of a phase transition we have a material substance - - - beer - - - *abruptly* changing from a liquid to a solid state after experiencing a change in pressure. In the case of immaterial space-time giving birth to energy-matter, the phase transition is similar in principle but different in its details. In this case we have what is an immaterial state of being changing into a material state of being due to a change in both pressure and temperature. The release of pressure allowed the Primordial Atom to change into immaterial space-time, and the Cosmic Inflation event, which began instantaneously when that pressure had been released, over a very short period of time increased the size of the Primordial Atom from the size it was at the moment the necessary condition was achieved, to the size of the Field of Play as it exists today. This enormous increase in size resulted in a significant decrease in temperature, which resulted in the creation of energy-matter. Just as when warm moist air comes into contact with cooler dry air and rain drops form in the atmosphere, energy-matter can be thought of as 'precipitating out' of the undifferentiated immaterial space-time as it rapidly cooled. This raises a speculative but intriguing possibility that could resolve a long-standing mystery in cosmology concerning the energy-matter known as 'antimatter.' Furthermore, as we shall see, the phase transition which gave birth to energy-matter has never ended; a muted version of this process continues to operate in the universe to this day. We will return to these topics presently.

To recap: the Big Bang state of being occurred when the Creator applied immense pressure to the Primordial Atom, which squeezed the Primordial Atom into an ever-smaller volume, greatly increasing its density while raising its temperature to billions of trillions of degrees. The high pressure and incredible temperature caused the Primordial Atom which, you will recall, consisted of the immaterial Mind of God, to undergo a transmutation, similar to the

transmutation process which occurs in the centre of stars, into what modern cosmology has termed a 'space-time foam.' When the Creator observed that the *necessary condition* had been achieved, the Creator abruptly removed the pressure which had been compressing the Primordial Atom. As a result, the Primordial Atom, now consisting not of the unaltered Mind of God, but of a new immaterial state of being which we are, for now, calling space-time, instantaneously and uniformly expanded in all directions. This instantaneous and extremely rapid expansion is known as the moment of Cosmic Inflation. It was the birthing of the Field of Play.

It is an accident of history that Science has been saddled with the label of 'Big Bang' to signify the beginning of the universe, for the beginning was neither 'big' nor did it 'bang.' In 1949, that label was attached to this theory of how the universe began by the British astrophysicist Fred Hoyle, who was a proponent of the 'steady state' theory, in which the universe was considered to be eternal with no starting point. Unfortunately the label stuck, and it has been confusing people ever since. The idea that there could have been a Primordial Atom to which pressure could have been applied has been dismissed by scientists on the grounds that before the Big Bang there was no space or time from which said pressure could be applied. We believe that point of view to be incorrect. It is clear that before the Big Bang there was no 'space-time.' But the manifestation we call 'space-time' (it is just a label, and like the 'Big Bang' not a very good one) came into being at a certain point, and whether Science accepts the Penrose/Hawking mathematical formulation of a singularity as the starting point for the universe, or whether Science endorses the more recent mathematical model of a very hot highly dense region of space-time foam as the beginning of the universe (there is some controversy about this,) in either case there existed an entity which had a boundary beyond which it did not extend, and beyond which there was then, and is now . . . . *something*, of which the singularity, or the space-time foam, or the Primordial Atom, was composed.

There was, by logical necessity, a boundary around the infant universe, and there is a boundary around the universe today. The

Field of Play is finite in both space and time; it had a beginning and it will have an ending. The Creator's mandate that in the Game of Being "all beginnings must have an ending" applies not only to that which is contained within the Field of Play, but also to the very Field of Play itself. One of the reasons why God, which is infinite, created the Game of Being, was to experience the finite. Beyond the boundary of the Field of Play is the void which surrounds it. This void is devoid of any material objects but it cannot be said to be truly empty, for it is inhabited by the Mind of God. To state it more precisely, this void *is* the infinite immaterial Mind of God, that is, Pure Consciousness; the same Pure Consciousness from which our immaterial/material universe arose, and of which it consists.

We return now to the moment of Cosmic Inflation. This theory was originally based not on any astronomical observations but on the mathematical calculations of a young particle physicist named Alan Guth and his colleagues in the early 1980's. These theorists

> ". . . mainly sought to explore the consequences that arose from certain theories of how elementary particles interact, when they applied those theories to the universe's earliest moments . . . they noted that a particular class of elementary-particle theories, if true, made a startling prediction about an era quite early in the universe's history. According to these theories, during this era the cosmos must have expanded at a truly extraordinary rate." (8)

The basic idea of the theory of Cosmic Inflation (and it has thus far remained a theory) is that at a certain point very early in the evolution of the universe, the Field of Play underwent, in an extremely short period of time, an incredibly massive increase in its size. The estimates of how long the so-called 'inflationary era' lasted (these estimates are at best educated guesswork) are in the range from perhaps 10^-33 of a second to 10^-30 of a second after the Big

Bang. (To be clear for the general reader: the Big Bang and Cosmic Inflation are two entirely different but connected events, the former preceding the latter in time. Do not confuse the 'Bang' of the Big Bang with the rapid expansion of the early universe during the Cosmic Inflation era). The guesstimates of how much the universe increased in volume as a result of inflation range from a factor of 10^60 to 10^75 times. These are very large numbers. The actual length of time inflation lasted and the actual increase in the size of the Primordial Atom which resulted from inflation are not of critical importance to our understanding at this juncture. What is germane is the idea that when the necessary condition had been achieved, the removal of the pressure which had been confining the Primordial Atom resulted in an extremely rapid expansion of the Atom in all directions, leading to the creation of the sphere of space-time of which the Field of Play consists. 'Cosmic Inflation' is the name that has been given to that period of extremely rapid expansion. As a result of that expansion, the temperature of the space-time comprising the newly-formed Field of Play had decreased from the temperature prevalent during the time when the Primordial Atom had achieved the necessary condition, some 10^32 degrees Kelvin, to a temperature of approximately 10^26 to 10^30 degrees Kelvin. It should be noted that these numbers too are merely educated guesstimates, but whatever the actual values which pertained, we can safely state that the new universe was extremely warm.

Back in the 1980's cosmologists latched onto the theory of inflation because it provided solutions to two problems associated with the Big Bang theory of the origins of the universe. These problems were known as the 'flatness' and 'horizon' problems. The flatness problem was simple: why does the universe appear to be flat? As we look out in all directions across the universe, now to a distance of some 14 billion light years, we find no evidence of curvature, either positive (like a sphere), or negative (like a saddle). The horizon problem posed the question of why the universe looks so much the same no matter in what direction we look. As the astrophysicist Donald Goldsmith notes in his informative book, *The*

Runaway Universe, "Astronomers find approximately equal numbers of galaxies in each large volume, and these galaxies fall into similar categories whose members resemble one another no matter where they appear."(9) Astronomers asked themselves how could regions that are in opposite directions in the sky and could never have had any contact with each other, and are further apart than the distance that could have been travelled by the speed of light during the calculated age of the universe, be so remarkably similar? These problems apparently greatly vexed the cosmological community, and the theory of inflation provided the key to a potential solution.

The standard inflationary theory states that at a certain point in time the space-time foam of the Big Bang era underwent a rapid expansion *in all direction*s. If the universe started out (before inflation) as a Penrose/Hawking singularity, literally as a single point, and the expansion was uniform, as the original inflation theory suggested, then logic demands that the only possible outcome of such an event would be a universe in the form of a sphere.

Our thinking endorses this general proposition because of our belief that the pressure applied by the Creator to the Primordial Atom would have squeezed the Atom down to a tiny spherical object similar to, but not exactly the same as, a Penrose/Hawking singularity. The Penrose/Hawking singularity is thought to contain all of the energy-matter currently extant in the universe, all compressed down into a single point of infinite density and infinite temperature. This idea we do not accept. In our model of the Primordial Atom being squeezed to the point at which the 'necessary condition' was achieved, this state of being did not contain all of the energy-matter now observable in the current universe; rather, it only contained the *potential* for energy-matter to be created.

So the flatness problem was disposed of because the theory of inflation allowed cosmologists to conclude that the universe rapidly expanded to such a vast size that even if it is spherical and curved, we cannot, from our vantage point, observe the curvature, in the same way we cannot observe the curvature of the Earth when we are standing on its surface. (This is true unless we happen to be standing

on a piece of land that is adjacent to a large body of water. If we scan the horizon of the ocean and a ship approaches the land upon which we stand, we will see the upper portion of the ship before we see its hull. This is due to the curvature of the Earth.)

There is, however, another possible reason why we cannot observe the curvature of the universe, but it has gone unrecognized due to the limitations of the cosmological model relied upon to explain the red-shifting of light from distant galaxies. Astronomers often use the analogy of dots painted on the surface of a balloon to illustrate the observation that everywhere in the sky we look, almost all other galaxies *appear* to be receding away from us. As you blow more air into the balloon so that it expands and its two-dimensional surface area increases, the distance between the individual dots increases at a rate which is proportional to the distance between them, and all the dots move ever-further away from all the other dots. This is an easy-to-grasp idealization, but it is a two-dimensional representation of a three-dimensional situation, and it has led cosmologists astray.

What if the reason we cannot observe the curvature of the universe is not because the sphere is so large that we cannot see the curvature from our vantage point on its surface, but because we are situated *within* the sphere? Observations make it clear that our galaxy is not situated on the two-dimensional surface of a sphere. As we look out across the Field of Play, we do not only see other galaxies spreading out from us on a 'horizontal' plane like spokes on a wheel with our galaxy as its hub. We also observe galaxies 'above' and 'below' that imaginary horizontal plane. Our galaxy is surrounded on all sides by other galaxies.

Imagine that you are situated within a sphere which is divided into two equal hemispheres by a glass floor. On the floor are painted two lines that are each equal to the diameter of the sphere, and that therefore cross each other at right angles at the exact centre of the sphere. This 'X' marks the spot where you are standing. You are facing along one of the line segments (the radius of the sphere) out towards where the painted line on the glass floor meets the inside

surface of the sphere. Pretending for a moment that you are standing on a large map, we will arbitrarily assign the word 'north' to the direction in which you are facing. To your right we will label the direction 'east,' to your left 'west,' and behind you the label 'south.' You now notice that there are lines painted on the inner surface of the sphere which arc over your head and beneath your feet, and which connect the ends of the two lines painted on the glass floor. As you look about, you realize that these lines divide the volume of the sphere into eight equal sections, four above the floor in the centre of which you are standing, and four more sections below your feet. Thus the section that is bounded by the painted lines labelled north and east, and by the arcs that extend from where these lines meet the inner surface of sphere and cross each other at right angles on the inner surface of the sphere directly above your head, can be labelled as the north-east quadrant of the upper hemisphere of the sphere.

While you are pondering the significance of this geometric division of the space around you, you notice that the sphere is beginning to expand. The inner surface of the sphere and the arcs painted on it are receding from you at an ever-increasing rate. The floor and its painted lines appear to be expanding in all directions as the inner surface of the globe recedes. Then the light begins to dim and soon the inner surface of the sphere can no longer be seen; it is lost in the gloom. The only light now comes from where the two lines painted on the floor cross beneath your feet. This dim glow allows you to see for some slight distance these lines as they stretch outwards towards the inner surface of the sphere, which has by now completely vanished. The fact that you can still see portions of the lines on the floor allows you to continue to orient yourself in this space, north, south, east and west.

For awhile nothing happens. The beating of your heart allows you to determine that time is passing. Then, gradually at first, and then more and more rapidly, specks of light begin to appear all around you, both above and below the glass floor. As time goes by the specks become brighter and you notice that they appear to be in motion. As you watch, captivated by the light show, your attention is

drawn to one particular speck of light that is at about eye-level in what you previously identified as the north-east quadrant of the upper hemisphere. You decide to investigate.

You set out towards this speck of light, taking cautious, tentative steps, for having left behind the dim glow in the floor at the point where the lines cross, you can no longer see the floor and cannot be completely certain that it is still there. Eventually however, you make your way safely to the speck of light which you are seeking. As you draw nearer, you perceive that this speck of light is not one single light, but is a huge number of individual lights organized in a disc shape around a central bulbous more brightly lit core. Because this is a new experience you have no words to describe what you are looking at, but what you have discovered is the Milky Way galaxy. It is very beautiful. Its beauty is almost over-powering, and you avert your gaze for a moment so as not to be emotionally overwhelmed.

As you look around, you see that the particular speck of light which you are investigating is surrounded on all sides and in all directions by other specks of light. Many, many of them, far more than you could count. Things appear to be similar in every direction you look. Of the curved walls of the sphere that enclosed you at the beginning of your adventure there is no sign. Based upon your current observations, you are tempted to conclude that the contour of the structure you are embedded in is flat, even though you remember that original spherical condition.

The last few paragraphs have been an attempt to demonstrate that the Field of Play consists of what we have labelled 'immaterial space-time,' and that this immaterial space-time is enclosed within a spherical boundary. Our galaxy is not situated on the two-dimensional surface of this sphere. Rather, it is situated somewhere within the three-dimensional volume of the sphere.

It is logically necessary to assume that there will be galaxies within the Field of Play whose position is such that they are situated adjacent to the surface of the sphere of space-time. The experience and understanding of the universe of the inhabitants (if any) of such

galaxies will be different from ours. They will observe other galaxies (although perhaps in lesser numbers than we do) in a 'horizontal' plane around them, and they will be able to see galaxies that are 'deeper' into the sphere than they are. But in the opposite direction, in an arc of sky 'above' them, they will observe only an inky blackness devoid of any other specks of light, a great emptiness.

The foregoing discussion of the nature of the Field of Play is very simplistic. It may give the reader the impression that galaxies are sprinkled more or less evenly throughout the universe, which is not in fact the case. Individual galaxies are found in groups called galaxy clusters. Galaxy clusters form superclusters which span hundreds of millions of light years. Between superclusters are vast voids that contain few or no galaxies at all. Some superclusters appear to be converging on a point in the Field of Play called the Great Attractor. It is a situation of great complexity.

If we accept the idea that the universe is a very large sphere - - - a bubble of immaterial space-time - - - within the interior volume of which galaxies are embedded, we lose our easy-to-visualize picture of dots painted on the expanding two-dimensional surface of a balloon as an explanation for why all galaxies appear to be receding from one another. But the loss of this image is not fatal to an understanding of this mystery. This phenomenon can be explained through a complete understanding of undifferentiated space-time, a topic to which we shall turn in due course.

As for the horizon problem (why does the Field of Play look roughly the same wherever we look), inflation theory states that the tiny pre-inflationary state of being was such that all its contents were in close proximity and in contact with each other at that point in the evolution of the universe, and was therefore homogeneous. Cosmologists thus concluded that:

> “After this inflation had blown a tiny bubble of space into an enormous volume, it left that volume with identical physical conditions throughout.” (10)

Goldsmith also states that “An observer adrift in the post-inflationary universe would observe the same conditions as an observer in a cosmos that had never undergone inflation . . .” (11) On these two points we disagree with the conclusions of current-day cosmology.

Dealing with the latter of these two statements first: we do not agree that the pre and post inflation universes were essentially the same. The pre-inflationary 'necessary condition' was much hotter and denser than the post-inflationary Field of Play, and these two states of being were fundamentally different. We do not, and we suggest that we cannot, have a clear idea of what the era of the 'necessary condition' 'looked like,' for it was immaterial. The term 'necessary condition' is a label for a picture we cannot image. What the details of that situation actually looked like is completely outside of human experience and beyond the capacity of human comprehension. It was the result of an act of God, which is, by definition, a miracle; and a miracle, by definition, is incomprehensible to the mind of humans. Thus the pre-inflation and post-inflation states of being are utterly different from one another. A detailed understanding of the pre-inflation universe is, in principle, beyond human comprehension because it came about through an act of God, and, significantly, took place before the Rules of the Game had come into effect.

We can formulate a theory of *what* was done. In the Game of Being theology we have proposed that the Creator took a portion of God's immaterial Mind and fashioned from it the Primordial Atom. But we cannot explain *how* it was done. How did the Creator, through the power of thought alone, compress the Primordial Atom, made of the Pure Consciousness of the Mind of God, and manipulate it into the state of being we have named the 'necessary condition?' *This we cannot know*; about this we can only speculate. However the post-inflation state of being, resulting in the universe we observe today, was (and is) governed in its evolution by the Rules of the Game, and is therefore accessible to rational analysis at which the human intellect excels.

(As an aside, we will take this opportunity to mention that we believe the reason the two foundational theories of 20th Century physics, the General Theory of Relativity and Quantum Mechanics, which have explained so much, are said to 'break down' and provide mathematical answers that 'run away to infinities' when applied to the moment of the creation of the universe, is that these theories are products of the human intellect, and our human minds are barred, in principle, from ever grasping in detail an understanding of an act of God. The 'breaking down' of these mathematical models is a hint to us from the universe that we have reached the limits of human knowledge in regard to the beginning of the Game of Being.)

Nor do we accept Goldsmith's statement that after inflation the universe was left "with identical physical conditions throughout." We will argue that after the inflation event there were regions within the Field of Play where the temperature of the immaterial space-time was significantly higher than in other regions; in other words, the inflation-induced cooling of the necessary condition as it expanded into the hot bubble of space-time was not uniform. We shall develop this idea presently.

The question naturally arises as to what caused inflation to take place, and also, why did it stop? Here the ideas put forward by the scientific community become somewhat hazy. Some say that inflation occurred because a number called the 'cosmological constant' suddenly and momentarily acquired a very large value, and then returned to a zero or near-zero value, bringing inflation to an end. However clever this mathematical explanation may be, it provides no visual picture or description of what brought the inflationary process about. Some say that inflation was caused by a 'quantum fluctuation.' Others have proposed that theoretical particles called 'inflatons' were responsible.

The cosmology of the Game of Being provides a much clearer visual picture and more easily comprehensible explanation of the cause of the inflation event. This cosmology states that inflation occurred when the Creator had observed that the

necessary condition had been achieved and, thinking, 'Let the Game of Being begin!' abruptly removed the pressure that had been confining the Primordial Atom, which in response instantaneously began to rapidly expand and cool; in other words, to inflate.

The question then arises as to why, after the initial burst of rapid inflation that relieved the pressure to which the Primordial Atom had been subjected, did the universe continue to expand? We will deal with this question when we turn our discussion to the amazing properties of space-time. As we shall see, serious doubt will be cast upon the current widely-accepted idea that the universe is in fact still expanding.

The idea that the infant universe underwent a period of rapid growth we name 'cosmic inflation' remains, at this point, just a theory. What evidence is there to support this theory? Cosmologists have, as we have previously discussed, used the inflation hypothesis to provide explanations for the flatness and horizon problems. Cosmologists have also concluded that their theories of how the universe would have appeared during the period following the inflation event agree with their observations of what is called the Cosmic Microwave Background (CMB).

In the late 1940's, three astrophysicists, George Gamow, Ralph Alpher, and Robert Herman, proposed that the elements hydrogen and helium ". . . were formed by the big bang, and that the result would be a cosmic bath of primordial radiation . . ." (12) In 1964, two Bell Labs engineers, Arno Penzias and Robert Wilson, using a radio antenna which had been built to communicate with the Echo 1 satellite that had been launched in 1959, accidentally detected a constant microwave radiation signal that was the same no matter what portion of the sky at which they pointed their antenna. Penzias and Wilson had discovered the radiation left behind by events that took place very early in the creation of the Field of Play. They had discovered the CMB. Their discovery cemented the Big Bang theory of the beginning of the universe, and consigned the Steady State theory to the dustbin of history.

In 1989, the Cosmic Background Explorer (COBE) satellite

was launched, carrying antennas that could probe the CMB in much finer detail than was previously possible. Scientists, using the theory of inflation, had predicted that there should be extremely minute variations in the otherwise smooth CMB temperature. When COBE did indeed detect these variations, the theory of Cosmic Inflation was vindicated. These temperature variations came to be known as 'wrinkles' and are thought to be the 'cosmic seeds' that grew into the galaxies, galaxy clusters, and super-clusters that we observe across the Field of Play today.

Of particular interest to our discussion is a statement by George Smoot, the lead scientist on the COBE mission, who wrote:

> "The big bang was correct, inflation theory worked, the pattern of the wrinkles was about right for structure formation by cold dark matter . . . Some of the structures represented by the wrinkles were so large that they could only have been generated at the birth of the universe, not later on." (13)

We will return to the topic of the CMB in due course. For now we will say only that we believe current cosmology's understanding of the cause of the CMB rests upon an assumption which will prove to be invalid.

Where does this leave our search for evidence that the theory of inflation is correct? The use of a theory to explain other phenomena - - - the flatness and horizon problems, and the CMB - - - doesn't necessarily provide direct evidence for the validity of the theory itself. Nevertheless, the physics of the Game of Being accepts the idea that an inflation event literally stretched the then existing necessary condition of the Primordial Atom into the Field of Play which we observe today.

Chapter Three

SOLVING THE MYSTERY OF 'BLACK HOLES'

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We now turn our attention elsewhere. Stars are born when huge clouds of cold hydrogen gas, floating in inter-stellar space, collapse inwards upon themselves due to the warping of space-time by the hydrogen atoms. As more and more hydrogen atoms are drawn into a growing sphere of gas, they collide more and more frequently and at ever higher velocities. Hydrogen atoms are made up of one proton for its nucleus and one electron spinning around it. Protons and electrons are two types of the perturbations of space-time which we referenced earlier that are stable and long-lasting. In the dense maelstrom of increasingly heated gas, the electrons of the hydrogen atoms are stripped away from the protons. At the centre of these spheres of gas the proton – proton collisions become so powerful that the force which acts to keep protons apart is overcome and, according to current theory, the individual protons begin to fuse together when they collide. This fusion process releases so-called 'energy' which flows outward

towards the surface of the star. Once the fusion process begins in the core of the sphere of hot hydrogen gas, the energy it releases which pushes outward, counteracts the effect of the gravitational field which causes the hydrogen atoms to fall downwards and inwards, and the continued collapse of the sphere of gas is halted, and thus a star is born. (We will examine the concept of 'energy' and its role in the structure and behaviour of stars in more detail presently.)

Stars come in different sizes, or as astrophysicists say, with different masses. Stars last only as long as there is nuclear fuel in their cores to support the fusion process. In his book *At the Edge of Time*, the astrophysicist Dan Hooper succinctly describes what happens to stars with large masses:

> "The larger a star is, the more rapidly it consumes its fuel - - - massive stars burn hot and they die fast. Stars with tens or hundreds of times as much mass as the Sun stop undergoing fusion after only millions of years, ending their lives in a spontaneous explosion animated by the intense power of gravity - - - a supernova. When the explosion is over, the most massive of these stars leave behind a black hole. Black holes are . . . objects so entirely adherent to the will of gravity that even light cannot escape." (14)

Hooper goes on to say that less massive stars, stars that are between ten and thirty times the mass of the Sun, still explode as supernovas, but they are not massive enough to collapse into black holes. Instead, these stars collapse into 'neutron stars.' These are spherical objects where the effect of the gravitational field is so great that it overpowers the force which normally keeps protons and electrons apart and slams these particles together, resulting in a super-dense substance made entirely out of neutrons. The material from which a neutron star is made is so dense that a teaspoon of it

here on the Earth would weigh as much as a battleship. Neutron stars spin at extremely high rates, rotating on their axis at speeds up to one thousand times per second. Some of them emit vast amounts of radiation across the entire electromagnetic spectrum, from long wavelength radio waves to short wavelength gamma rays. Neutron stars that exhibit this behaviour are called 'pulsars,' due to the pulse of light which they send out across the galaxy like a lighthouse.

In 1917, only a year after Albert Einstein published his General Theory of Relativity, a man named Karl Schwarzschild derived a solution to the theory's equations which seemed to indicate that:

> "If the mass of a star is concentrated within a sphere of a definite radius . . . then the curvature of space becomes too great for light to escape from the star." (15)

A half-century later Schwarzschild's calculations became the basis for the modern understanding of so-called 'black holes.' In 1970, observational evidence for the existence of these phenomena was obtained by the satellite Uhuru. In his excellent book *The Dancing Wu Li Masters,* author Gary Zukav, describes the modern understanding of black holes as follows:

> "Surrounding this remainder of a star is an "event horizon." An event horizon is created by the enormous gravitational field of the burned-out star . . . Anything within the gravitational field of this mass quickly is pulled toward it, and once past the event horizon, can never return . . . [an object pulled past that point] will be pulled directly to the center of the black hole to a point called the singularity. There it literally will be squeezed out of existence, or as physicists say, to

> zero volume. At the black hole singularity all the laws of physics break down completely and even space and time disappear." (16)

These are truly extraordinary claims: that inside a black hole the curvature of space becomes so great that light cannot escape; that material objects sucked into a black hole will be squeezed out of existence into nothingness; that in a black hole the known laws of physics do not apply; that in a black hole space and time disappear. The renowned astrophysicist Carl Sagan once stated that "extraordinary claims require extraordinary evidence." Yet despite the extraordinary nature of these ideas and despite the utter lack of empirical evidence to support them, astrophysics has for the most part adopted them as a valid description of the phenomenon known as 'black holes.'

Now, it is necessary to point out that all the conclusions listed in the previous paragraphs are based merely upon some mathematical equations, mysterious squiggly markings on a piece of paper. There is no observational data to support them. No human has ever been near to or inside of a black hole.

I can say, in English, "The cow jumped over the moon." This sentence follows the rules of the English language and is grammatically correct. But the statement is, of course, nonsense. Mathematics is also a language. Its statements are called 'equations.' Like English, mathematics has grammatical rules which must be followed in order for an equation to be grammatically correct. And as in English, it is possible to write down a mathematical equation that is grammatically correct, but the substance of which does not necessarily correspond to anything that actually exists or occurs.

Touching on this topic, physicist and noted author Paul Davies has written:

> "To appreciate the significance of [how mathematics functions] it is necessary to know

> something about the relationship between the equations of a physical theory and their solutions. It often happens in science that a set of equations possesses many solutions, each describing a *possible* (emphasis added) reality. To pick one, you have to decide which best fits the facts, or else appeal to some additional criterion, *such as physical reasonableness or elegance*." (emphasis added) (17)

Karl Schwarzschild's solution to the equations of Einstein's General Theory of Relativity are the mathematical basis for the modern understanding of the phenomenon that has been labelled 'black holes.' Because his solution was mathematically grammatically correct, scientists concluded that it describes a *possible* reality.

So does Schwarzschild's solution fit the facts? When the modern picture of black holes was first formulated there were no *facts*. Nobody really *knew* what a black hole is. How about the criterion of physical reasonableness? How can it be that a star of up to thirty times the mass of the Sun contracts to form a neutron star, the most dense substance in the known universe, but that when a star of over thirty solar masses contracts the matter of which it consists simply evaporates? Is the contention that matter which enters a black hole "literally will be squeezed out of existence" physically reasonable? This brings us to the criterion of mathematical "elegance." As we shall see, the reliance of the profession of physics on the "elegance" of certain sets of equations has led scientists down some strange and convoluted rabbit holes, and to erroneous conclusions.

An example of one such rabbit hole is the so-called 'black hole information paradox.' Leah Crane, a reporter for *New Scientist* magazine offers the following description of this particular rabbit hole:

> "The question of what happens to information when it falls into a black hole has vexed physicists for decades. When Stephen Hawking calculated that black holes should slowly evaporate by emitting radiation - - - now called Hawking radiation - - - he also created a problem.
>
> "His work suggested the radiation should be emitted in a way that depended only on the black hole's current state and not on what previously fell into it. If correct, it would mean that when matter is pulled into a black hole, all the information about the state of that matter would be destroyed.
>
> "This isn't allowed in quantum mechanics, the laws of which require that it must be possible to use the state of any closed system at any point in time to extrapolate forward or backward in time. Essentially, it must be possible to mathematically rewind the system in order to understand its past state. However, if information is destroyed, that possibility is lost with it. This problem is called the black hole information paradox." (18)

This is an example of the kind of problems that can arise as a result of an invalid assumption; in this case, the erroneous assumption made by scientists in the 19th Century that the luminiferous ether was in some sense material in nature. We will deal with that assumption in detail later. For now the question before us is: Is Schwarzschild's solution to the equations of General Relativity and the conclusions which have been based upon it reasonable, or is this a case in which the cow is jumping over the moon?

We suggest that Zukav's description of the black hole

phenomenon, which was based solely on mathematical equations is, frankly, preposterous. It is the stuff of science fiction, not Science. (In making this allegation we must not blame Zukav; he is a writer, not a scientist, and his writings depended upon the ideas and information he received from the scientific community while researching his very informative book.)

We object to this understanding of the black hole phenomenon because of its claim that "At the black hole singularity all the laws of physics break down completely." Our objection is based upon our firm belief that the Rules of the Game, which are reflected in our human-derived laws of physics, apply everywhere within the Field of Play, and that there exists no situation in which the Rules do not apply.

We suggest that there is an alternative explanation for black holes that does not require a curvature of space so extreme that electromagnetic radiation cannot escape its boundaries; where matter is not squeezed out of existence; where the laws of physics still apply; where the black hole phenomenon is consistent with other astronomical observation; and in which space-time does not disappear but is transformed. We say that at the centre of every black hole which resulted from the collapse of a massive star lies not the fanciful and purely mathematical concept of a singularity, but a very real and a very massive neutron star. The question then arises: other neutron stars, in the form of pulsars, are observable by the electromagnetic radiation they emit; why can't we observe the neutron star at the centre of a 'black hole?' The answer to this question lies with a correct understanding of the nature of space-time.

Immaterial space-time is the flexible 'stuff' which pervades the entire universe. It penetrates almost all so-called 'solid' bodies such as the Earth and you and me. The only solid bodies which it does not penetrate are neutron stars. Vibrations of this flexible stuff are what we call electromagnetic radiation or light. Space-time is present throughout the hot gaseous spheres we call 'stars.' When a star which is massive enough to collapse into a 'black hole'

runs out of its nuclear fuel, it can no longer resist the inward pull of its own gravitational field. In a very brief period of time, mere seconds, the entire volume of the star collapses into a neutron star, an object with a much smaller diameter than the original star.

Einstein's General Theory of Relativity demonstrated that gravity is the curvature of space-time by matter. In order for this to occur, matter must 'pull' on space-time. When a neutron star is formed, all the mass of the original star is compacted into a body which is very much smaller and much more dense. This smaller, denser object, the neutron star, pulls on the space-time in its vicinity much more effectively than did the original star, resulting in a much more powerful gravitational field. The 'pull' on the space-time in the immediate vicinity of a neutron star *of sufficient mass* is so powerful that this space-time is pulled taut, resulting in the complete loss of its flexibility. This loss of flexibility means that it can no longer vibrate. Since - - - quite contrary to the 'photon' theory of light - - - the vibration of space-time is what electromagnetic radiation is, this means that no light can pass through this region of space-time. This is why 'black holes' are black, and why they do not emit radiation of any kind, 'Hawking' or otherwise. The outer surface of this region of space-time around the neutron star corresponds to what Zukav referred to as the "event horizon."

With this knowledge in hand, we are now in a position to dispel the various popular misconceptions regarding 'black holes.' First of all, they are not 'holes' in space at the centre of which is some mysterious entity wherein matter is crushed out of existence, and where the laws of physics do not apply, and where space itself ceases to exist. On the contrary, at the centre of a 'black hole' is not nothingness, but a very, very solid object: a neutron star of a certain minimum mass.

A second common misconception regarding 'black holes' is that they grow by 'feeding' on the matter that they pull in towards them. This is incorrect. No ordinary matter ever falls onto the surface of a neutron star which is surrounded by an 'event horizon.'

This is because the space-time within the event horizon is not only too inflexible to permit the transmission of electromagnetic radiation, it is also impervious to the passage of ordinary matter in the form of individual protons, neutrons, and electrons. The region of space-time immediately beyond the event horizon is also being pulled on by the neutron star, to a degree which causes that space-time to be highly 'stressed.' It is commonly believed that any object which approaches too close to a 'black hole' will be 'spaghettified,' that is, stretched out, by the pull of the 'black hole's' gravity. But as the General Theory of Relativity demonstrated and as we will make abundantly clear, gravity is not a force that one material body exerts upon another material body; it is the curvature of space-time, and therefore spaghettification is not the fate which awaits those who venture too close to a neutron star. Any solid body - - - except another neutron star - - - which attempts to pass through space-time which is sufficiently stressed, will simply disintegrate into the sub-atomic particles of which it is made. As we will see, there is observational evidence from within our own solar system to support this claim. Thus any normal matter which passes too closely to a 'black hole' is simply shredded into its constituent protons, neutrons, and electrons by the space-time through which it passes, like cheese through a cheese grater. These sub-atomic particles do not possess enough mass to penetrate the impervious layer of space-time situated within the so-called 'event horizon,' and therefore cannot contribute to the growth of the 'black hole.'

So what happens to all the matter, shredded into sub-atomic particles, which has gravitated towards the neutron star at the centre of a 'black hole?' These particles bump up against the outer surface of the sphere of the neutron star's event horizon, where they begin to orbit around the neutron star in what is called an 'accretion disc.' Inside the event horizon, the neutron star is spinning just like the 'naked' neutron stars that we can directly observe, pulsars. It is well established that because of their extreme densities, spinning neutron stars create powerful magnetic

fields which rotate as the star rotates. These rotating magnetic fields induce the charged particles in the accretion disc to orbit the star at velocities that are a significant percentage of the speed of light. As they travel around the star at high speed, the friction between the particles as they jostle one another heats them up, causing them to glow and emit a wide range of electromagnetic radiation, up to and including x-rays. Astrophysicists have now obtained direct images of an event horizon silhouetted against a glowing accretion disc. The magnetic field around a 'black hole' can become wound too tightly and then suddenly discharge, blasting out the material collected in the accretion disc in powerful beams that erupt from the poles of the 'black hole.' These beams are known as 'quasars' or 'relativistic' jets. We shall examine these phenomena in more detail presently.

It is currently popular to consider such phenomena as being a case of the 'black hole' "feeding," but this is a misleading metaphor. While the occurrence of a relativistic jet may or may not be caused by a sudden increase in the amount of matter swirling around in the accretion disc, this process has nothing to do with any increase in the size of the neutron star in the centre of the 'black hole' itself. This is not an instance of the 'black hole' feeding; it is more akin to the 'black hole' throwing out the trash which has accumulated it its yard.

Neutron stars come in a variety of sizes, depending upon the mass of the star which gave birth to them. Neutron stars birthed by parent stars with sufficient mass to create event horizons upon collapse are called 'stellar mass black holes.' The direct images obtained by astrophysicists referred to a moment ago were of 'black holes' situated at the centres of the galaxies designated as M87, and of our own Milky Way galaxy. These 'black holes' are considered to be 'super-massive black holes' because of their tremendous sizes. The super-massive 'black hole' at the centre of the Milky Way, known as Sagittarius A*, is thought to have a mass of 4 million Suns. It is now widely accepted that a super-massive 'black hole' lurks at the centre of all galaxies.

A pertinent question is: how did super-massive 'black holes' get to be so super-massive? As we noted above, we can rule out a gradual growth process by the addition of ordinary matter onto the surface of any neutron star which is surrounded by an event horizon. The only object in the universe which can pass through the matter-shredding space-time of an event horizon unscathed is another neutron star, with or without its own event horizon. Thus super-massive 'black holes' can only be formed over time by repeated collisions between individual neutron stars. We now have direct evidence, in the form of so-called 'gravitational waves,' that such collisions are regular occurrences within the Field of Play. It is logical to assume that such collisions are more frequent in the crowded centres of galaxies, making possible the growth of super-massive 'black holes' in those locations. Growth is also thought to occur when entire galaxies merge, and the super-massive 'black holes' at the centre of each galaxy join together in spectacular collisions to create even more massive objects.

It is not entirely incorrect to state that there is no space-time at the centre of a 'black hole,' but it is not because space-time has been crushed out of existence at that locale. Space-time is not 'crushable.' In an ordinary atom there is a gap between the nucleus (made up of protons and neutrons) and the atom's electrons. Space-time flows through this gap as the atom moves about in the Field of Play. But in a neutron star the neutrons are glued tightly together, and there is no gap through which any space-time can flow, and therefore space-time is forced to flow around the outer surface of the neutron star just as a river flows around the concrete piling of a bridge.

Finally, we can cast aside Hawking's mathematically-derived theory that black holes evaporate via the process known as 'Hawking radiation.' Black holes are neutron stars of a certain minimum mass, and they do not evaporate any more than smaller mass neutron stars do. On the contrary, they are the most permanent objects to be found in the universe and will continue to exist until the Endtimes, and their moment of uncreation.

Chapter Four

DARK MATTER PART 1

* * * * * *

This completes our examination of the phenomena known as 'black holes,' and we are now ready to move on to the associated topics of so-called 'dark matter' and gamma rays. The sources of gamma rays, electromagnetic radiation of extremely high frequency, have long puzzled and intrigued astrophysicists. In 2008, the Fermi Gamma Ray Telescope was launched into orbit to study these phenomena. "Fermi was designed to produce the most detailed map of the gamma-ray sky that has ever been seen . . ." (19)

The Fermi Telescope has detected a powerful gamma ray signal emanating from the centre of the Milky Way. For awhile astrophysicists considered the possibility that the source of this signal was Sagittarius A*, the super-massive 'black hole' at the centre of our galaxy, but this has since been ruled out. As Hooper explains:

> "But today we know that the gamma-ray signal in question extends at least 10 degrees or more in all directions away from the Galactic Centre - - -

> much too wide to originate from a single, central source . . . (20)

More to the point, our understanding of 'black holes' completely rules out the possibility that these phenomena can emit electromagnetic radiation of any frequency. But it is possible that gamma rays are being emitted by the associated accretion discs which orbit around 'black holes.' The fact "that the gamma-ray signal in question extends at least 10 degrees or more in all directions away from the Galactic Centre" may possibly be accounted for by the presence of a swarm of stellar mass 'black holes' orbiting around Sagittarius A*, each with their own accretion disc. 'Black holes' could be concentrated within the central volume of the galaxy for one, or both, of two reasons. It is likely that stars massive enough to birth 'black holes' are more common nearer the centre of the galaxy where the concentration of the hydrogen gas clouds necessary to form stars is likely to be greater. Alternatively, or in addition to this possibility, 'black holes' formed elsewhere in the galaxy may have migrated inwards towards the Galactic Centre. It is very possible that 'black holes,' because they have so much mass concentrated in such a small volume, are more susceptible to the effect of the gravitational field created by Sagittarius A* than are regular stars.

At this point we should pause for a moment to review the history of the theory of dark matter so that we may understand how it came to intersect with the phenomenon of gamma rays. The astrophysicist George Smoot describes cosmology's current understanding of dark matter as follows:

> "Dark matter, which by its nature is unaffected by radiation but responsive to gravity, would have started forming structure much earlier than visible matter, which [at that time would have been] buffeted by the energetic flux of photons
> . . . dark matter could have begun to aggregate,

> under the influence of gravity, as early as ten thousand years after the big bang. At three hundred thousand years, the decoupling of matter and radiation freed ordinary visible matter to be attracted to the structures formed by dark matter." (21)

In the 1960's and 70's astronomical observations of other galaxies revealed that the rate of rotation of these galaxies could not be accounted for by only the amount of visible matter contained in those galaxies. The galaxies were spinning faster than they should be able to, based on the total masses of all the visible matter. Astronomers calculated that the total masses of all the visible matter in a given galaxy could not provide enough gravitational pull to keep the galaxy from flying apart at its observed rate of rotation. Based on these observed facts, astronomers concluded that there must be present another form of matter in the galaxies to provide the additional gravitational force required to explain the galaxies' rate of rotation, but which was necessarily a type of matter that does not emit or interact with electromagnetic radiation. They called this theoretical stuff 'dark matter,' and the race was on to discover what this dark matter is made of.

Because of the success of particle physics theories in the 20th Century at explaining material phenomena, astrophysicists naturally concluded that dark matter must consist of particles of some kind. In 1978, it was proposed

> ". . . that a small but important fraction of dark matter particles in our universe today is likely to be undergoing the process of annihilation . . . it is entirely plausible that . . . when pairs of dark matter particles come into contact with and annihilate each other, their mass can be converted into other forms of energy, including that of gamma rays." (22)

In the years since this proposal was made the search for dark matter has developed along two different tracks. Here on the Earth scientists have built increasingly elaborate and evermore sensitive detectors to discover dark matter in the form of what they called Weakly Interacting Massive Particles or WIMPS (scientists have a distinct fondness for acronyms.) After 40 years of increasingly sophisticated efforts, their search has come up empty. In the sky, astrophysicists have searched for gamma ray signals that would match up with the signal their theories tell them would be expected from the annihilation of two dark matter particles. No such signal has been observed. These results have left the astrophysics community puzzled and frustrated.

There is one potential observational test which, if the technological capability for it exists, should be able to determine whether or not dark matter particle annihilation is in fact occurring. If dark matter particles exist and do annihilate when they come into contact with one another, that means that there is less and less dark matter in galaxies as time goes by. When we look out into space with our telescopes we are looking back in time, because the light from distant galaxies has taken time, in many cases billions of earth-years, to reach us. So when we observe the light from a galaxy that is two billion light years distance from us (a light year is the distance that light travels in one year, approximately 9.5 trillion km), we are seeing that galaxy as it was two billion years ago. Now, if dark matter is self-annihilating and disappearing from galaxies, then there should have been more dark matter generally in galaxies two billion years ago than is present in galaxies today. And there would have been still more dark matter present in galaxies four billion years ago, and even more dark matter present in galaxies six billion years ago, and so on, back to the beginning of galaxy formation in the universe, thought to be some 13.5 billion years ago.

The particle theory of dark matter states that its presence causes galaxies to spin faster than can be accounted for by adding up the gravitational effects of all the visible matter in a given

galaxy. Therefore if there was more dark matter present in galaxies in the past, galaxies in general should have been spinning faster the further we look back in time; or looking at it another way, the rate of rotation of galaxies in general should have been slowing down over time if dark matter annihilation is taking place.

Given the technology available to astrophysics today, it may be possible to conduct a survey of distant galaxies to determine whether or not all galaxies that are four billion light years from us are rotating faster on average than all galaxies that are two billion light years away from us, and that all galaxies six billion light years distant are rotating faster still. If this was found to be the case, it would lend support for the theory that dark matter particles are undergoing mutual annihilation and potentially emitting gamma rays in the process. If, as we look further out into the universe and thus further back in time, no general increase in the rotation rate of galaxies is observed, then the theory of dark matter particle annihilation, and perhaps the theory of dark matter itself, will be called into question.

Of course, in order to carry out such a survey it would first be necessary to determine the distances to the galaxies under observation with considerable accuracy. This is a task we have yet to fully master. In any event, such a project in all likelihood would turn out to be a wild goose chase, for the plain and simple reason that dark matter simply does not exist. As we shall see, there is an alternative explanation for the observed rates of rotation of stars in galaxies which does not require the invention of dark matter at all.

In the last few years astronomers have come up with new theories to account for the gamma rays coming from the centre of our galaxy. In general, they are based upon the idea that there is a significant amount of anti-matter present in the centre of the galaxy which, when it encounters matter, annihilates and emits gamma rays as a result. However, so far there is no solid evidence to explain where this anti-matter comes from, and so at this point the puzzle regarding the source of these gamma rays remains unsolved.

Chapter Five

SEEING THE LIGHT

* * * * * *

We now turn our attention to the history of humanity's efforts to understand the nature of light. Our discussion of this history will be relatively brief and will rely almost entirely upon the very informative book, *Catching the Light,* by Professor of Physics Arthur Zajonc. It is a delightful read and we highly recommended it to anyone who wishes to delve more deeply into the history of human understanding of light than the scope of our current discussion will allow.

To the philosophers of the pre-scientific era the phenomenon of light itself was of lesser importance than the phenomenon of vision. For the ancient Egyptians, "The gaze of Ra was the light of day. For men and women of that civilization, to stand within daylight was to stand in the sight of their sun god . . . The gaze of God was light. *Light was God seeing*." (23) The 5th Century BC Greek philosopher Empedocles wrote that our eyes had been fashioned from the four elements thought by the Greeks to make up the world: earth, water, air, and fire, by Aphrodite, the goddess of love. "Marvellous passages were fitted into the eye, permitting it to transmit a fine interior fire through the water of the

eye . . . to the object seen; the eyes rayed out their own light." (24) "According to Plato, the fire of the eye causes a gentle light to issue from it. This interior light coalesces with the daylight, like to like, forming thereby a single homogeneous body of light. That body, a marriage of inner light and outer, forges a link between the objects of the world and the soul." (25) Plato's understanding of the nature of vision would be accepted in the West for almost 1,500 years. Around 300 BC, the mathematician Euclid, whose axioms of geometry you learned in high school, while adhering to the Platonic understanding of the nature of vision, for the first time subjected vision to mathematical analysis. "In Euclid's hands, the eye's fiery emanation has become a straight line, a visceral ray, susceptible to deductive logic and geometric proof." (26)

In the 11th Century in what is now Iraq, a man named Ibn al-Haytham, or Alhazen, as he came to be known in the West, developed a theory of vision that would eventually replace the ideas of the ancient Greeks. "Alhazen marshalled a series of logical arguments in support of the view that sight proceeded not partly, but entirely by means of light entering the eye from objects around us." (27) Alhazen's logical reasoning sounded the death-knell for the Platonic understanding of vision. "The eye, once the site of a sunlike, divine fire, fast became a darkened chamber, awaiting an external force to enlighten it." (28)

The next major development in our understanding of the phenomenon of light was brought about by Sir Isaac Newton. From his studies of light with prisms and lens, Newton concluded that light was "corpuscular," that is, made up of very small bodies that emanated from the sun or a candle flame. He suggested that these particles of light came in a variety of sizes, the smallest of which produced the colours of violet and blue light, with the corpuscles growing larger through the colours of green, yellow, orange, and red respectively. Somehow these corpuscular bodies blended together to produce white light. Lost in the general glare of Newton's fame was the competing wave theory of light advanced by the Dutch scientist Christian Huygens, but a hundred

years later Huygens' theory was proved to be correct.

In 1803, an Englishman named Thomas Young, through a simple and ingenious experiment demonstrated that light is a wave-like phenomenon. Using "a well-known phenomenon of wave mechanics called interference," (29) the evidence from Young's experiment proved conclusively that light is a wave phenomenon. The evidence from Young's experiment was so overwhelming that it should have settled the question of what is the true nature of light once and for all. But it didn't.

The battle over whether light is composed of waves or a stream of tiny projectiles raged over the course of the 19th Century. In a paper published in 1864, the brilliant mathematician James Clerk Maxwell, building on the work of Michael Faraday concerning the effects of magnetism and the newly discovered phenomenon of electricity, gave the wave theory of light a boost by concluding that "The agreement of the results [of Maxwell's equations describing magnetic and electrical phenomenon] seems to shew that light and magnetism are affectations of the same substance, and that *light is an electromagnetic disturbance propagating through the field according to electromagnetic laws*." (30)

The idea that light is an electromagnetic wave was strengthened due to the fact that from Maxwell's equations "a prediction for the velocity of light could be made, and it agreed well with the best measurements then available." (31) For Maxwell light was to be understood as an electrical wave propagating on a straight line through space, with a corresponding magnetic wave propagating along the same line at 90 degrees to the electrical wave. Here we have an early example of a physical phenomenon (light) being "explained" by a purely mathematical formulation. But as we have seen in the case of 'black holes,' it is possible to arrive at mathematical equations that are grammatically correct and which appear to provide *a complete description* of a given phenomenon, but do not necessarily provide *the correct description* of the phenomenon.

Could that be the situation in this case? Have Maxwell's equations led physicists astray? If light is 'made of' separate electrical and magnetic components as is supposed, then one can imagine that it should be possible to bend the path of a beam of light by placing a magnet of sufficient strength next to the beam. Yet that does not happen. It is clear that light is a wave phenomenon, but is light actually a combination of electrical and magnetic waves? Or is it an entirely separate phenomenon whose velocity through space just coincidentally corresponds to a prediction derived from a set of mathematical equations that were formulated to explain the behaviour of completely different phenomena? We leave that question open for the reader to chew upon.

When Maxwell stated that "light and magnetism are affectations of the same substance," the substance he was referring to was called the 'luminiferous ether.' The idea that there is some *substance* that fills the space between the heavenly bodies goes back to antiquity.

> "According to Aristotle . . . There was no such thing as emptiness; everything was filled by the *divine presence.* (emphasis added) All matter was made of the four elements: earth, water, air, and fire. A fifth essence made up the spheres, [which contained the heavenly bodies] a perfect substance that could neither be destroyed or changed into anything else - - - this quintessence was called the aether." (32)

In the 17th Century, Robert Hooke, who engaged in a long and bitter feud with Isaac Newton over the nature of light wrote ". . . that light is nothing but a pulse or motion propagating through an homogeneous, uniform and transparent medium." (33)

Gary Zukav describes the ether as follows:

> "The theory of the ether was that the entire universe lies in and is permeated by an invisible, tasteless, odourless *substance* (emphasis added) that has no properties at all, and exists simply because it has to exist so that light waves can have something to propagate in. For light to travel as waves . . . something has to be waving. That something was the ether . . . The ether, according to the theory, is everywhere and in everything . . . To the ether, the hardest substance is as porous as a sponge to water. . . Although we move in the ether sea, the ether sea does not move." (34)

In 1864, when he published his equations describing the electromagnetic field,

> "Maxwell and everyone else still thought in terms of the ether, but his *mathematical analysis* did not require it at all. For the first time, the wave conception of light was given a full *theoretical* treatment that was . . . [supposedly] free of the ether." (emphasis added) (35)

We come now to a pivotal moment in our history of human understanding of the phenomenon we call light, and to the first of the assumptions to which we referred in the prologue to this discussion, which we believe have obscured human understanding of the fundamental nature of the universe.

Many of you will have had the experience of travelling in a moving vehicle, sticking your arm out of the window, and feeling the breeze blow against your hand. What you experienced as the 'breeze' is a *material substance* pressing against your skin. What you were feeling in this experience is the impact of the molecules of gas that make up the atmosphere exerting pressure on your hand

as it is propelled through the air by the motion of the vehicle.

In 1887, two American scientists, Albert E. Michelson and Edward Morley, conducted a famous experiment to determine the velocity of the Earth through the ether, based on an idea similar to your experience of sticking your arm out the window of a moving vehicle. In their experiment the ether sea would take on the role of the atmosphere, and a beam of light would play the role of your arm. In *The Dancing Wu Li Masters*, Gary Zukav describes the theoretical basis of the experiment as follows:

> "If the earth is moving, they reasoned, and the ether sea is at rest, then the movement of the earth through the ether sea must cause an ether breeze. Therefore, a beam of light traveling against the ether breeze would have a slower velocity than a beam of light sent across the ether breeze . . . if the theory of the ether sea is correct, a light beam sent upstream against the ether breeze and then downstream with it will take longer to return to its starting point than a light beam sent back and forth across the ether breeze." (36)

Michelson and Morley carried out their experiment with an apparatus Michelson invented called an interferometer, which "was designed to detect the interference pattern created by the two beams of light as they returned to a common point." (37) However, to the astonishment and consternation of the scientific community, when the experiment was conducted an expected change in the interference pattern when the interferometer was rotated 90 degrees was not observed. Later in these pages we will conduct a detailed examination of the Michelson – Morley experiment. For now we simply note that at the time scientists concluded that there were only two possible explanations for these unexpected results: either the Earth was not moving - - - clearly incorrect - - - or there was no

ether sea. Faced with just these two possible explanations, logic demanded the acceptance of the conclusion that the ether sea does not exist.

But this either/or choice which confronted scientists given the results of the Michelson – Morley experiment rested upon a widely-held *assumption* about the nature of the ether. That assumption was that like the atmosphere pressing on your arm when you stick it out the window of a moving vehicle, the ether is composed of a *material substance.* The scientists of the late 19th Century cannot be faulted for making such an assumption, for it would be another 100 years before physicists came to accept that there exist in the universe phenomena which are either seldom directly detectable, such as neutrinos, ghostly particles of which billions are theorized to pass through your body every second; or sub-atomic entities called quarks and gluons, currently believed to be the fundamental building blocks of atoms which ". . . if we are correct, will never be directly observable." (38)

So, as these examples illustrate, there was a third possible explanation for the results of the Michelson – Morley experiment to which scientists at that time were blind, due to their *assumption* concerning the nature of the ether. That third possible explanation is that the ether, which in this discussion we have been referring to by its more modern name - - - space-time - - - is not a material substance, but is *immaterial*, being the immaterial Mind of God made manifest. Being immaterial, it is an entirely different *state of being* from what humans refer to as 'matter.' It is to an elaboration of this idea which we will soon turn.

But for now we must continue on our journey through the history of humanity's understanding of light. Although the Michelson – Morley experiment had dealt a seemingly fatal blow to the theory of the ether, at the turn of the 20th Century the theory that light is a wave-like phenomenon still held sway, based on the experiment of Thomas Young and Maxwell's equations. However, a fresh take on the understanding of light was about to make an appearance. This new understanding of light was prompted by the

newly discovered phenomenon called the 'photoelectric' effect. Zukav describes the photoelectric effect as follows:

> "When light hits (impinges on) the surface of a metal, it jars electrons loose from the atoms in the metal and sends them flying off. With appropriate equipment, we can count these electrons and measure how fast they are traveling . . . [the discoverer of the photoelectric effect, Philippe Lenard] showed that the flow of electrons in the photoelectric effect begins immediately when the impinging light strikes the target metal. Turn on the light and out come the electrons. According to the wave *theory* (emphasis added) of light, the electrons in a metal only start to jiggle when they are struck by light waves. They do not come out of the metal until they are moving fast enough. This takes several oscillations . . . In short, the wave theory of light predicts a delayed emission of electrons. Lenard's experiments showed a prompt emission of electrons." (39)

In 1905, Albert Einstein proposed that the photoelectric effect could be explained if light was considered to be composed of tiny particles. (Did this make Newton's ghost smile with satisfaction?) "A beam of light," said Einstein, "is analogous to a stream of bullets." (40) These 'bullets' eventually came to be called 'photons,' familiar to all Star Trek fans ("Mr. Spock, arm the photon torpedoes!") Einstein's theory, for which he was awarded the Nobel prize, *allegedly* explained the photoelectric effect. "Every time a particle of light, a photon, strikes an electron, it immediately knocks it out of its atom." (41) Unfortunately for the Nobel Prize awards committee for 1921, the year in which Einstein was awarded his Nobel, Einstein's explanation for the photoelectric

effect is quite impossible. Allow me to explain, or, more correctly, allow me to have Arthur Zajonc explain:

> "If we wish to study the least part of light, the isolated photon, the first task clearly is to construct a source of them. At first blush it would seem trivial. Simply take any light source, a candle even, and dim it sufficiently so it gives off a slow but steady stream of single photons. Just this was done for decades until the fundamental logical flaw in doing so was realized. No one ever checked experimentally to see if these sources were really producing single photons. One *assumed* (emphasis added) without experimental evidence that dim light is a single-photon stream. What evidence would convince us that a source is a single-photon source? Obviously, a suitable means of testing light sources is required.
>
> "Perhaps the most elegant single-photon test has been realized by the French group of Alain Aspect, Philippe Grangier, and G. Roger. Although technically somewhat difficult, it is conceptually supremely simple. One passes the suspected photon into an optical instrument that divides light, sending half one way and half another way. If at some point the light is no longer divisible, then we have reached the level of the photon, or "atom" (from the Greek, meaning indivisible) of light. The optical device that divides light in half is a half-silvered mirror, or "beamsplitter." When light falls on it, half the light is transmitted and half reflected. Imagine a single, atom like photon striking the beamsplitter. What will happen? If it is truly indivisible, then

it will go one way or the other but not both. This is called “anticorrelation.” If, on the other hand, the light can be divided, both branches will have light, half will go one way and half the other. This is the test.

“In contrast to an atomic theory of light, the wave theory conceives of light as infinitely divisible; there is no lower limit to how weak the light's intensity can be. Therefore the beamsplitter will *always* divide the light, transmitting half one way and reflecting the other half. The beamsplitter is, therefore, a litmus test for light: wave or particle. Performing it on a variety of light sources has yielded startling results. All traditional sources such as candles, incandescent lamps, gas discharge or fluorescent lights, and even lasers show no anticorrelation, whatever their intensity. No matter how weak their light, the data show that the light they emit splits at the beamsplitter in a way that can be well described by a wave theory of light. All the usual sources of light thus fail the simplest criterion for single-photon emission. *Single-photon sources are not natural*.” (emphasis added) (42)

Pause for a moment, and allow the import of Zajonc's last four sentences to sink in. Natural light in the universe, and the artificial types of light that were available to experimenters in Lenard's day, the light responsible for the photoelectric effect, obviously *does not* consist of 'photons.' Einstein's “stream of bullets” does not exist. Or at least it did not until the mid-1980's. Zajonc, whose book was published in 1993, goes on to say:

“In recent years, two such [single-photon] sources

> have been developed, one relying on atomic cascade and the other on what is called in the trade "two-photon, parametric, down-conversion . . ." these sources have been shown to pass the single-photon litmus test. The light they produce displays the anticorrelation looked for in single-photon sources." (43)

Zajonc then goes on to describe experiments using single-photon light sources that demonstrate so-called 'wave-particle duality,' in which unambiguously individual photons appear to interfere with themselves as if they were waves.

So, where does this leave us? "What is called *in the trade* . . ." "The light [*single-photon sources*] produce displays the anitcorrelation looked for in single-photon sources." It is clear that physicists have created, *in the laboratory,* a phenomenon that does not appear in nature. The question then fairly arises as to whether or not this new phenomenon is properly considered to be 'light' at all. After all, in the beamsplitter test these single photons show anticorrelation, whereas all the traditional sources of light show no anticorrelation in the beamsplitter test. It certainly seems that it is possible to conclude that these photons are a quantum phenomenon which is new to the universe, created by humans, which, while similar to light in that it sometimes manifests wave-like behaviour, is in fact a unique quantum phenomenon in and of itself, quite different and separate from what has always been considered to be light, prior to the creation of these phenomena in a lab.

And where does all this leave the wave theory of light in regard to the photoelectric effect? Quoting Zukav earlier we noted that ". . . the wave theory of light predicts a delayed emission of electrons," which contradicts observation. Yet we now have unambiguous evidence that the light Lenard used in his experiments demonstrating the photoelectric effect *must* have been a wave phenomenon. Photons, Einstein's "bullets," did not exist anywhere in the universe for another 80 years (unless, of course,

they had previously been created in another lab on an alien planet far, far away.) This means that the *mathematical analysis* of the wave theory of light which predicted a delayed emission of electrons must be flawed. Is this yet another example of Science's reliance on mathematics leading us all astray?

Chapter Six

THE EVIDENCE FOR

IMMATERIAL SPACE-TIME

* * * * * *

The Substance of the Tao
Is Vague and Misty.
Misty and Vague,
But it contains Images!
Its Substance
Is Tenuous and Dark!
But it contains an Essence,
Supremely Real,
Sure and Unfailing.
From days of old
It has been present,
The Source of all Things. (44)

As we noted previously, the quest to understand the fundamental nature of the Field of Play stretches back to antiquity. These thoughts, attributed to a mysterious 5th Century BC Chinese

sage known as Lao-tzu, point with amazing accuracy to the description of space-time we are about to disclose.

Despite the supposed death-knell of the ether rung by the Michelson – Morley experiment, over the next few decades considerable ambiguity on the topic continued to reside within the international community of physicists, including in the mind of the greatest physicist of the age. Albert Einstein made conflicting comments on the existence of the ether. From a presentation given by Einstein in 1920 titled "Ether and the Theory of Relativity," Zukav quotes Einstein as saying:

> "The ether does not exist . . . The electromagnetic fields are not states of a medium [the ether] and are not bound down to any bearer, but they are independent realities which are not reducible to anything else." (45)

However, from that very same 1920 presentation Zajonc notes that Einstein stated:

> "According to the general theory of relativity, space without ether is unthinkable, for in such space there not only would be no propagation of light, but also . . . no basis for space-time intervals in the physical sense. But the ether may not be thought of as endowed with the qualities of a ponderable media . . ." (46)

So, we have two problems here. The first is that, practically in the same breath, Einstein said on the one hand "The ether does not exist," while on the other hand stating ". . . space without ether is unthinkable."

The second problem is that in the year before he received a Nobel Prize for his light-is-a-stream-of-bullets explanation for the photoelectric effect, Einstein was referring to light as (Maxwell's)

"electromagnetic fields" which understood light as a wave phenomenon.

This is a very muddled picture. What is clear is that there was uncertainty regarding the concepts of light and the ether in the mind of the leading physicist of the day. Einstein's confusion over the nature of light went on to become part of the reigning dogma of 20th Century physics. Physicists eventually concluded (assumed?) that light is both a wave and a particle phenomenon; that light has both a wave aspect and a particle aspect. This is, of course, logically impossible.

As for Einstein's contradictory statements concerning the existence of the ether, we shall trust that the translators of his 1920 presentation chose their words with care, and draw your attention once again to the last line which Zajonc quoted: "But this ether may not be thought of as endowed with the qualities of *ponderable* (emphasis added) media . . ." The Oxford English Dictionary defines "ponderable" as "having appreciable weight."

So while acknowledging that the ether must exist, for "space without ether is unthinkable," Einstein was saying that the ether has "no appreciable weight." How did Lao-tzu describe the Tao? "The Substance of the Tao is Vague and Misty . . . Tenuous and Dark! But it contains an Essence, Supremely Real . . . The Source of All Things."

Now we come to it: Lao-tzu's "Substance of the Tao," Aristotle's "aether," Hooke's "homogeneous, uniform and transparent medium," Maxwell's "ether," Minkowski's "four-dimensional space-time," all different names from different eras, all signifying the same phenomenon. We shall now proceed to provide a modern description of this phenomenon.

We pause here for a moment to remind our readers that we submit that the Game of Being as a whole is the direct manifestation of the *immaterial* Mind of God, and that the immaterial Mind of God is manifest as the Field of Play, which consists of two separate but related classes of entities, two different but connected *states of being*: immaterial space-time, and energy-

matter.

Zukav's description of space-time (he used the term “ether” - - - see p.64) is in some respects accurate. Space-time is indeed tasteless, odourless and, under certain circumstances, invisible. However, we shall see that in other circumstances, its presence is made visibly apparent. Zukav's statement that space-time has no properties is misleading. This implies that space-time is always the same at all times and in all places; that is, in the same condition at all locales. This is incorrect. The condition of the space-time in the immediate vicinity of a 'black hole' is different from the space-time in inter-stellar or inter-galactic space. Zukav states that space-time is everywhere and in everything. This is partly correct; as we have seen, the exception to this rule is the phenomena we call 'neutron stars,' which space-time cannot penetrate. Zukav finishes by stating that space-time does not move. To the extent that this implies that space-time is incapable of any motion whatsoever, this is incorrect.

Since it is *immaterial*, space-time is not detectable in a Michelson – Morley type of experiment. Being immaterial, there is no space-time 'breeze' created by the movement of the Earth through space-time to slow down the beam of light heading into this supposed breeze.

However, the presence of space-time is made apparent in other ways. All forms of electromagnetic radiation, except for lab-created 'photons,' are indisputably a wave phenomenon. As with sound waves in the air and waves travelling through liquids, as Zukav noted, “For light to travel as waves . . . *something must be waving*.”(emphasis added) That something is space-time, *immaterial* though it may be. These electromagnetic waves travelling through space-time can be understood as vibrations of the space-time medium, and thus are evidence that space-time is capable of motion. Such vibrations of space-time are evidence that this medium possesses the property of flexibility.

Because it is flexible space-time bends or curves in the presence of massive bodies. The prediction that space-time is

curved by massive bodies was proclaimed in Einstein's General Theory of Relativity, and was verified by Arthur Eddington in 1919. This is more evidence that space-time is capable of motion. The curvature of space-time is considered to be the causative agent for what we call 'gravity,' which keeps us attached to the surface of our planet.

Current cosmological understanding of the universe posits that throughout the Field of Play space-time exhibits yet another type of motion, that of 'expansion.' The notion that nearly all galaxies are in general moving away from one another is supposedly due not only to the motion of the galaxies themselves (although they are indeed independently in motion), but is also *thought* to be due to the expansion of the 'fabric' of space-time itself. It has become fashionable among astronomers and cosmologists to use the phrase "the fabric of space-time" as a metaphor, in order to be able to discuss the phenomena they clearly observe in the cosmos. Thus while maintaining that the ether does not exist (because of the current interpretation of the results of the Michelson – Morley experiment), they simultaneously rely upon the notion of the expansion of the 'fabric of space-time' to explain the *apparent* motion of galaxies away from one another.

So according to current cosmological thinking, space-time both exists and does not exist. Light is both a wave and a particle. Some massive stars collapse to form super-dense neutron stars, while other slightly more massive stars literally disappear into nothingness. Thank you, Albert Einstein! Actually, it would be unfair to blame Einstein for the 'black hole' debacle, even though the idea arose from his own equations. The physicist Freeman Dyson has noted that:

> "Einstein was not only skeptical, he was actively hostile, to the idea of black holes. He thought the black hole solution was a blemish to be removed from the theory by a better mathematical formulation, not a consequence to

be tested by observation. He never expressed the slightest enthusiasm for black holes, either as a concept or a physical possibility." (47)

It is entertaining to ponder what Einstein would have said had he lived long enough to see the first supposed evidence of the existence of 'black holes.' Would he have recanted, and declared his hostility to the idea of 'black holes' the second biggest blunder of his career?

It is supposedly established fact that the distance between galaxies is steadily increasing, and the claim was made in the late 1990's that for about the last five billion years the rate of that expansion is itself increasing. In other words, as time goes by the universe appears to be expanding faster and faster. What could be causing this to happen? The current in-vogue theoretical premise of cosmologists is that this phenomenon is due to something named 'dark energy.' Dark energy is thought to permeate space-time and is theorized to manifest as a force which acts in opposition to the force of gravity. The source of this dark energy is unknown. However, *we believe* that if we dispense with the idea of *mysterious forces* - - - like gravity and dark energy - - - and accept the idea of the existence of a flexible immaterial space-time, we can derive a solution to the mystery of the increasing rate of expansion of the distances between galaxies. We will return to this topic presently, after we have more firmly established as fact the actual existence of space-time as a flexible but immaterial entity.

It is the purpose of this portion of our discussion to arrive at an understanding of the fundamental nature of the universe that will allow us to dispense altogether with the 'fabric' *metaphor*, and to speak directly of space-time itself, not simply as a theoretical four-dimensional mathematical construct, but as a real existing entity in its own right.

Generally, matter is, to varying degrees, permeable to space-time; that is, under most circumstances matter is capable of passing through space-time without being degraded or deformed.

The degree of permeability depends upon three factors: one, the strength of the molecular or atomic bonds of the matter under consideration; two, the degree of stress being experienced by the space-time through which the matter in question is travelling; and three, the velocity of the matter through space-time.

It is well-established fact that the atoms which make up the seemingly solid matter of which the Earth and you and I consist are made up of mostly 'empty space.' As a scaled-up analogy, we can say that if the nucleus of a given atom was the size of a soccer ball sitting at the centre of a stadium, the nearest of its electrons would be orbiting that soccer ball at a distance comparable to the middle of the spectator seating. However, all that 'empty space' between the atom's nucleus and its electrons is not empty; it is filled with immaterial space-time, which is constantly passing through the atom as the atom moves through space-time.

That is the case for most, but not all, types of matter. The matter which makes up neutron stars is completely impermeable to the passage of space-time. In a neutron star there are no electrons orbiting a nucleus at a distance; there are only neutrons packed extremely closely together, leaving no room for space-time, even though it is immaterial, to pass through the bodies of neutron stars. Since neutron stars are impermeable to the passage of space-time, the space-time through which they pass is cleaved and split apart. In relation to space-time neutron stars act like zippers, unzipping the space-time in front of them and zipping it closed behind them. Because of this, and because young neutron stars spin so rapidly about their axis, in some cases hundreds of times per second, which creates extremely powerful magnetic fields, and because the space-time around them is also being radically stressed by the intense gravitational field of the neutron star, the space-time around a neutron star is in a constant and complicated state of flux.

An enduring mystery in astrophysics is the source of what are known as 'cosmic rays.' Cosmic rays are charged ions that move at tremendous speed and strike Earth continuously from all directions. We now know that neutron stars are numerous and

scattered throughout the galaxy. Our solar system is surrounded on all sides by neutron stars. It has been suggested that the charged particles of which cosmic rays consist are accelerated to their very high velocities by the extremely powerful magnetic fields which are believed to accompany neutron stars. We suspect that this suggestion is correct.

While studying cosmic rays in 1932, the particle physicist Carl Anderson discovered a particle which possessed the same mass as an electron, but which had the opposite charge. The existence of just such a particle had been theorized earlier by the theoretical physicist P.A.M. Dirac. This new anti-matter particle was given the name 'positron.' How Anderson's positrons were created is unknown. We suggest that in the highly fluxed space-time that surrounds a neutron star, the conditions exist whereby the charge of electrons can be flipped, thus creating positrons which are then propelled away from the neutron star at high velocities by the neutron star's magnetic fields.

This idea may also provide a solution to the puzzle of the source of gamma rays emanating from the centre of our galaxy. It is entirely possible that the central region of the galaxy contains a significant population of neutron stars and stellar mass 'black holes,' each of which will possess a very powerful magnetic field. The central region of the galaxy is a crowded place, full of all sorts of matter. If these magnetic fields are indeed creating positrons in substantial numbers, there would be ample opportunity for these positrons to encounter free electrons and undergo mutual annihilation, resulting in the emission of the gamma ray signal which has been detected emanating from the central region of the galaxy. More recent research suggests that the Earth is being hit from all sides by gamma rays and not just from the galactic centre. The idea that neutron stars are turning electrons into positrons could be a potential explanation for this phenomenon as well.

At this point we must pause our narrative to clearly define two everyday words so that all of our readers will understand how they are used in the field of physics. The first word is 'velocity.' In

physics, velocity is made up of two components. The first of these is *speed*, which is what most people refer to when they use the word 'velocity.' Speed is expressed as the distance travelled by an object divided by the amount of time required by the object to travel that distance (km per hour). The second component of velocity is that of *direction.* In physics, if an object changes the direction in which it is moving, even though it may continue to travel at a constant speed, its velocity will be said to have changed. So, in physics, if a moving object changes either its speed of travel or the direction in which it is travelling, its velocity will have changed.

This brings us to the second word, which is 'acceleration.' Acceleration means that a moving object has changed either one or both of the components of its velocity. Thus if a car speeds up, it has experienced acceleration; if it slows down, it has experienced negative acceleration (sometimes called 'deceleration'). In physics, if a car goes around a curve or a corner it will be considered to have undergone acceleration, even if its speed was reduced in so doing, because it has changed the direction in which it is travelling. Thus an object can simultaneously experience both positive and negative acceleration. Having clearly defined these two terms, we can return to our narrative.

With the exception of neutron stars, space-time permeates all solid, liquid, and gaseous bodies. The 'empty space' between the nucleus of an atom and its surrounding electrons is occupied by space-time. As a seemingly solid body such as the Earth (including you and me) moves through space-time, the space-time occupying that space between the nucleus and electrons which make up the atoms of that supposedly solid body is constantly being refreshed. But it is a mistake to conclude that in this respect space-time is in motion. It is not. Space-time remains in place and does not flow through the Earth. Rather, it is the Earth which flows through space-time.

The Earth is flowing through space-time at a steady rate which means that the space-time which occupies the gaps between

the nuclei and electrons of the atoms that make up our bodies is being 'refreshed' at a steady rate, equal to the velocity of the Earth in its orbit around the Sun, about 30 kilometres per second. (For the purposes of this discussion and for the sake of simplicity, we will ignore the additional velocities of the solar system around the galactic core and of the galaxy itself through the Field of Play.)

Our bodies evolved under this condition and under most circumstances we normally are not aware of this process of 'refreshment.' However, our bodies are sensitive to *changes* in the rate at which our bodies are flowing through space-time. When astronauts blast off from the Earth the rocket carrying them must achieve the so-called 'escape velocity' of more than 11 kilometres per second in order to enter into orbit around the Earth. While accelerating from zero velocity to 11 kilometres per second, the astronauts experience what is referred to as the 'G-force.' The 'G-force' is a measure of acceleration. 1 G is defined as the acceleration we feel due to the *force* of gravity. But as Albert Einstein predicted and Arthur Eddington first confirmed, and as every physicist knows, and as we will make abundantly clear, gravity is *not a force*, but is the curvature of space-time by massive bodies. If gravity is not a force, then there can be no such thing as the 'G-force.'

We stated earlier that the degree of permeability of matter to the passage of space-time through it depends in part on the degree of stress currently being experienced by the region of space-time through which the matter is passing. When a region of space-time is within the gravitational field of a massive body, it experiences a certain level of stress, which is dependent upon the mass of the body, and the region of space-time's distance from the centre of that body.

Keeping this in mind, we suggest that this so-called 'G-force' experienced by the astronauts is not a *force* at all, but is actually a sensation experienced by their bodies due to their passage through a region of space-time which has undergone a temporary increase in its level of stress, as a result of the passage of

an accelerating massive body through that space-time. The increased level of stress makes the space-time temporarily slightly more resistant to the passage of matter through it. That greater resistance to the passage of matter through the space-time is experienced by the astronauts as the 'G-force.'

Once in orbit aboard the International Space Station (ISS) which travels through space-time at a *constant speed* of approximately 8 km per second, the astronauts no longer experience the G-force. Yet when the astronauts leave Earth orbit and descend back to Earth, once again *accelerating* through space-time as they fall freely through Earth's gravitational field, they once again experience this apparent 'G-force.'

One does not need to be an astronaut to experience this phenomenon. The thrill that we get from many of the rides at the county fair is the result of our bodies being *accelerated* through space-time at a sufficiently rapid rate. Imagine that you are riding a roller coaster. Members of the Engineering Department of the University of Colorado Boulder have supplied the following description of the ride along with the conventional analysis of the experience:

> "Riders may experience weightlessness at the tops of hills (negative g-forces) and feel heavy at the bottom of hills (positive g-forces). This feeling is caused by the change in direction of the roller coaster. At the top of a roller coaster, the car goes from moving upward to flat to moving downward. This change in direction is known as acceleration and the acceleration makes riders feel as if a force is acting on them, pulling them out of their seats. Similarly, at the bottom of hills, riders go from moving downward to flat to moving upward, and thus feel as if a force is pushing them down into their seats. These forces can be referred to in terms of gravity and are

> called gravitational forces, or g-forces. One "g" is the force applied by gravity while standing on Earth at sea level."

Note the repeated use of the phrase "as *if* a force" (emphasis added). The basic problem with this analysis is that gravity is not a force, it is the curvature of space-time by massive bodies. Hence, there are no mysterious "negative" or "positive" G-forces. These mystical apparitions simply do not exist. Yet the riders of the roller coaster will indeed experience the physical sensations as described. If these sensations are not caused by 'G-forces,' then what *is* their cause? Answer: acceleration through *stressed space-time.*

The article begins by saying that "Riders may experience weightlessness at the tops of hills" and states that this is due to mysterious "negative g-forces." But there is a much simpler explanation which does not involve reliance upon mysterious forces. The riders will not experience any feeling of weightlessness upon cresting the first hill, only during the cresting of subsequent hills after the roller coaster has achieved a sufficient velocity. The feeling of weightlessness arises because an inertial mass in motion, in this case the bodies of the riders, will keep on moving in the same direction (and at the same speed) unless something acts upon it to cause it to change direction. This is Newton's first law of motion. As the roller coaster climbs a hill at speed, it wants to continue travelling in a straight line; it wants to shoot off into space on a line equal to the angle of the hill it is climbing. The reason that this does not happen is because it is attached to a set of tracks, which force it to level off and then fall down the far side of the hill. Depending on the design of the ride, the riders may or may not be firmly attached to the roller coaster. If they are not, the feeling of weightlessness will be enhanced. But in either case the inertial mass of their bodies will want to continue in that straight line out into space. This will make them feel as if some 'force' is *pulling* them out of their seats, inducing a feeling of weightlessness. But no such extraneous 'force' is involved. The

only force involved in this situation is the force exerted on the bodies of the riders by the roller coaster as it pushes them up to the top of the hill. All that is happening is that their bodies wish to continue moving in a straight line. If this is true, in the case where the riders are not firmly attached to the coaster, why then do they not fly off into space? Well, in fact they do, just not very far. The reason for this is that their bodies are being launched up the hill of the curvature of space-time. Because the hill is steep, they don't get very far before they fall back down that hill into the seat of the coaster. If the downward slope of the previous hill was longer and/or steeper, and if the hill they are currently cresting was not so high, and if the riders are not attached to the coaster, the riders would then indeed be catapulted out of their seat and go flying through the air, with disastrous results. Roller coasters are carefully designed to prevent this from happening. Thus we see that the feeling of weightlessness can be explained without resort to *inexplicable forces* (and *negative* ones at that!).

Now, what is the explanation for the sensation sometimes experienced by riders when the roller coaster is going down a hill, during which they again feel as if some force is pulling them out of their seat? Again, this sensation is enhanced if the riders are not attached to the coaster. This sensation arises because in fact the riders are falling down the hill of space-time at a rate which is slightly faster than the rate at which the coaster is falling. The rate at which the coaster is falling is restrained by the slope of the track to which it is attached. But if the riders are not firmly attached to the coaster and if the slope of the track is sufficiently steep, the riders will literally start to *fall out* of their seats. It may feel as if some force is 'pulling' them out of their seats, but this is not the case. No mysterious 'force' is involved. The riders are simply accelerating downwards through space-time at a slightly faster rate than the coaster itself.

Now we come to what is, in terms of the physics of the situation, the most interesting and complex portion of the roller coaster experience. The University of Colorado article states that

". . . at the bottom of hills, riders go from moving downward to flat to moving upward, and thus feel as if a force is pushing them down into their seats." The article ascribes the feeling of heaviness experienced by riders at this point of the ride as a result of an acceleration due to a sudden change in direction. But this cannot be the explanation, or to be more precise, this cannot be the whole explanation. During both launch and re-entry, astronauts experience this same feeling of heaviness while their capsule is accelerating without an attendant sudden change in direction.

The actual explanation for this part of the roller coaster experience is as follows: as the coaster accelerates down a hill it creates a shock wave in space-time which is projected out in front of it. The greater the acceleration, the greater is the force of the shock wave, and the greater is its effect on the space-time through which it is passing. As the shock wave passes through the space-time in front of the coaster, it temporarily increases the level of stress being experienced by that region of space-time, which is already stressed due to its proximity to the gravitational field of the Earth. The more stressed any given region of space-time is, the more resistant it will be to the passage of material objects through it. For the riders this resistance begins to be experienced as soon as the coaster crests a hill and begins to accelerate downwards, and simultaneously accompanies the sensation of being 'pulled' out of their seats. At the bottom of the hill where the downward acceleration of the coaster peaks, the stress experienced by the affected region of space-time is the highest, and the 'heavy' feeling experienced by the riders is maximized because it is at that location where the increased resistance to the passage of material objects through space-time is the greatest, relative to other parts of the ride. The temporarily increased resistance of the region of space-time in front of the coaster, and thus a continuation of the sensation of heaviness, carries on even as the coaster begins to ascend the next hill and is actually decelerating, because the shock wave in space-time has been projected out in front of the coaster while it was still accelerating down the previous hill, affecting the level of stress in

the region of space-time surrounding that portion of the ride. The 'heavy' feeling is enhanced by the fact that at the point at which the coaster bottoms out, it 'catches' the bodies of the riders who have been falling slightly faster than it, and begins to lift them higher through the more highly stressed space-time which then exists at that location. Once again we find that no mysterious 'G-forces' are required to explain these phenomena, only acceleration and stressed space-time.

Another common example which is conventionally explained by the existence of a 'G-force' is when the automobile we are in undergoes rapid acceleration. Imagine sitting in a vehicle which has an engine powerful enough to accelerate the vehicle from 0 to 100 miles per hour in 5 seconds. When the driver puts the gas pedal down to the floorboards, you will experience a mild 'G-force' as the car rapidly accelerates. (The drivers of dragsters briefly experience up to 5 'G's' as they rapidly accelerate to over 300 mph in a matter of seconds.) If, once the car has reached 100 mph, the driver eases up on the throttle and simply maintains that velocity, no further 'G-force' is experienced by the vehicle's occupants because the vehicle is no longer in a state of acceleration. Also, if the vehicle accelerates slowly - - - say it accelerates slowly and steadily from 0 to 100 mph over a period of 5 minutes - - - then no 'G-force' sensation will be experienced. These examples of 'G-forces' generated by straight line acceleration are explained by the shock wave/stressed space-time theory.

A centrifuge is a mechanical device designed to spin objects around in a circle at a rapid rate. They come in a variety of sizes and are used in laboratories all around the world. One of their uses is to train astronauts and fighter pilots in how to cope with the 'G-forces' they will experience in their line of duty. These centrifuges consist of a central shaft to which is attached an arm which extends out some distance, at the end of which is a cockpit in which the test subject sits. The rate at which the cockpit can rotate about the central shaft is variable and is controlled by the centrifuge's operator. These machines are capable of inducing intense 'G-force'

experiences, up to 10 or more times the supposed 'force' that we experience walking around on the surface of the Earth.

In these centrifuges the 'G-forces' are generated by both types of acceleration: increases in speed and changes in direction. Since the cockpit is travelling in a circle, it is constantly changing direction and thus a constant 'G-force' will be experienced by the test subject, provided that a certain minimum rate of rotation is reached and sustained. If the cockpit rotates at a rate of 1 rpm, then no increased 'G-force' will be generated. But if the cockpit rotates at 10 or 20 rpm there will be a noticeable increase in the level of 'G-force' experienced by the test subject. Why is this? In both cases the amount of change in direction is the same: it is a constant, determined by the circumference of the centrifuge. What is different in these two situations is the amount of pressure the body of the test subject is placing on the space-time through which it is passing. When an object in motion changes direction in space-time, the resistance of space-time to the passage of that object increases. This is why objects in motion travel though space-time in straight lines unless some external force acts upon them (Newton's first again). Space-time tries to keep objects in motion on the straight and narrow, and resists when they try to depart from that path. That resistance is experienced as the 'G-force.' This accounts for the increased (compared to everyday experience) level of the 'G-force' experienced by the test subject when the cockpit is rotated at some minimally sufficient but constant rate.

However, when the rate at which the cockpit is being rotated is rapidly increased (accelerated), another factor comes into play. Then the cockpit and its passenger, like the roller coaster and its riders, generates a shock wave into the space-time in its path, stressing that region of space-time, which in turn makes that space-time more resistant to the passage of material objects through it. This rapidly increases the level of the 'G-force' experienced by the test subject. If the centrifuge operator then levels off the increase in the rate of rotation at some new higher rate, the 'G-force' will stop *increasing,* but will now be at a higher level than it was at the

cockpit's former rate of rotation. This is because at this new higher rate of rotation, the cockpit and its passenger, still constantly changing direction, are now exerting more pressure upon the space-time through which they are passing than was the case at the lower rate of rotation. Because the third factor which determines the permeability of matter to the passage of space-time through it is the velocity of the object through space-time, at a higher rate of rotation the space-time in the path of the cockpit offers greater resistance to this increased pressure, and thus the cockpit's passenger experiences a larger 'G-force.'

The ISS can be thought of as the cockpit of a centrifuge that has an imaginary arm that is 420 km long, the altitude at which the ISS orbits the Earth. Although the ISS and the astronauts on board are travelling through space-time at a constant speed of 8 km/sec, much faster than any speed attainable in any Earth-bound centrifuge, and even though they are constantly changing direction, they do not experience any 'G-force' while in orbit. This is because the circumference of the circle which they are travelling around through space-time is so large compared to the circumference of a centrifuge on the Earth, and thus the rate at which they are changing direction through space-time (their rate of acceleration) is insufficient to cause the distortion in space-time required to generate the increased stress in space-time necessary to create the 'G-force' experience. It is comparable to the cockpit of an Earth-bound centrifuge rotating at a rate of 1 rpm, a rate which is insufficient to generate any increased 'G-force.'

In general, we can say that the sufficient acceleration of an inertial mass, either in a straight line or on a sufficiently curved path, results in a distortion of the space-time directly in its path, temporarily increasing the degree of stress experienced by that space-time, which in turn increases the resistance of that region of space-time to the passage of objects through it. When the object passes through such more highly stressed space-time, it experiences that increased resistance. This increased resistance is the cause of the 'G-force.'

Why it is that only when objects undergo a certain minimum degree of acceleration do they generate the distortions in space-time which initiate this condition is a mystery. It may be that objects moving at a constant velocity in a straight line do in fact also create distortions in space-time, but that in such situations the distortions created are too minimal to generate an increased level of stress in the space-time, and so there is no increase in the level of resistance of the space-time to the passage of the object through it, and hence no increased 'G-force' is experienced. This appears to be true for the velocities to which we are commonly accustomed, but we suspect that any object moving at a constant velocity which is a significant percentage of the speed of light will suffer serious degradation and eventual disintegration into its constituent sub-atomic particles due to the resistance of space-time to its passage. Precisely at what velocity such disintegration will occur we cannot say, but we can say it will be to some degree dependent upon the strength of the atomic bonds of the matter in question, as well as the degree of stress being experienced by the space-time through which the object is passing.

So in addition to making possible the propagation of electromagnetic radiation, and being the proximate cause of so-called 'black holes,' the 'G-force' is another way in which immaterial space-time makes its presence apparent.

There is yet another way in which the existence of immaterial space-time is made apparent. This is via the phenomenon which has come to be called 'gravitational waves.' Gravitational waves are ripples which travel through immaterial space-time at the speed of light. Somewhat ironically, like 'black holes' the existence of 'gravitational waves' was predicted by Einstein's General Theory of Relativity. Scientists have built a gravitational wave propagating through space-time detector, a truly incredible feat of engineering, which they have named the Laser Interferometer Gravitywave Observatory (LIGO). On September 14, 2015, history was made when LIGO detected a gravitational wave calculated to have been caused by the collision of two

massive 'black holes' some 1.3 billion light years from Earth. Since then, LIGO has detected over 100 more such occurrences.

The data shows that gravitational waves are created by two separate but sequentially-connected processes. A report written by Sapphire Lally and published in New Scientist magazine on July 24, 2021 titled “Where does gold come from?” stated that:

> “In 2017, LIGO observed the clear signal of two neutron stars colliding: there was a “hum” of increasing frequency as the stars spiralled closer, then a “chirp” as they crashed together.”

In the moments just before two neutron stars collide they are both moving in highly elliptical orbits which bring them closer together and then farther apart, closer together then farther apart. As they move apart their enormous masses cause the space-time between them to be stretched taut, but as they move towards one another they create a wrinkle in the 'fabric' of space-time. That wrinkle is a gravitational wave, part of the “hum” of gravitational waves detected by LIGO which were created before the two neutron stars actually collided. It is easy to demonstrate how this process works. Take a towel and spread it out on any smooth surface. Place your hands on the towel a couple of feet apart. Pull your hands apart and the fabric between your hands will become taut. Move your hands towards one another and at least one wrinkle will appear in the fabric between your hands. Voila! Simulated gravitational waves.

The “chirp” detected by LIGO was not caused by the collision of the actual bodies of the neutron stars. That collision resulted in the emission of electromagnetic radiation and, it has been theorized, the creation of heavy elements such as gold. Recall that a 'black hole' is a neutron star surrounded by a region of space-time which has been stretched so taut that it can no longer vibrate. It was the crashing together of these two regions of space-time which created the gravitational wave “chirp” detected by LIGO.

(A momentary aside about 'black holes': the current theoretical explanation for 'black holes,' which is based purely on a mathematical solution to the equations of Einstein's General Theory of Relativity, is that 'black holes' are manifestations of nothingness; no matter, no space-time, nothing. These 'nothings' are said to possess the mass, without consisting of any matter whatsoever, of dozens or hundreds or even millions or billions of Suns. How can 'nothing' possess mass? How can the coming together and merging of two 'nothings' create a gravitational wave in space-time? Bearing in mind our explanation for the 'black hole' phenomenon we laid out earlier in this discussion, it is worth noting that astrophysicists have now concluded that 'gravitational waves' are created not only by the collisions of 'black holes,' but by the collisions of neutron stars as well. This makes complete sense of course because 'black holes' are simply neutron stars which are sufficiently massive to stress the space-time surrounding them to the point at which that space-time loses its flexibility, and can therefore no longer transmit light.)

There are two other developments in gravitational wave physics upon which we wish to comment. First there is the idea that "Because gravitational waves travel directly through everything, they could even provide us with an opportunity to peer inside neutron stars . . ." (48) We believe that this will never be possible. The neutrons in neutron stars are packed so closely together that space-time cannot flow through them; therefore no gravitational waves, which propagate through space-time, can penetrate them.

The other idea upon which we wish to comment is the current belief held by some astrophysicists that all bodies create gravitational waves as they move through space-time. According to this idea, we create gravitational waves every time we wave our arms in the air. We believe that this idea is incorrect because space-time flows through all moving bodies (except for neutron stars) as those bodies move through it. Neutron stars are the only truly 'solid' objects in the universe, and are thus impervious to the

flow of space-time. When two neutron stars approach one another they push the 'fabric' of space-time up into a wrinkle between them because they are impervious to its flow. That wrinkle then propagates across the Field of Play in the form of a gravitational wave.

The purpose of our raising the topic of gravitational waves has been to demonstrate another way in which immaterial space-time makes its presence apparent. If there are gravitational *waves*, and there are, then there must be something for those waves to travel through. Without liquid oceans there could be no tsunamis. And this something is not some merely theoretical four-dimensional metaphorical 'fabric.' It is a real thing which actually exists: immaterial space-time.

We have now discussed a number of ways in which space-time, though immaterial, makes its presence in the universe apparent. It is the medium through which electromagnetic radiation propagates. The curvature of space-time is responsible for the phenomenon we call gravity. When it is sufficiently stressed it is what makes 'black holes' black. In a phenomenon known as 'gravitational lensing,' the medium of space-time acts like a giant polished lens, bending the light from a distant galaxy around an intervening galaxy which blocks us from observing the more distant galaxy directly. If our bodies are sufficiently accelerated, we become aware of the passage of space-time through our bodies in the effect known as the G-force. The collisions of neutron stars create ripples that propagate through the space-time medium for incredible distances. In all of these ways space-time, even though it is immaterial, makes its presence apparent. Later in this discussion we will examine how space-time affects the behaviour of certain kinds of clocks.

Chapter Seven

IS THE UNIVERSE EXPANDING?

PART 1

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Having firmly established the existence of immaterial space-time as an indisputable fact, we will now use this knowledge to question the notion that the universe is expanding.

In 1929 the American astronomer Edwin Hubble published a paper which claimed to demonstrate that distant galaxies in all directions are moving away from us, and that the further away from us they are, the more rapidly they are receding. Hubble based this conclusion on Einstein's General Theory of Relativity. As Hooper explains:

> "Much like the pitch of a sound wave shifts when its source is moving toward or away from you (the Doppler effect), Einstein's theory predicts that the frequency of light will be shifted if its source is in motion." (49)

(As an aside, it is worth pausing to note that while in 1905 Einstein theorized that light is a stream of projectiles, he nevertheless relied on the wave theory of light to explain the Doppler effect in 1916.)

As Isaac Newton first demonstrated, when sun light is passed through a prism it will emerge showing the colours of the rainbow in a seemingly continuous band. In 1814, Joseph Fraunhofer discovered that this seemingly continuous band of colours was in fact broken up by a series of vertical black lines. In 1859, Gustave Kirchhoff and R.W. Bunson established that those black lines are caused by the absorption of a particular frequency of light by a given element present in the Sun's atmosphere.

The position of these Fraunhofer lines, as they came to be called, on a spectrum of light shifts if the source of the light is in motion, as Einstein's theory predicted. If the light source is moving towards the observer, the Fraunhofer lines shift towards the blue end of the spectrum, and are said to be 'blue-shifted.' If the light source is moving away from the observer, the Fraunhofer lines shift towards the red end of the spectrum and are said to be 'red-shifted.'

Edwin Hubble had used observations of a particular class of stars known as Cepheid variables to calculate the distances to the galaxies he was studying. It is important to note that before Hubble the existence of galaxies other than our own was unknown. Hubble discovered that there was a correlation between the distance to a given galaxy as obtained from the study of Cepheid variables and the red-shift of light from that galaxy. The further away was the Cepheid variable, the greater was the amount of red-shift in the spectrum of that galaxy's light. Hubble thus concluded that the further away a galaxy is from us, the more rapidly it is receding from us. This phenomenon was observed to be the same in all directions in the sky. The idea that the universe is expanding was born.

So the idea that the universe is expanding is less than one hundred years old. Thirty to forty years later, when it became widely accepted in scientific circles that the universe had a definite

beginning in time in the Big Bang event, the question became whether the universe would expand forever, or whether it would, under the mutual gravitational pull of all the galaxies upon one another, glide to a halt and then begin to collapse inwards upon itself in what has been termed the 'Big Crunch.'

This question was based upon a misconception concerning the motion of celestial objects. It was originally assumed that the recession of the galaxies was due to the motion of the galaxies themselves, but this idea was eventually superseded by another. It is true that, in accordance with the rule that everywhere within the boundary of the Game change shall be unceasing, galaxies themselves are in motion through space-time. Our own Milky Way galaxy and our galactic neighbour, the Andromeda galaxy, are moving towards one another and may eventually merge.

However, as astronomers built evermore powerful telescopes allowing them to see further and further out into the universe (and further and further back in time), they found that the most distant galaxies were receding at velocities approaching a significant percentage of the speed of light. According to Einstein's Special Theory of Relativity nothing can travel through space-time faster than the speed of light. What was the source of energy that could be propelling entire galaxies to such velocities? The new answer was that it is not the galaxies themselves that are moving at such incredible speeds, but the expansion of space-time itself that is causing the galaxies to recede so rapidly. At least, that is the currently accepted theory. But as we shall see, there are reasons to doubt whether or not this theory accounts correctly for the observed data.

In the 1990's, two groups of astronomers carried out a survey of exploding stars called supernovae in distant galaxies in an effort to answer the question of whether or not the rate of expansion of the universe was staying the same or, as many expected, was slowing. Much to most cosmologists' surprise, they found that the rate of expansion was apparently increasing. Their interpretation of the data obtained suggested that starting about five

billion years ago the rate at which the universe was expanding had begun to speed up. As we mentioned earlier, cosmologists have invented the concept of 'dark energy,' the source of which is unknown, to account for the apparent expansion of the universe and for the recent observations that astronomers have made. There are several problems associated with the theory that the universe is expanding. Consider Figure One.

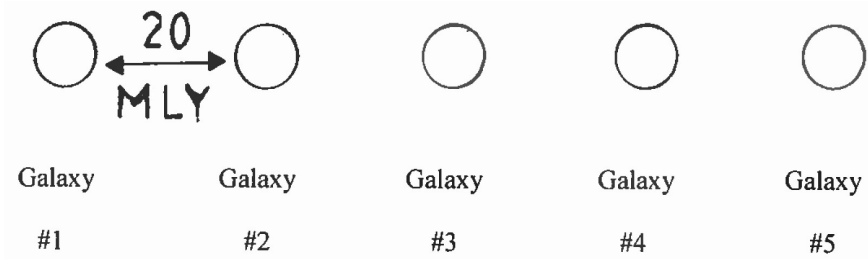

FIGURE 1

The drawing represents our own Milky Way galaxy (Galaxy #1) and four more galaxies stretched out in a given direction in space-time. For simplicity's sake we will arbitrarily assume that the distance between any two neighbouring galaxies is 20 million light years (Mly). Thus Galaxy #2 is 20 Mly from the Milky Way, and Galaxy #5 is 80 Mly from our position in the Milky Way. According to currently accepted theory, Galaxy #5 is receding away from us at a rate that is four times as fast as the rate at which Galaxy #2 is receding from us. The current explanation for this phenomenon is the supposed existence of so-called 'dark energy,' (physicists like to use words like 'dark' and 'energy' as a kind of magic talisman when they don't actually understand some phenomenon.) This 'dark energy' is supposedly everywhere and is apparently creating more space-time. Hooper states that “Distant galaxies appear to be moving away from us because the amount of space between them and us is growing.” (50) Goldsmith is more

explicit, stating that 'dark energy' is ". . . pushing different regions apart at an increasing rate as new space comes into existence. . ." (51)

The first problem with this idea is the question: by what means is this new space-time being created? The incubation of the space-time making up the Field of Play was created by the incredible temperature, pressure, and density that prevailed during the Big Bang state of being (which resulted in the achievement of the necessary condition). Clearly there is no evidence that some sort of similar process is at work everywhere in today's universe. The creation of space-time required a very specific set of circumstances. That set of circumstances is no longer present anywhere, let alone everywhere.

There is also a logical contradiction at play here. Most astrophysicists would deny the existence of an actual physically manifested space-time in the universe, while at the same time at least some of them are claiming that more of that stuff, which supposedly does not exist, is being created.

A third problem with this idea is that if there is new space-time being created between the Milky Way and Galaxy #2 that is pushing Galaxy #2 away from the Milky Way towards Galaxy #3, there will be an equal amount of new space-time being created between Galaxy #2 and Galaxy#3 (since the 'original' amount of space-time between all the galaxies in the example is uniform) that will be pushing Galaxy #2 back towards the Milky Way. The current expanding universe theory attempts to circumvent this conundrum via the 'expanding balloon' analogy. But we have already suggested that the expanding balloon analogy is invalid. We submit that the galaxies spread about the Field of Play are not situated in a horizontal plane upon the surface of an expanding sphere. They are situated *within* a sphere; a sphere of space-time.

A fourth problem with the current theory of an expanding universe is that the Milky Way's galactic neighbour, the Andromeda galaxy, also known as M31, is moving *towards* the Milky Way not *away* from it, in contradiction to both the theory of 'dark energy'

and the 'expanding balloon' analogy. If new space-time is being created everywhere in the universe driving galaxies apart, then it must be being created between the Milky Way and Andromeda as well, driving them apart. Yet that is not what direct observation has revealed. Current theory's solution to *this* conundrum is that the gravitational attraction between these two galaxies is greater than is the power of the 'dark energy' to push them away from one another. This explanation is simply too convenient and ad hoc.

We have established that the existence of a flexible immaterial medium we call 'space-time,' which is the most basic constituent of the Field of Play, is a fact. It clearly does exist. Space-time is the stage making up the Field of Play upon which the Game of Being is played out. Galaxies are the theatrical troupes which, with a cast of billions, travel about this stage, putting on a continuous performance for the benefit of God, the Creator.

In the current epoch of the evolution of the Game of Being galaxies tend to travel in packs, or 'clusters.' The cluster of which our Milky Way galaxy is a member is called the Local Group, which contains a few dozen galaxies. We know that massive bodies such as stars and planets curve space-time. In effect they do this by 'pulling' on the flexible 'fabric' of space-time (which must no longer be understood as a mere metaphor, but as an actually existing three dimensional thing) forming a constantly moving distortion in that fabric. Galaxies can be imagined as wide valleys moving through space-time, each containing billions of deeper and steeper depressions in the space-time fabric. All around the rim of each galactic 'valley,' the flexible fabric of space-time is being pulled taut by what lies at the centre of the galaxy. For a galaxy the size of the Milky Way, which is approximately 100,000 light years in diameter in its visible extent, the actual size of the galactic valley extends for some distance beyond its optically visible edge. We can call this point in space-time, which is constantly in motion, the galaxy's 'gravitational rim.'

Any space-time that is infiltrated by a passing galaxy, that is, any space-time that is encompassed within the gravitational rim of a

given galaxy, is space-time which is being curved, with the degree of curvature growing larger as one travels from the gravitational rim towards the centre of the galaxy. As we proceed towards the galactic core, we will encounter regions where the fabric of space-time is radically curved by the presence of stars and planets. Space-time that is curved is space-time that is 'under stress,' with the amount of stress increasing in direct proportion to the degree of curvature.

Chapter Eight

GRAVITY PART 1

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We come now to the second assumption about the nature of the universe that has led human understanding of the universe astray. This assumption can be traced back to Isaac Newton. Based upon his formulation of the laws of gravity, Newton assumed that every celestial body in the universe exerts a gravitational force on every other celestial body in the universe. Newton, of course, had no idea how large the Field of Play actually is; nor did he accept the idea of the ether which was championed by his bitter rival Robert Hooke. Newton's laws of gravity state that the gravitational force between two bodies is directly proportional to the product of the masses of those bodies, and is inversely proportional to the square of the distance between the bodies. This means that the gravitational force between two bodies falls off rapidly as the distance between them increases.

The assumption that every body in the universe exerts an attractive gravitational force on every other body in the universe has been carried forward into modern cosmology. Thus it is assumed that every galaxy is gravitationally attracted to every other galaxy. From this assumption came the idea that, due to this

gravitational attraction, the expansion of the universe might one day glide to a halt, and through this mutual gravitational attraction of all the galaxies in the universe, one upon the other, result in the collapse of all the matter in the universe into the so-called 'Big Crunch.' But the assumption upon which this idea is based is unwarranted and, as we shall see, invalid.

For Newton, gravity was a mysterious force that attracted one body to another. He made no attempt to explain *how* this force worked; he simply calculated the strength of its effect. Because he conceived of gravity as an attractive force between two bodies, Newton imagined that this force would extend outward to infinity, even though its strength would rapidly decrease with distance.

However, Einstein, in his General Theory of Relativity, conceived of gravity not as a mysterious force existing between two bodies but, rather, as a warping of space-time by the presence of massive bodies. Thus the planets of the solar system orbit the Sun not because the Sun is exerting some 'force' upon them, but because they are following a *straight* path (in accordance with Newton's first law of motion) through *curved* space-time, the degree of curvature of which is determined by the distance of each planet from the Sun.

Now, Einstein's understanding of gravity has repeatedly been demonstrated to be conceptually superior and more accurate than Newton's. But because the mathematics of the General Theory are difficult to work with, and because the mathematics of Newton's laws of gravity are simple and straightforward and accurate enough for most applications, and because Science has remained blissfully unaware of the actual existence of immaterial space-time, astronomers and cosmologists have in many cases continued to rely upon Newton's understanding of gravity in their calculations of astronomical phenomena. This practice, though convenient, has been accompanied by some invalid conceptual baggage: namely, the assumption that every body in the universe exerts, by some mysterious means, a 'force' on every other body in the universe, even across distances of millions or billions of light

years. This assumption is simply incorrect.

Any given galaxy has absolutely no effect on the motion of some other galaxy at some arbitrary distance from the first. The ability of a galaxy to affect the motion of some other celestial body is limited to only those celestial bodies whose intrinsic random path through space-time causes them to cross the boundary of the gravitational rim of that galaxy. Only at that point, where space-time becomes actively curved and put under stress, is the motion of that celestial body affected. If the angle between the path of the celestial body in question and a radial line drawn from the centre of the galaxy to the point at which the celestial body crossed the galaxy's gravitational rim is sufficiently large, and if the velocity of the celestial body is sufficiently large, then it may recross the galaxy's gravitational rim at some other point and exit from the galactic valley back into inter-galactic space-time. Otherwise, if those conditions are not met, the path of the celestial object will be 'bent' by the curvature of space-time within the galactic valley into an orbit around the centre of the galaxy.

The same dynamic applies to the motions of bodies within a galaxy. The solar system in which we live can be understood as a 'mini valley' within the larger galactic valley. The elliptical paths of the planets through space-time around the Sun are all situated within the gravitational rim of the valley in space-time created by the mass of the Sun. The motion of Proxima Centauri however, the star closest to the Sun at some 4.6 light years distance, is not at all affected by the presence of the Sun because it lies outside the gravitational rim of the valley created by the Sun. There is no mysterious force connecting the Sun and Proxima Centauri. Their motions are entirely due to the curvature of space-time within the galactic valley caused by the presence of the super-massive neutron star, known as Sagittarius A*, which is situated at the centre of the Milky Way.

Similarly, there is no force at work in the universe which is acting to draw together the galaxies which are scattered about within the Field of Play. The approach towards one another of the

Milky Way and Andromeda galaxies is not due to some gravitational attraction between them; rather, it is down to chance that their intrinsic random motions are moving them towards the same position in space-time. If and when the gravitational rims of these two galaxies cross paths (this appears to have already occurred) only then will they quite literally fall down through the space-time of their respective valleys into each others' spiral arms. So, since there is no mysterious force reaching out across space-time to draw galaxies together, there is no possibility that at some point in the future all the matter in the universe will crash together in a 'Big Crunch.'

The Creator decreed that everywhere within the boundary of the Game of Being *change shall be unceasing.* The primary manifestation of this decree is the movement of material bodies within the Field of Play. How is the motion of matter accomplished? (Note that we ask *how*, not *why.* The answer to *why* matter moves is that the Creator decreed that change shall be unceasing. *How* asks *by what means* that motion is achieved).

The Field of Play is comprised of the flexible fabric of immaterial undifferentiated space-time. Scattered about the Field of Play are agglomerations of differentiated space-time in the form of energy-matter. The Game of Being was designed so that energy-matter, when concentrated in sufficient quantities, can 'grasp' the fabric of space-time, and by so doing, pull itself about the Field of Play. We will use the Earth as an example to explain how this process works.

Like a person pulling themselves hand-over-hand up a dangling rope, the Earth-Moon system is pulling itself through space-time at a rate of 30 km per second. The fabric of space-time is literally being pulled through the gaps between and within the atoms that make up the Earth (and its passengers) at that rate. The Earth's speed and its specific path through space-time is determined by the curvature of the space-time through which it passes, which in turn is determined by the mass and motion through space-time of the Sun, which is also pulling itself through space-time. The closer

a planet's orbit is to the Sun, the greater is the curvature of the space-time through which it is passing, and the higher is the planet's speed along its path. Thus Venus, which is closer to the Sun than the Earth, travels at a speed of 35 km per second and Mars, which is further from the Sun, has a speed of 24 km per second.

Isaac Newton realized that if you apply force to a body which accelerates it to some given speed in some particular direction, that body will continue to travel in a straight line at that speed forever, unless some other force acts upon it. Einstein realized that there is no mysterious gravitational 'force' acting upon the planets and that therefore they are travelling in straight lines. The planets move in curved elliptical orbits around the Sun, not because of their intrinsic motion, but because the medium through which they travel, the fabric of space-time, is itself curved.

Material bodies do not directly affect gravitationally other material bodies. Rather, material bodies pull on the fabric of space-time, which in turn affects the behaviour of matter. If we stand in the middle of a room with a pen in our hand and let go of the pen, it will immediately fall to the floor. According to Newton, that happens because the matter making up the Earth exerts an attractive force on the matter making up the pen. This is conceptually incorrect. The matter of the Earth is not pulling on the matter of the pen; rather, it is pulling on the space-time which is constantly passing through the atoms that make up the pen. Under everyday circumstances this distinction may seem to be of little consequence. Either way you look at it, the pen still falls to the floor. Up to and including distances that span the diameters of individual star/planetary systems Newton's conceptual understanding of gravity - - - that matter attracts matter - - - *appears* to be correct. In most (but not all) circumstances Newtonian mathematics accurately predicts the motion of the planets within our solar system. But, as we shall see, when considering much greater intra- and inter-galactic distances, the distinction between the two concepts of gravity, matter pulling on matter versus matter pulling on space-time, becomes very consequential indeed.

Chapter Nine

IS THE UNIVERSE EXPANDING?

PART 2

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Having firmly established the existence of immaterial space-time, we now have at hand an alternative explanation for the observed red-shifting of light from distant galaxies which does not require any fantastical beliefs such as the idea that celestial bodies are moving around the Field of Play at near light speed. We can now say, with a high degree of confidence, that the largest portion of the observed red-shift in the light from distant galaxies is due not to the recession of those galaxies with an attendant Doppler effect, but, rather, is due primarily, though not entirely, to the distance, that is, the amount of immaterial space-time, between us and those galaxies. The upshot of this is that it is not true that virtually all of the other galaxies within the Field of Play are moving away from us. It is a certainty that many galaxies are in fact moving towards us. The unavoidable conclusion of our analysis of the existence of the space-time fabric is that, contrary to popular belief, the universe is not, in fact, expanding.

Astronomers have calculated through their study of Cepheid variable stars that the Andromeda galaxy is approximately 2.2 million light years away from our galaxy. Because Andromeda's light has been observed to be blue-shifted, we know that Andromeda is moving towards us. Putting these two facts together provides us with valuable information. It tells us that 2.2 million light years is a span of space-time which is insufficient to fully mask the blue-shifting of light resulting from the motion of a galaxy towards us.

What do we mean by this statement? Refer again to Figure 1 (page 97). Let us assume for the sake of argument that Galaxy #2's intrinsic motion is moving it away from the Milky Way and towards Galaxy #3. From our vantage point Galaxy #2's light will be red-shifted due to its motion away from us. Galaxy #2's light will be further red-shifted by its journey towards us through the space-time in the 20 million light year interval between us and Galaxy #2. Under the currently accepted theory of an expanding universe, the addition of these two sources of red-shifting together will cause us to arrive at a value for the velocity of Galaxy #2 that is greater than it actually is.

For observers in Galaxy #3 the situation is reversed. Because Galaxy #2 is moving towards Galaxy #3, the light from Galaxy #2 travelling towards Galaxy #3 will be blue-shifted as it starts out on its journey. However, that initially blue-shifted light will be gradually red-shifted during its journey across the 20 million light year interval between Galaxies #2 and #3, masking the original blue-shifting of the light emitted by Galaxy #2. If astronomers in Galaxy #3 who observe the resulting red-shift of Galaxy #2's light are unaware of the existence of the immaterial flexible fabric of space-time between them and Galaxy #2, and who, like their compatriots here on Earth, mistakenly believe that the observed red-shift of Galaxy #2's light is due entirely to its intrinsic motion through space-time, then they will incorrectly conclude that Galaxy #2 is moving away from them, although in our example we have specifically stipulated that Galaxy #2 is in

fact moving towards Galaxy #3.

In a non-expanding universe with billions and billions of galaxies moving randomly about within the Field of Play, it stands to reason statistically that a certain percentage of them will be moving towards us (this would be those galaxies whose initially blue-shifted light has been masked by the red-shifting of that light's journey through space-time towards us), a certain percentage will be moving away from us; and a certain percentage will be moving across our line of sight. The light from all of these galaxies will be red-shifted by its journey through the space-time interval between us and them.

Consider the example in Figure #1 again. According to the expanding universe theory, Galaxy #5 is moving away from the Milky Way at a rate that is four times the rate at which Galaxy #2 is receding. But the application of Occam's Razor supports the much simpler explanation for the difference in the red-shift of the light from those two galaxies, as being due to the straight-forward fact that Galaxy #5 is four times further from the Milky Way than is Galaxy #2, and that therefore its light, having travelled through four times the amount of space-time, will exhibit four times the red-shift. This much simpler explanation does not require the invention of a mysterious 'dark energy' of unknown origin, nor the creation of more space-time by some unexplained process. It only requires the presence of flexible immaterial space-time, the existence of which we have amply demonstrated previously in these pages.

Ultimately this means that we may not be able to determine the direction of motion of distant galaxies. Galaxy #5 may in fact be moving towards us just as is Andromeda, but the initial blue-shifting of its light travelling in our direction which would have revealed this motion to us, will have been red-shifted and masked during its 80 million light year journey from Galaxy #5 to our telescopes. Of course, this leaves us in no worse position than we were in under the assumption that the universe is expanding and that all galaxies are receding away from us. While we will no

longer be able to state with certainty the direction of any given galaxy's motion, we will still be able to estimate the distance to that galaxy based on the amount its light has been red-shifted, as long as we allow some leeway in our estimation for the possibility that the galaxy is moving towards us, and that therefore its light would have begun its journey towards us blue-shifted.

During the 1920's, the American astronomer Edwin Hubble, after whom the famous Hubble Space Telescope was named, was working at the Mount Wilson Observatory outside Los Angeles which at that time had the finest telescopes in the world. At that point in the history of astronomy no one knew that galaxies other than our own existed. In fact, the word 'galaxy' was not yet in use. Hubble spent his time observing a class of stars that are known as Cepheid variables. An astronomer at Harvard, Henrietta Swan Leavitt, had earlier discovered that Cepheid stars could be relied upon as 'standard candles' to accurately determine their distance from us. Through his study of such stars Hubble realized that some of them were so far away that they could not possibly be a part of the collection of stars that during this period became known as the Milky Way, our home galaxy. Hubble's discovery introduced to humanity the knowledge that there are many other dense collections of stars in the universe at great distances from us.

By 1929 Hubble had gathered distance estimates for about 20 galaxies, and in that year he made an even more startling announcement: most of these new-found galaxies were moving away from us at speeds that were proportional to their distance from us. The farther away the galaxy was, as established by the observation of its Cepheid variable stars, the faster it was receding from us, and that this was the case in every direction in the sky in which he looked. This relationship between distance and recession velocity became known as Hubble's Law, which is expressed mathematically as $v = H \times d$ (recession velocity equals the Hubble constant times distance.) The Hubble constant is defined as being the rate of expansion of the universe measured in kilometres per second per megaparsec. Interestingly, almost 100 years after the

introduction of this concept, the actual value of the Hubble constant has yet to be firmly established. Hubble's conclusion was based upon the observed 'red-shift' of the light spectra from each of these galaxies. The cause of this red-shifting was initially thought to be due to the Doppler effect.

> "The Doppler effect arises when a source of wave motion (for example, of sound waves or light waves) moves with respect to an observer. The changing distance between the observer and the source either compresses the waves (if the source approaches the observer) or stretches them (if the source recedes from the observer). This compression or stretching appears as a change in the frequency (number of waves per second) and wavelength (distance between successive wave crests) of the waves that the observer measures." (52)

Since the spectral lines (known as Fraunhofer lines) in the light spectra from these galaxies were moved towards the red end of the light spectrum, that is, the light waves were being stretched, the light was said to be 'red-shifted.' Initially, this observed red-shifting was ascribed entirely to the intrinsic motion of each individual galaxy; but although this notion was soon called into question, the idea that *the universe is expanding* soon became accepted scientific dogma.

Up until this time it had been commonly believed that the universe was eternal and had no beginning in time. Hubble's discovery changed that. Astronomers reasoned that if the galaxies were all currently moving away from each other and steadily increasing the distance between them, there must have been a time when they were all closer together. In 1931, a Belgian priest named Georges Lemaitre, who was trained as a mathematician and astronomer, published a paper in which he proposed that the

universe and all that it contained had begun as a “primordial atom” which had begun its expansion at a particular point in the past. The universe was thus not eternal: it had a definite beginning. This was the beginning of the idea which would eventually become known as the Big Bang.

Over the next three decades the field of scientific study now known as *cosmology* was being developed. Within that field, the idea that the universe had begun from a single point-like source was highly controversial. In 1949 the British physicist Fred Hoyle, who was a proponent of the 'steady state' theory of the universe, which claimed that the universe is not evolving, referred to Lemaitre's idea as the 'Big Bang.' The name, with all its potential for misunderstanding, stuck.

Over this same period of time astronomers were discovering galaxies that were further and further away, and which exhibited ever-larger red-shifts. The most distant of these galaxies had red-shifts that indicated that they were receding at velocities that were a significant percentage of the speed of light. Cosmologists questioned how it was possible that entire galaxies could be uniformly propelled to such speeds and still maintain their cohesion. It was therefore concluded that, while it was beyond question that individual galaxies are indeed in motion, their intrinsic motion is not responsible for the majority of the observed red-shift. Rather, the bulk of the red-shift was ascribed to an ever-increasing rate of growth in the distances between the galaxies. Thus the explanation for the observed increasing red-shift of light from increasingly distant galaxies subtly changed from being based upon *motion per se* (the Doppler effect) to being based upon the *distance*, that is, *the ever-increasing amount of space-time,* between the galaxies.

Cosmologists have developed mathematically based models to explain the supposed expansion of the universe. In order to point out their errors, we must first ensure that the reader is acquainted with these models, and with the assumptions and reasoning that supports them. To accomplish this task we will rely

upon the work of a professional cosmologist, which your author most assuredly is not. We will quote extensively from Donald Goldsmith's very informative book, *The Runaway Universe.* We have added italics to emphasize certain portions of the text:

> "All of modern cosmology rests on *the assumption* that we have a representative view of the universe. This hypothesis has no basis in observational reality, other than the fact that the cosmos that we see does look much the same in all directions. . . . The principle that what we see provides us with a representative slice of reality can never be fully verified. Astronomers support this hypothesis, which they call the "cosmological principle," because it offers the most straightforward statement about the cosmos we cannot see. Yet they remain fully aware that the cosmological principle rests on what cosmologists *choose to hypothesize* about the universe." (53)

Aside from what we consider to be Goldsmith's misuse of the word "reality," which we will get to later, we have no quarrel with the above statements. The assumption upon which the cosmological principle rests certainly appears to be valid, but it is important to bear in mind that the models that cosmologists use to explain the workings of the universe have arisen due to a *choice* made, from amongst various alternatives. Under the heading "Models of the Expanding Universe," Goldsmith continues:

> "Can the cosmos really expand everywhere, with all observers recording the same basic pattern? Doesn't the cosmic expansion imply a central stationary point, with all galaxies receding from it, that must be different from

other locations in the universe? Hubble's observations plus the cosmological principle provoke these questions, which turn out to have complete, *if not completely satisfying*, answers. Astronomers who attempt to ease the public into accepting the idea of an expanding universe start by urging acceptance of the fact that no one can truly imagine the cosmos. To hold the universe in mind while contemplating its expansion demands more than human brainpower - - - not in capacity, but in conceptual ability. By definition, the universe contains all that exists, and we cannot step outside it, *even in our minds,* to obtain a clear view. Instead we must *make do* with mathematics, models, and approximations. These serve us well, but they will never fully spread the embroidered cloths of the heavens before us.

"The favourite model of cosmologists reduces three-dimensional space to the two-dimensional surface of an expanding balloon, *so that we can indeed step outside the model* and watch it expand. If we glue stickers on the balloon to represent galaxies and insist that light can travel only around the balloon's surface, we can verify that as the balloon expands, every sticker will see all the others receding. Indeed, the stickers obey Hubble's law: A sticker twice as distant as another from any reference point will move away twice as rapidly. No sticker can claim to be the stationary center of the expansion. If a center exists, it lies not on the balloon's surface, *but in its interior,* which does not exist in the universe that the model

> embodies . . .
>
> "The balloon model of the expanding universe also helps to resolve another objection to the concept of an expanding universe. What is space expanding into? In the model, only the balloon's surface exists, representing all of three-dimensional space, and *what we take to be space represents merely a mathematical construct.* Thus the balloon can expand, gaining a larger surface area that stands for a greater total amount of space, without running into anything. *Those who object to this sleight of space must remind themselves that no model can furnish a wholly satisfactory explanation of how the cosmos behaves."* (54)

Our analysis of this passage begins with Goldsmith's acknowledgement that "the answers" derived by cosmologists concerning the fundamental nature of the universe are not "completely satisfying." Then why accept them as answers? According to Goldsmith, we are required to accept these not completely satisfying answers because the "conceptual ability" of humankind is insufficient to achieve answers that actually are satisfying. As a scientist, Goldsmith is presumably committed to the idea that an understanding of the universe is susceptible to the application of logic and reason, and that when enough facts about the universe have been obtained, humans are capable of arriving at an accurate picture of how the universe functions. To state that humans are fundamentally lacking in the conceptual ability to arrive at completely satisfactory answers concerning that functioning appears to be contrary to that scientific ideal. This slippage from that scientific ideal has resulted in the creation of models of the universe that are, as we shall see, completely inaccurate and incorrect.

Goldsmith then goes on to state: "By definition, the

universe contains all that exists, and we cannot step outside it, *even in our minds,* to obtain a clear view." Firstly, while by definition the universe contains all that *materially* exists, in this book we argue that the universe does not contain all that is; more on that later. Secondly, Goldsmith states that "we cannot step outside [the universe], *even in our minds,* to obtain a clear view." Yet in the very next paragraph Goldsmith (and all of cosmology) does exactly that. *In their minds* they "step outside" the universe (as Goldsmith readily admits) by creating a model of the universe which they view from "the outside."

At the end of that first paragraph Goldsmith finishes by saying, "Instead we must *make do* with mathematics, models, and approximations. These serve us well, but they will never fully spread the embroidered cloths of the heavens before us." In other words, a true understanding of the nature of the universe will forever remain beyond the grasp of humanity. We believe this attitude of "make do" to be folly of the highest order. This attitude has resulted in the creation of models of how the universe functions which not only have not enabled our understanding, but, rather, have actively obscured it.

In the next paragraph Goldsmith introduces cosmologists' *favourite model* of the expanding universe: the entire universe imagined as existing on the surface of an expanding balloon. Cosmologists accomplish this amazing feat by the waving of a magical mathematical wand to reduce three-dimensional space to the two-dimensional surface of an expanding balloon. This is nothing more than mathematical nincompoopery at its finest. As we have previously noted, just because some notion can be stated in the language of mathematics does not guarantee that the statement represents that which actually exists. The expanding balloon model is so obviously flawed that it is a wonder that anyone can seriously employ it.

Goldsmith states, "If we glue stickers on the balloon to represent galaxies and insist that light can travel only around the balloon's surface, we can verify that as the balloon expands, every

sticker will see *all the others receding."* But this statement wilfully contradicts repeated observation in the real world. The light from Andromeda, which is the largest of our galactic neighbours, and some other galaxies in what is known as the Local Group of galaxies of which the Milky Way is a member, is blue-shifted, meaning that they are moving toward us, not receding away from us. Furthermore, as astronomers have looked ever-further into the depths of the cosmos, they have observed many instances of galaxy collisions, which would be impossible if the galaxies behaved like the stickers on the surface of an expanding balloon.

More to the point, everywhere we look in the sky we find galaxy upon galaxy, stretching out to almost unimaginable distances. We are *surrounded* by other galaxies. They are not spread out around us in some generally horizontal plane. It is clear and obvious that if the universe can indeed be likened to an *expanding* (present tense) balloon - - - an idea with which we strongly disagree - - - then we must be *in the interior* of the balloon, not sitting upon its surface. But in the case of cosmology's "favourite model," the interior of the balloon "does not exist in the universe that the model embodies;" there is only the balloon's surface. Of course, a balloon which is all surface and no interior is no longer a balloon, but this absurdity is simply ignored by cosmologists.

Goldsmith continues by saying that for cosmologists, "The balloon model of the expanding universe also helps to resolve another objection to the concept of an expanding universe. *What is space expanding into?* In the model, only the balloon's surface exists, representing all of three-dimensional space, and *what we take to be space represents merely a mathematical construct.* Thus the balloon can expand, gaining a larger surface area that stands for a greater total amount of space, without running into anything." Dealing with the last sentence first: "Thus the balloon can expand, gaining a larger surface area..." But we have just clearly demonstrated that a "balloon" that is all surface and no interior

cannot be considered to be a "balloon." Now the question, "*What is space expanding into?"* This question is based upon one incorrect conclusion and one completely unwarranted assumption. The incorrect conclusion is that space is expanding at all. As we shall demonstrate presently, when one takes into account *all of the available evidence,* the most logical conclusion is that the universe is not, in fact, expanding. The completely unwarranted assumption is that there is *no thing* beyond the edge of the universe. We shall argue that this *assumption* is invalid.

In order to make ourselves clear we must also deal with the statement, "what we take to be space represents merely a mathematical construct." We are now getting to what is in many ways the nub of the problem. To begin with, Goldsmith misstates what he is trying to communicate. The statement should be: what we take to be space *is represented by* a merely mathematical construct. With the phrase "a merely mathematical construct" Goldsmith acknowledges that the expanding balloon model is just that - - - a model. The basis of the difficulty lies in the fact that the universe and the space by which it is made manifest is real, that is, it exists, while mathematics is not real and has no existence which is independent of our minds. We will have more to say on this topic later.

Finally, Goldsmith attempts to deflect the kind of criticism of the expanding balloon model laid out in the previous paragraphs by stating: "Those who object to this sleight of space must remind themselves that no model can furnish a wholly satisfactory explanation of how the cosmos behaves." This is a restatement of his claim that humans are ultimately incapable of deciphering the mysteries of the cosmos, and that therefore we must "make do" with what we can conceptualize. That our understanding of any problem is limited by what we are capable of conceiving is an obvious truism, but this limitation does not give us license, simply out of convenience, to employ models that account for some apparent facts while ignoring others which directly contradict the basic premise of the model, or to rely on models that contain

inherent logical contradictions. Whatever one may think of the validity of this "make do" claim, it seems clear that it is unacceptable for an entire important field of scientific endeavour to endorse and promote a model of how the universe functions which is in such flagrant contradiction to established fact.

The question remains: what are all these pretzel-like contortions of logic which are contained in cosmology's "favourite model" of the universe in aid of? The answer is straightforward. The stickers on the surface of the balloon *obey Hubble's law.*

All scientific endeavours are based upon the assumption that the operation of the universe is based upon logic and is susceptible to rational analysis. If the application of a given law results in an "understanding" of the universe which is illogical and irrational, that is, its application does not conform to established facts or contains logical contradictions, then the validity of that law must be called into question. Is Hubble's law, v = H x d, relating *recession velocity* to distance, in fact correct? We are quite certain that it is not. This is because Hubble's law is *conceptually* flawed.

Hubble's law, as it is currently interpreted, assumes that the observed red-shift in light from distant galaxies is due to the *motion* (hence *velocity*) of those galaxies, which supposedly is the result of, that is to say, has been *induced* by, the expansion of space between us and the galaxies under observation. Although in *some cases* the *intrinsic* motion of a given galaxy is a *contributing factor* to the amount of red-shift observed, in the case of *distant* galaxies, *motion per se, and hence velocity,* plays only a small part in the determination of the total amount of red-shift; and as we have demonstrated, it cannot be stated categorically that all distant galaxies are actually receding from our position in the cosmos. Some of those galaxies are undoubtedly actually moving toward us. The greater percentage of the red-shift of light from *distant* galaxies is not due to their *intrinsic motion*, but, rather, is dependent on *the size of the gap* (in other words the total distance) between the galaxy under observation and its observer, and upon

yet another important factor, the nature of which we shall examine in a moment. That gap between galaxies is not empty; something is occupying it. The question is: What is doing the occupying? The answer to this question is: immaterial space-time.

Consider the following: If the universe is getting steadily larger as is currently believed, that means that somehow the amount of space is steadily increasing. There are two possible explanations for this unproven hypothesis. One theory is that more space is being actively created in the gaps between galaxies (although mysteriously not *within* galaxies or even *within* galaxy clusters) and is pushing them apart. The other possibility, which is currently in vogue within the cosmological community, is that some mysterious force, popularly dubbed 'dark energy,' is somehow winning a supposed 'battle' with that other mysterious force dubbed 'gravity,' and is thereby causing the universe to expand. Goldsmith employs both of these ideas in his explanation for this supposed process of expansion:

> "Although [space] looks empty, and in fact is empty to every technique of measurement, every cubic centimetre abounds with invisible energy! This energy, *utterly invisible and unperceivable,* has no "useful" form. Its sole function and result is to push space apart, and as it does so, *new space comes into existence,* itself just as rich in energy as the space that gave it birth. (emphasis added) (55)

There are several problems with these ideas, and a careful analysis demonstrates that they cannot be correct. First of all, the idea that *new* space is "coming into existence" is highly implausible. According to the Big Bang theory, which Goldsmith undoubtedly endorses, the "original" space was created in a hot dense state (called the "singularity" by some) wherein the temperature was in the trillions of degrees. No such condition is

evident *anywhere* in the universe in the current epoch, let alone *everywhere,* so how is this "new" space being created?

Furthermore, the idea that new space is being actively created in the gaps between the galaxies results in a logical contradiction. Imagine a string of five galaxies spread out in a line over a distance of eighty million light years at intervals of 20 million light years. (See Figure #1 page 97.) Now imagine "new space" being created in each of those intervals, resulting in the galaxies being pushed further apart. The new space created between Galaxy #2 and Galaxy #3 would push Galaxy #2 toward Galaxy #1, while it would simultaneously push Galaxy #3 toward Galaxy #4. But Galaxy #4 would be simultaneously pushed toward Galaxy #3 by the new space being created in the interval between Galaxy #4 and Galaxy #5. Similarly, Galaxy #2 would be pushed toward Galaxy #3 by the new space being created between Galaxy #1 and Galaxy #2. Each galaxy ends up being pushed simultaneously from two opposing directions, and the only logical result of this scenario is that no expansion would take place at all. So the proposal that the expansion of the universe is the result of new space "coming into existence" cannot be correct.

What about the "invisible energy" to which Goldsmith makes reference? This idea is now popularly referred to as 'dark energy' and is thought to somehow be exerting a mysterious force pushing the galaxies apart, in opposition to the force of gravity which is *supposedly* working to pull galaxies together. There are three problems with this idea. First, there is no *force* pulling galaxies toward one another. Einstein demonstrated conclusively that the phenomenon we call "gravity" is not the result of some mysterious force that connects one massive body to another and works to pull those bodies together, as imagined by Issac Newton; rather, gravity is the result of the curvature of space in the presence of mass. So there is no 'force' for dark energy to operate in opposition to. So does dark energy somehow work to 'undo' the curvature of space and 'straighten it out?' It takes a significant amount of mass concentrated in a particular volume of space in

order to bring about a significant curvature of space. So presumably, it would take a significant density of dark energy concentrated in one place to undo the curvature. There is no evidence that significant 'pockets' of such energy exist anywhere in the observable universe.

The second problem with the 'dark energy' explanation for the expansion of space is that it leads to the same logical contradiction that arose with the "new space is being created" proposal. Assuming that the energy density of this dark energy is spread evenly in the gaps between the galaxies - - - how could it be otherwise, and if it is otherwise, what is the explanation for that?- - - then once again each galaxy will be simultaneously pushed upon evenly from opposing directions and so no expansion could take place. But there is still a greater objection to this idea. Figure #1 is merely a two dimensional representation of five galaxies in a row, but galaxies actually exist in *three-dimensional* space, which means that the dark energy would be pushing equally upon each individual galaxy from *every direction*. Once again, the only logical conclusion is that no motion in any one particular direction would be possible. In these circumstances how is it possible that all galaxies could be receding from one another?

The third problem with the 'dark energy' explanation for the expansion of the universe is that there is no plausible source for this supposed energy, as in the way the Earth is bathed in the energy generated by the Sun. The whole concept of dark energy is nothing more than a rather desperate attempt to explain the apparent consequences of Hubble's flawed law. Ultimately, there is zero evidence for its existence.

Understood in its proper context, 'Science' is just the latest iteration in the long line of religions that humans have created over the ages in an effort to understand the nature of being. Science has its own creation story: the Big Bang theory. It has its own dogma: Newton's law of gravitation, Einstein's Special and General theories of Relativity, Hubble's law governing the expansion of the universe, the laws of Quantum Mechanics. It has

its own hierarchical class of “high priests”: the scientists who interpret and apply the teachings of its dogma. Its adherents have constructed modern day versions of magnificent cathedrals to demonstrate to the general populace Science's power and glory: the Large Hadron Collider, the Hubble Space Telescope, the Laser Interferometer Gravitational Observatory, and other colliders, telescopes, and observatories around the world and in space. And, like all other religions, Science is very concerned with the task of being able *to predict the future.*

As far as we can tell, humans are unique among the lifeforms on this planet in being cursed with the knowledge of their own eventual demise. As one story goes, humanity is to be punished for all of eternity because the original humans, Adam and Eve, defied God's explicit instructions not to eat the fruit of the Tree of Knowledge. What was the secret knowledge that the Tree possessed? *That all beginnings must have an ending.* Some would have it that the punishment was the banishment of humans from the earthly paradise of the Garden of Eden where lifeforms had eternal life, and was thus the infliction of mortality upon humanity. But this is to misinterpret the message contained in the story. Because of the imposition of the Creator's rule that in the Game of Being all beginnings must have an ending, Adam and Eve were always destined to die. The curse entailed the fact that they now knew this in advance.

This fact is a basic element in the construction of each individual human reality, and its result is that at a very deep level humans are both fearful of, and curious about, the future. A major purpose of all organized religions has been to provide a framework of beliefs to calm those fears and to satisfy that curiosity.

For the religion called 'Science,' the 'discovery' that the universe is 'expanding' brought into sharp focus the question of what lies in the future for the universe as a whole. The question is: Will the universe expand forever, or will the mutual gravitational attraction of all matter - - - described by Newton's law - - - eventually cause the expansion to grind to a halt, and

cause all matter to reverse course and finally come crashing back together in what has been termed the 'Big Crunch?' Science's high priests in charge of this question, the cosmologists, have put in decades of intense effort to divine the answer. What will happen *in the future?*

Humans have relied on various methods to predict what the future will bring. Some have relied on the patterns created by the tossing of yarrow stalks upon the ground, or the patterns left by tea leaves in the bottom of a cup. Some have claimed the power to discern the future by observing the lines on the palm of a person's hand, or by seeing visions in a ball of clear crystal. Some say that our fates are preordained and are dependent upon the position of the planets and stars in the sky at the moment of our birth. The monotheistic religions claim authority for their predictions on the basis that their teachings were divinely inspired. Science bases its predictions upon observations of the workings of nature and then extrapolates on the basis of those observations, and/or employs the manipulations of the mystical language known as mathematics.

During the 1990's, two groups of astronomers set out to answer the question surrounding the ultimate fate of the universe with renewed vigour. They had new tools at hand to help them with their investigation: new and larger telescopes that are capable of looking much further out into the universe and therefore ever-deeper into the past. It is important at the outset to remember that all their observations were interpreted through a lens cast on the belief that the universe is indeed expanding. They concentrated their efforts on observations of the death of stars known as “supernovas.” When stars above a certain critical mass run out of fuel in their cores and are crushed by their own gravity, they then explode more violently than any other process in the universe, and for awhile their light outshines all the light produced by all the other billions of stars together that are situated in their galaxy. Supernovas are not all the same but we will not go into the various causes of the different kinds of supernovas here. The salient point for the purposes of our discussion is that there is one

kind of supernova, called Type 1a, that was thought, at the time, to arise from the same particular and repetitive set of circumstances from one Type 1a supernova to the next. This meant that the intrinsic luminosity would be the same for each Type 1a supernova, independent of what galaxy it was in. This would allow astronomers to use these Type 1a supernovas as 'standard candles' to determine the distance to the galaxy in which they were situated.

Modern telescopes look out into the universe much further than did the telescopes available to Edwin Hubble. But while these telescopes can gather light from much more distant galaxies, beyond a distance of about 100 million light years they cannot resolve individual stars within those galaxies, and so cannot observe the individual Cepheid stars that Hubble relied upon as standard candles to determine distance. Type 1a supernovas were thought to be the new tool to replace the use of Cepheids, and crucially, at much greater distances.

Of particular interest to those two teams of astronomers in the 1990's were observations of high red-shift supernovas which they believed to be *moving away from us more rapidly* than lower red-shift supernovas. Based on their observations both teams concluded, much to their surprise, that the expansion of the universe is not slowing down as expected, but rather that the rate of expansion itself is increasing. These conclusions were based of course on the assumption that Hubble's law is correct and that the universe is actually expanding. If the universe is not indeed expanding, then its “rate of expansion” cannot be increasing.

But the universe has thrown a monkey wrench into the works. In more recent times, new observations and theoretical developments have suggested that there is more than one set of circumstances that can give rise to Type 1a supernovas, meaning that their intrinsic luminosity may differ from one Type 1a to another, meaning that they cannot be used as standard candles. If this is correct, their conclusion that the *rate of expansion* of the universe is increasing is very much thrown into doubt.

There are some issues relating to observations of Type 1a supernovas that we do need to deal with at this point. In his book, *Just Six Numbers,* first published in 1999, England's Astronomer Royal Lord Martin Rees stated that Type 1a supernovas:

> ". . . display another trend that relates directly to their redshift: the remotest and most redshifted ones appear to flare up and fade more slowly than closer ones of the same type. This is exactly what we would expect: a clock on a receding object *should* run slow. If it sends out periodic 'beeps', the later ones have further to travel, and so the intervals between arrival are lengthened.
>
> The brightening and fading of a supernova is itself like a clock, so a slowdown in the 'light curves', proportional to the redshift, is just what we would expect if they are receding. It would have no explanation in a static universe. This is the best counter to any suspicion that the redshift is due to some kind of 'tired light' effect." (56)

There are several problems contained within these statements. As we have already noted, astronomers now know that Type 1a supernovas are not reliable standard candles, a fact that was unknown at the time Rees wrote this. So the fact that the "most redshifted ones appear to flare up and fade more slowly than closer ones" may be due to the possibility that the more red-shifted examples have arisen from a different set of circumstances than the closer ones. Indeed, Rees acknowledges this possibility two pages later:

> "These observations are right at the limits of what is possible with existing telescopes. Remote

> supernovae are so faint that it's hard to measure them accurately. Furthermore, some astronomers worry that an intervening 'fog' of dust could attenuate the light, making the supernovae seem further away than they actually are. Also, the 'bomb' may not be quite standardized: for instance, its yield may depend on the amount of carbon etc in the precursor star, which would be systematically lower in objects that formed when the universe was younger (in other words, those that we observe with the highest redshifts)." (57)

But there are more fundamental problems with the rest of Rees' statements, not all of which we are prepared to deal with at this point in our narrative. For the moment we simply point out that "The brightening and fading of a supernova" is not comparable to a clock that sends out periodic 'beeps'. Supernovas brighten and fade in a continuous process, and so there are no "intervals" in their signal to be lengthened. We also sharply disagree with Rees' claim that "the-difference-in-light-curve" phenomena would have no explanation in a static, that is non-expanding, universe; as we will see, this is not the case. Finally, there is Rees' statement that "This is the best counter to any suspicion that the redshift is due to some kind of 'tired light' effect." This statement reflects Rees' evident belief that *all* of the observed red-shift of the light from distance objects is due to their *apparent* recession velocity. As we have argued and will continue to argue, this belief is simply unfounded.

But we have digressed somewhat from the primary theme of our current narrative: the cause of the observed red-shift of the light from distant galaxies. We have shown that the explanations currently accepted by cosmology's high priests for this phenomena are beset by both contradictions in the observational evidence which purports to support those explanations, and by the fact that they contain inherent logical contradictions which render them

logically impossible. Yet there is absolutely no doubt that the red-shifting of light from distant galaxies is an established fact, and that the further away from us a galaxy is, the greater is the amount by which its light is red-shifted. *Something* is causing this phenomenon to occur. What could it be?

We are convinced that the key to this puzzle lies with the acceptance of the fact that the conclusion drawn from the Michelson - Morley experiment of 1887 is incorrect. Those scientists *assumed* that the ether, the presence of which they hoped their experiment would reveal, is *material* in nature. This assumption was not unreasonable; everything else in the universe appears to be made of matter. Why would the ether not be made of some kind of matter as well? But *this assumption* was, and is, invalid. There are several lines of evidence that lead to the conclusion that the ether - - - which throughout this discussion we have, and for now will continue to, refer to as 'space-time' - - - does in fact exist. Space-time cannot be detected in a Michelson-Morley type experiment because it is *immaterial*, *a state of being* that is distinct from that of the material components of the universe.

Previously in this discussion we have laid out what we believe to be convincing evidence for the existence of immaterial space-time, but we repeat it here for emphasis. Cosmologists currently believe that a force they call 'dark energy' is responsible for a universe which is expanding, the result of which is the red-shifting of light from distant galaxies. According to Goldsmith, "This energy [is] *utterly invisible and unperceivable."* Neither of these statements is true of *our* conception of space-time. Space-time is perceivable and makes its presence apparent in several different ways, and, as we shall see, under the right conditions it is quite visible.

If there are light *waves*, and clearly there are, then *something* must be waving. If there are gravitational *waves*, and clearly there are, then *something* must be doing the waving. If light from distant galaxies is being focused as if through a lens,

and it is, then *something* must be acting as a lens. So-called 'black holes' are black because the gravity of the neutron stars at their centres has rendered the space-time in their immediate vicinity inflexible, preventing the passage of electromagnetic radiation through it. All of these phenomena are explainable by the existence of an immaterial state of being we have been calling space-time.

So we have three potential explanations for why the light from distant galaxies is red-shifted. One is that more space is constantly being created, even though, for reasons which go unexplained, this creation of 'new' space is taking place only in certain areas of the cosmos and not others. In the past this was an extremely high-temperature process; but there is no evidence anywhere in the observable universe that such a process is currently taking place. A second is the presumed presence of dark energy, for which there is no known source. The third possibility is that the universe is filled with, or to be completely accurate, *made of,* a flexible immaterial state of being that we have been calling space-time, and the existence for which there are several supporting lines of evidence. From among these potential explanations for the observed red-shift of light it is clear which one provides the most complete and satisfying solution. All that is required is for Science to accept that the assumption underlying the Michelson-Morley experiment is invalid. The details of how light is red-shifted by its passage through space-time we will deal with in *Chapter 40, The Inconstant Speed of Light.*

Since the time of the ancient Greeks, when the roots of Science were originally laid down, humans have made the entirely understandable, but completely mistaken, assumption that the fundamental constituent of the universe is matter. This idea is incorrect. The fundamental constituent of the universe is flexible immaterial space-time. Space-time is, by far, the most common element, the most common “stuff” - - - we cannot use the word “material” for it is not made of matter - - - in the universe. It is that of which the Field of Play is composed. It is the parent of

energy-matter. It is the Mind of God made manifest.

Space-time is the flexible stuff between galaxies (and between the stars and planets within galaxies) that vibrates when electromagnetic radiation passes through it. Because it is flexible, it is distorted when matter pulls on it. Einstein was correct; Newton was mistaken. Matter does not pull on matter. Matter pulls on space-time.

Issac Newton hypothesized that gravity is an attractive force emanating from all celestial bodies and that its reach, while decreasing rapidly with distance, is in each case infinite, and that therefore each gravitating body exerts a force of attraction, however weak, upon every other body in the universe. We are absolutely convinced that Newton's hypothesis is incorrect, and that the 'gravitational reach' of any gravitating body is not infinite, but is limited by that body's ability to “deform” the space-time in its vicinity, which is directly dependent upon that body's mass. We shall discuss the consequences of this formulation in more detail shortly; we bring it up now in the context of the movement of individual galaxies through space-time.

Under the universe-is-expanding model of the universe, astronomers have attempted to calculate the amount by which space-time is expanding everywhere; that is, a number (the Hubble *constant*) that would apply to the expansion of space-time between any two galaxies or galaxy clusters anywhere in the universe. As we have noted earlier, this number is expressed in kilometres per second per megaparsec.

However, in a non-expanding universe the situation is more complex. While it will still be possible to rely upon the observed red-shift of the light from a given galaxy to estimate its distance from us by extrapolating from the amount of red-shift observed in the light from galaxies whose distance from us has been determined by other means, it will no longer be possible from an observation of red-shift alone to determine any particular galaxy's motion relative to our position. It is currently thought that the motion of any particular galaxy within a galaxy cluster is affected

by the presence of all the rest of the galaxies within that cluster, regardless of their distance from that galaxy. We disagree with this theory, and believe that the motion through space-time of every galaxy is, except under a particular set of circumstances, in some respect random, and is not affected by the presence of its galactic neighbours. We shall discuss the nature of those particular circumstances later. The point we wish to make at this juncture is that because the universe is not in fact expanding and thereby carrying most galaxies away from us, and if galaxies move somewhat randomly through space-time, then many galaxies will be moving directly away from us, and many galaxies will be moving directly toward us, and many galaxies, probably the majority, will be moving across our field of vision.

The light from those galaxies that are moving directly away from us will begin its journey toward us already red-shifted by the Doppler effect. The light from those galaxies that are moving directly toward us will begin its journey blue-shifted by the Doppler effect. If the galaxy moving directly toward us is at a sufficient distance, its originally blue-shifted light will eventually become red-shifted by its passage through space-time. In this situation, if an astronomer observing this galaxy is relying solely upon the amount of red-shift observed to estimate the distance to the galaxy, she will under-estimate its actual distance due to the fact that its light was initially blue-shifted. This means that we cannot state with confidence *the direction of motion of any* distant galaxy, if that galaxy is moving directly toward or directly away from us.

We are able to conclude that one galaxy is further away than another galaxy because its light is dimmer and is more highly red-shifted. And, during the 1970's, the astronomers Brent Tully and J.R. Fischer discovered a “way of measuring distance to a galaxy, based on a link between how fast it spins and how bright it is.” (58) But we will still have no way of determining its motion if its motion is moving directly away from or directly towards us along our line of sight. An observation showing that light from a

galaxy is red-shifted can no longer be considered a guarantee that the galaxy is in fact moving away from us.

The reason why the light from a more distant galaxy shows more red-shift than a nearer galaxy is that the light from the more distant galaxy travels through a greater amount of space-time before it reaches us, and thus more red-shifting occurs. Your author does not know with certainty the extent to which a galaxy's central massive neutron star 'black hole' can distort the space-time around it; that is, we do not know how far out its ability to pull on space-time reaches, although as we shall see, there may be a basis upon which this distance can be calculated. We do believe that its reach depends upon the mass of the galaxy's central super-massive neutron star 'black hole,' that its reach is not infinite, and that the amount of distortion per unit of space-time diminishes with distance from the 'black hole.' Also, we believe that at least in the case of those super massive neutron star 'black holes' that reside in the centre of galaxies, and perhaps for 'black holes' in general, the amount of distortion per unit of space-time does not diminish smoothly in inverse proportion to the square of the distance from the 'black hole' as suggested by Newton's law of gravitation.

We also believe that the light escaping from a massive body undergoes red-shifting in direct proportion to the mass of the body from which it is escaping. That such red-shifting occurs was demonstrated conclusively in an experiment involving gamma rays carried out by Robert Pound and Glen Rebca at Harvard University in 1959. We suggest that this red-shifting occurs because the electromagnetic radiation in such a situation is 'climbing uphill' through the space-time distortion caused by the presence of the massive body; in this case the Earth. It is reasonable to conclude that the more massive the gravitating body, the greater the space-time distortion and so the steeper will be 'the slope' up which the escaping light must climb, and thus a greater amount of red-shifting will take place within a given distance from the surface of the gravitating body. We shall refine this idea later on in these pages.

Chapter Ten

QUASARS

* * * * * *

This understanding explains what is an otherwise unexplained phenomenon. Astronomers have observed objects which are extraordinarily bright, indicating that they are (relatively) closer to us than many other observed galaxies, but which also exhibit extraordinarily high red-shifts which, according to current theory, indicates that they are very far away from us and rapidly receding. These objects, which were discovered in 1961, are called quasistellar objects, or quasars. Quasars are so bright that they outshine the combined light from all the billions of other stars of the galaxy in which they occur. In 1974 the astronomer Paul W. Hodges described what was then known about these objects as follows (we have added italics to emphasize certain portions of his text):

> "The quasistellar objects have a very small apparent size, both in optical photographs and according to radio telescopes' measurements. They appear very much smaller than known galaxies and most would not be distinguishable

> from stars by ordinary techniques. They have very broad emission lines in their spectra, indicating that they are made up of extremely hot gas with large turbulent velocities. Their radial velocities, as measured from their Doppler shifts in their emission lines, are very large, ranging from several thousand miles per second up to velocities of about 85 percent of the velocity of light. They sometimes show rapid and usually irregular fluctuations in their intensities over a few days or weeks, which indicates that the objects are intrinsically very small. . . . And yet the quasars are so bright and so energetic at both visual and radio wavelengths, that it is difficult to understand how so much energy can be emitted from such a small object. *Some astronomers have argued that the quasars are not as distant as their red shifts would indicate and this may someday be proven to be the case,* but at the time of the writing of this chapter we are left with conflicting evidence. *They are either much too close for their red shifts* or they are much too energetic for their size." (59)

In his book, Martin Rees stated that ". . . quasars with similar redshifts *(in other words, at similar distances)* (emphasis added) display a wide range of apparent brightness." (60)

Taken together, these observations provide evidence for our hypothesis that large-mass objects cause a greater amount of red-shift than lower-mass objects. It is now generally believed that quasars are the result of super massive 'black holes' - - - which we say are not 'holes' in space-time at all but are super-massive neutron stars - - - in the centres of large galaxies 'feeding' on the gases stripped off of stars whose orbits bring them too close to the super-massive neutron star.. Quasars are now thought to be intense

highly concentrated energetic jets of particles and electromagnetic radiation that are spewed out from the poles of the massive neutron stars along the lines of the axis of their rotation. We concur. (We have previously discussed our conception of what black holes are and how they behave, and will not repeat it here.) This explanation is based on two of the observations noted by Hodges. First, the "very broad emission lines in their spectra, indicating that they are made up of extremely hot gas with large turbulent velocities," is exactly what would be expected if the source of quasars is the hot gases stripped off of orbiting stars. Secondly, it is believed that the orbits of stars close to super massive black holes will be rapid and highly elliptical. This means that greater amounts of gas from a star's surface would be stripped away at the star's closest approach to the black hole than at the furthest extent of its orbit. This would account for the observation that quasars "sometimes show rapid and usually irregular fluctuations in their intensities over a few days or weeks."

Super-massive neutron stars, those with masses that are more than a hundred million times the mass of the sun, reside in the centres of galaxies that are larger and more massive than average. It is now thought that many galaxies have a super-massive neutron star 'black hole' at their centre. Galaxies grow larger by merging with other galaxies. When this occurs, the massive neutron stars at their centres also eventually merge. When enough of such mergers have taken place the massive neutron star at the centre of the resulting massive galaxy becomes a 'super-massive' neutron star. Therefore we suspect that galaxies that play host to a quasar are more massive than average because they have a super massive neutron star at their centre, which could only have come about as a result of numerous galaxy mergers.

We have hypothesized that the more massive a given galaxy's central neutron star is, the greater is the amount by which the light emitted from that galaxy will be red-shifted. This is so because its greater mass results in a greater distortion of the space-time in its region, light-year for light-year, than that resulting in the

case of a galaxy containing a lower mass central neutron star. The electromagnetic radiation emitted by a quasar is more red-shifted than the light from the rest of the galaxy in which it resides for two reasons. First, this is so because it arises from the centre of the galaxy and therefore must traverse more distorted space-time than light emitted by the stars at the galaxy's edge which is nearest to us. Second, and more significantly, because of the presence of a highly massive object in the centre of the galaxy (the super-massive neutron star), the space-time *within the galaxy* is more severely distorted, light-year for light-year, *than the space-time beginning at the periphery* of the visible portion of the galaxy. Obviously, once the electromagnetic radiation emitted by the quasar reaches the visible edge of the galaxy, it will then continue to be red-shifted by the same amount as the light emitted by all the other stars in the galaxy. Of course, as we noted earlier, when a galaxy's central super-massive neutron star is 'feeding' and thus creating the 'quasar' phenomenon, its brightness blots out the light from all the rest of the stars in the galaxy. However, once the massive neutron star has finished 'feeding' and its latest 'quasar' stage has ceased, the red-shift observed from the rest of the stars in the galaxy, which would now be visible, should be somewhat less than the observed red-shift of the light from the quasar itself, although, as a practical matter, this difference may not be detectable due to the distances involved.

Therefore, contrary to the statement from Rees quoted above, certain quasars have similar red-shifts not because they are at *similar distances* (although their distance from us is definitely a significant factor), but because they arise from galaxies that contain central super-massive neutron stars of *similar masses.* The observation that these quasars "display a wide range of apparent brightness" indicates that in fact these quasars are at *dissimilar distances,* and that, like stars, the closer they are to us the brighter they appear to be. Ultimately, as with the mistaken understanding regarding the movements of galaxies, the observations of a whole class of physical phenomena are being misinterpreted due to

cosmology's adherence to the flawed idea that the universe is expanding.

As quoted above, the astronomer Paul Hodges stated that as early as 1974, "Some astronomers have argued that the quasars are not as distant as their red shifts would indicate *and this may someday be proven to be the case*. . . .They are either much too close for their red shifts or they are much too energetic for their size." Astronomers have now arrived at a sound explanation for how something of such a small size can generate so much energy. As for the other part of that statement, we believe we have now provided an answer to the riddle of quasars being "much too close for their red shifts." In so doing we have explained how it is possible for a galaxy with a large red-shift to be closer to us than a galaxy with a smaller red-shift. Quasars are a clear example of that phenomenon. A primary factor in determining the amount of red-shifting of the light emitted by any given galaxy is the mass of the super-massive neutron star st the centre of that galaxy. The ultimate solution to this conundrum is to accept as fact the existence of a flexible immaterial stuff, that fills the universe and permeates all the objects present within the Field of Play; the stuff we have been calling *space-time.*

In concluding our discussion of quasars we should note three other related points of interest. Because of their extraordinarily large red-shifts, quasars were formerly believed to be signals sent from the extreme edges of the cosmos, and were therefore considered to be events that occurred only during the earliest times of the universe's existence. Our analysis demonstrates that quasars can occur in galaxies that are much closer to us than some assumed "edge" of the universe, and are therefore events which are occurring during our current epoch. It is now speculated that the massive neutron star 'black hole' at the centre of our own Milky Way galaxy, Sagittarius A*, is capable of producing the highly energetic jets of particles and electromagnetic radiation that we have been calling quasars when observed in distant galaxies. In the past few years astronomers have discovered

two giant bubbles of gas, called 'Fermi bubbles,' which extend tens of thousands of light years into space above and below the central portion of the disc of the Milky Way. It is believed that these bubbles are the result of Sagittarius A* going 'quasar' at some point in the past.

Finally, we refer to one of the statements from Paul Hodges quoted earlier. He said, "[Quasars'] radial velocities, as measured from their Doppler shifts in their emission lines, are very large, ranging from several thousand miles per second up to velocities of about 85 percent of the velocity of light." We believe that the explanation for such extreme red-shifting (red-shifts which are being interpreted as indicative of velocities of about 85 percent of the velocity of light) is actually quite straight-forward. The light from such quasars shows such extreme red-shifting because it has been triply red-shifted, that is, such light has undergone three separate and distinct red-shift inducing processes. First, this light has experienced *gravitational red-shifting,* as it 'climbed up the slope' through the distorted space-time created by the presence of the super-massive neutron star 'black hole' from which it originated. Secondly, this light has experienced further red-shifting due to the Doppler shift caused by its originating galaxy's motion away from us. Third, this light has been further red-shifted by its passage through space-time from its origin galaxy to our galaxy, in a process that we will explain presently. Together these three processes combine to cause the extreme red-shift observed in the light from some quasars. No celestial bodies are flying through space or moving away from us at 85 percent of the speed of light. As we shall see, this is quite impossible.

This understanding of the quasar phenomenon also provides a solution to another puzzle confronting astronomers. No one has been able to explain how the super-massive 'black holes' at the centres of some galaxies have managed to grow to such stupendous sizes in the time since the Big Bang. Supposedly, no known process can satisfactorily explain how these 'black holes' grew to their present sizes in the time available since the beginning of the

universe. The most obvious answer, accretion, that is, their enlargement by matter arising from within their host galaxies falling onto their surfaces we have already ruled out. Ordinary matter in the form of sub-atomic particles is not able to penetrate the rigidity of the space-time surrounding a 'black hole;' 'black holes' can only grow by merging with other massive neutron stars. However, such 'cannibalism' is deemed by most astronomers to be insufficient to account for the growth of these super-massive 'black holes' in the time available. Bold (not to say wild) new theories have been suggested to solve the puzzle, including the theorized existence in the early universe of massive cold dark stars, or the presence of some kind of dark matter. William of Ockham, he of the rule of Occam's Razor, would not be impressed.

The solution to this puzzle, as is so often the case, turns out to be simple and straight-forward. The super-massive 'black holes' in question are thought by astronomers to have appeared early in the universe, too early to have had time to grow into their super-massive sizes. They are thought to be present in the *early* universe because they are seemingly so far away. They are thought to be so far away because of the extreme red-shifting of the light from the quasars which they emit. But we have now seen that the light from these quasars is triple red-shifted by three different processes, none of which, by the way, include the idea that the universe is expanding, meaning that these quasars and the super-massive black holes which give rise to them are not as far away as currently thought. Keeping in mind the fact that the greater the distance we look out into space the further back into the history of the universe we see, if they are nearer to us than is currently believed, then this means that they are not evidence of the conditions prevailing in the early universe but, rather, are evidence of the conditions prevailing later on in the timeline of the universe. This means that there would have been more time from the beginning of the galaxy formation process for the merger/cannibalism mechanism to produce the super-massive 'black holes' which we now observe in the centre of many galaxies.

And as we shall see, an additional factor is that the current method for estimating the age of the universe rests on shaky theoretical ground. The beginnings of the galaxy formation process may lie more distantly in the past than is currently believed, meaning that there may have been even more time available for the creation of super-massive 'black holes.' It is entirely within the realm of possibility that there was one or more generations of very massive stars at the beginning of the galaxy formation process that were relativity short-lived, and which gave rise to massive neutron stars that even in their original form were many times the mass of our sun. Such massive neutron stars could have been the 'seeds' from which the super-massive 'black holes' we observe today were grown.

At the present time in the evolution of the universe, galaxies are, in general, 'pack animals' and come in groups or clusters, thought to be held together by gravity. The Milky Way and Andromeda galaxies are considered to be part of a group of some three dozen galaxies called the Local Group, which is estimated to be a few million light years across. Lord Martin Rees notes:

> "Our Local Group is near the edge of the Virgo Cluster, an archipelago of several hundred galaxies, whose core lies about fifty million light-years away. The clusters and groups are themselves organized into still larger aggregates. The so-called 'Great Wall', a sheet-like array of galaxies about 200 million light-years away, is the nearest and most prominent of these giant features. Another concentration of mass, the 'Great Attractor', exerts a gravitational force that pulls us, and the entire Virgo Cluster as well, at several hundred kilometres per second." (61)

Rees' analysis is based on the assumption that Newton's

understanding of how gravity works is correct; that is, that there exists an attractive “force” between all material bodies that extends infinitely in all directions. We dispute this claim. The light we observe from the large majority of the several hundred galaxies of the Virgo Cluster is red-shifted. In light of the foregoing discussion, it is our view that it is not currently possible to detect the motion of those galaxies which are moving either directly toward us or directly away from us. The movement of galaxies across our line of vision will be detectable over a sufficient period of time. But the statement that all several hundred galaxies of the Virgo Cluster are moving in unison toward the 'Great Attractor' is highly unlikely to be accurate. As we will see, the movement of each individual galaxy is, except under a very particular set of circumstances, not affected by the presence of its galactic neighbours, and is certainly not affected by a galaxy tens or hundreds of millions light-years away. In general, the movement of individual galaxies through space-time is random. As for the claim that our own Milky Way galaxy is moving in the direction of the 'Great Attractor' at several hundred kilometres per second: if indeed this is the case, it is not because of some mysterious inexplicable force pulling us in that direction. Our galaxy, like all galaxies, is on the move. Inevitably it will be moving *toward something*. The fact that it is proceeding toward the 'Great Attractor' is entirely coincidental.

The situation regarding Andromeda, our largest galactic neighbour, may be instructive here. We know from the observation of Cepheid variables in Andromeda that it is some 2 to 2.5 million light years away from us. We know that Andromeda is moving toward us because the spectra of its light is blue-shifted. This tells us that at a distance of 2.5 million light years, the red-shifting that all light undergoes as it passes through space-time is insufficient to mask or cancel out the blue-shifting of Andromeda's light caused by its motion towards us. If these two galaxies were further apart, say ten million light years, the additional space-time between them might then be sufficient to cause the red-shift of the

light passing between them to cancel out the blue-shift caused by its motion towards us. Furthermore, as we will see, if Andromeda and the Milky Way were in fact 10 million light years apart (as they once might have been), their motion towards one another would have been entirely random, whereas under the current circumstances wherein their respective gravitational rims have overlapped, their motion towards one another is definitely induced.

There is another consideration here. It has been estimated that the Andromeda and Milky Way galaxies will collide in approximately 4 billion years. The estimate of Andromeda's velocity toward the Milky Way is based upon the amount by which its light is blue-shifted. But after Andromeda's blue-shifted light has left Andromeda, it will be somewhat shifted toward the red end of the spectrum by its passage through the intervening space-time between the two galaxies, reducing the amount of blue-shift as observed by us, thereby causing us to under-estimate Andromeda's velocity of approach and to therefore over-estimate the amount of time before the collision will take place.

Chapter Eleven

THE BIG BANG AND COSMIC INFLATION

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Before we can turn our attention to our explanation of gravity and how it is manifested at the solar system and galactic scales, we must first arrive at a clear understanding of the fundamental nature of the entity by which gravity is made manifest - - - space-time, its characteristics, and how it came to be. To do that we must revisit the ideas of the Big Bang and Cosmic Inflation.

As we have stated earlier, we contend that there is a Creative Intelligence, that for the sake of convenience and familiarity, we have labelled 'God' or the 'Creator', which is responsible for the creation of the universe, the Field of Play in which the pageant of the Game of Being is being played out. The Game of Being creation mythology states that this Creator took a portion of God's immaterial Mind, and from that formed the Primordial Atom. Therefore we can say that our theory of how the universe was created is not based on the idea of *creatio ex nihilo,* that is, we are not claiming that the universe was created from

nothing. The universe was not created from nothing; it is 'made *of*,' and *by*, the Mind of God. After having endowed the Primordial Atom with the Rules of the Game, the Creator subjected the Primordial Atom to immense pressure, squeezing it into an ever-smaller volume causing its density and temperature to rise to incredible heights.

We pause to note an important distinction between the terms "density" and "temperature" as we use them here, and the common scientific understanding of these terms in general usage today. Usually, when we think of an object which is undergoing an increase in density, we picture the constituent particles that make up that object being squeezed closer together. And we think of temperature as being a physical quality which is measured by the average kinetic energy of the particles in the object. But those conceptions do not apply in this case. At that point in the evolution of the Primordial Atom, *there were no particles* to be squeezed closer together or to possess kinetic energy. There was just one continuous *singular* thing: a portion of the immaterial Mind of God undergoing a transmutation into space-time, which became "denser" and "hotter" during the process of transmutation. Do not be concerned if you cannot picture this process in your mind or understand how this process could have taken place. The coming into existence of the Field of Play, which consists of immaterial space-time, which itself is the transmuted immaterial Mind of God, was an act of God, which is to say that it was a miracle, and a miracle is, by definition, beyond human comprehension.

When the Primordial Atom had achieved the 'necessary condition' (How did the Creator *know* that the 'necessary condition' had been achieved? Had God done this before?) God abruptly removed the pressure that had been confining the Primordial Atom, which instantaneously began to rapidly expand and cool. The 'necessary condition' is what modern cosmology calls the Big Bang, and its subsequent rapid expansion is what cosmology calls Cosmic Inflation. Current theory contends that

the inflationary event lasted for a billionth of a billionth of a billionth of a billionth of a billionth of a billionth of a second, and that during that span of time the volume of the 'necessary condition' increased by a factor of about 30,000. According to the prevailing theory, at that point Cosmic Inflation came to a halt and the universe then continued to expand at its 'normal' rate, whatever that rate supposedly is.

This author does not pretend to know how long the inflationary event took, we only submit that it was long enough for the universe to attain a diameter that was some given percentage greater than its final diameter, the diameter of the universe today. The achievement of the 'necessary condition' was the culmination of a process which transformed a portion of the immaterial Mind of God into a small volume of flexible, immaterial 'stuff.' When God removed the pressure which had been confining that small volume of flexible, immaterial 'stuff', during the process humanity has come to call 'Cosmic Inflation' it rapidly expanded *in all directions,* creating an elastic sphere of space-time that stretched in every direction until it could stretch no more. It then recoiled into a more relaxed state of somewhat smaller diameter. A useful analogy here is a bungee cord. Take a bungee cord in both hands and stretch it out as much as you can, then drop the bungee on the ground. It will immediately recoil into a relaxed state. The idea that the Field of Play recoiled from a state of maximal stretch into a relaxed state is important, for it created a degree of 'slack' in the system, a potential for localized flexing in the future, which in turn enabled the phenomenon we call gravity to be made manifest.

We pause for a moment to consider the question of what the elastic sphere of space-time was expanding into. Traditionally cosmologists have claimed that there is no-thing beyond the edge of the universe; that the universe is, by definition, all that exists. Indeed, one of the reasons that cosmologists favour the universe-exists-on-the-surface-of-an-expanding-balloon model is that they can then claim that the universe is expanding without expanding *into* anything. With that model the universe is not really

expanding; rather, the universe is a two-dimensional construct which is *stretching*, causing the distances between galaxies to grow. As for the question of what the universe is expanding into, the whole issue can simply be conveniently ignored. It is worthwhile noting that for those cosmologists who support the multi-verse idea (which we will spend more time on later), the issue is not so easily dismissed. In any event we have already demonstrated that the universe-as-an-expanding-balloon model is nonsensical. But the idea that there is no-thing beyond the edge of the universe is simply *one more assumption* made by modern cosmology and, we believe, an unwarranted one. As for us, we choose to believe that the universe, having been manifest as an elastic sphere of space-time, expanded into the infinite ocean of the Pure Consciousness of the Mind of God from which it was created, and that it floats there, surrounded by the immaterial Mind of God, somewhat like a bubble of gas rising from the bottom of the sea here on earth, except that it is not moving.

Returning to our narrative of how the Game of Being began: we now have a bubble of pure hot space-time, grown to its full extent, 'floating' in the ocean of the Mind of God. There is no matter-energy as of yet, and it is still very hot, and in complete darkness. The standard cosmological theory of the Big Bang and Cosmic Inflation posits that after the halt of the inflationary event the universe was, for a very, very brief span of time, cold and empty. According to Dan Hooper in his book, *At the Edge of Time*, the universe then somehow went through a brief period of reheating, and quickly following upon that came the appearance of quarks and gluons, the theorized basic building blocks of matter. Keep in mind that according to the standard Big Bang theory all of these events, the inflation, the cold emptiness, the reheating, and the first appearance of sub-atomic particles all took place within a few billionths of a second. We will not comment at this point on the plausibility of all this, nor on the plausibility of the existence of quarks, a supposed sub-atomic particle that cannot, in principle, ever be directly observed. We will, however, present an

alternative scenario.

We claim that the Cosmic Inflation event, however long it took, resulted in a full-and-final-sized universe consisting of a bubble of hot space-time. In the standard theory the universe steadily cooled as it continued to expand *after* the inflationary event. But in our model the universe achieved its full current size while still being very hot. Where did the heat go? The heat escaped to the only place it could go. It rapidly radiated outwards from the hot bubble of space-time into the cold dark infinite realm of the Mind of God. Absolute zero is defined as the temperature at which gas has zero volume and molecular kinetic energy is at minimum; it is equal to zero degrees on the Kelvin scale, or -459.7 degrees Fahrenheit. The realm of the Mind of God is the realm of Pure Consciousness, wherein there are no gases or any molecular kinetic energy. Therefore the temperature in this realm is at absolute zero, zero degrees Kelvin. In his book Hooper estimates that the prevailing temperature when what we have termed the 'necessary condition' was achieved to be approximately 10^32 degrees Kelvin. That is a 1 with 32 zeros behind it. No one knows if this figure is accurate, but we can say with confidence that it was rather warm, and that the temperature difference between the bubble of space-time and the realm of the Mind of God was very large. We propose that because of this large difference in temperature the heat within the space-time bubble radiated outwards at a velocity greater than the current speed of light, steadily lowering its temperature. Einstein's rule that nothing can travel through space-time faster than the speed of light does not apply to the behaviour of space-time itself, as is evidenced by the theory of Cosmic Inflation. The universe-as-an-expanding-balloon model currently subscribed to by most cosmologists also relies on the idea that space-time can expand faster than the speed of light.

Before we can proceed any further, we must first acquaint ourselves with the notion of the quantum energy of the vacuum. The first step is to dispense with the terminology of the 'vacuum.'

Physicists refer to the supposedly empty space between the stars and planets as being in a vacuum state because they remain ignorant of the fact of the existence of space-time. They believe that there is no-thing is those 'empty' spaces; hence it is a vacuum. But they are mistaken. Space-time is not a no-thing; it is a some-thing, and it is real, that is, it exists. So in the description which follows, when you read the word 'vacuum,' think 'space-time.'

In his very interesting book, *In the Beginning,* the accomplished science writer Dr. John Gribbin writes:

> ". . . what quantum physics tells us is that any tiny region of the vacuum, which we think of as 'empty' space, might actually contain a small amount of energy
> . . . [Since] particles are made of energy (E = mc2), this means that particles are allowed to pop into existence in the vacuum of empty space. They are made out of nothing at all, and can exist only if they pop back out of existence again very quickly.
>
> "In this picture, the quantum vacuum is a seething froth of particles, constantly appearing and disappearing, and giving 'nothing at all' a rich quantum structure. The rapidly appearing and disappearing particles are known as virtual particles, and are said to be produced by quantum fluctuations of the vacuum." (62)

This idea, that there are quantum particles constantly appearing and disappearing within the space-time all around us, was first proposed by the Dutch physicist H.G.B. Casimir in 1948. Although it sounds fantastical, carefully controlled experiments, which we will not describe here, have demonstrated that this is indeed the case.

Now, we claim that these virtual particles are not made out

of “nothing at all;” rather, like all the sub-atomic particles which make up the atoms which make up all the matter in the universe, they are tiny perturbations of space-time itself. If this phenomenon is constant, that is, it is happening all around us all the time, then the only logical conclusion is that it has *always* been taking place. Therefore we conclude that it is *a fundamental property of space-time* to be continually shedding quantum particles. But for some reason, so-called 'virtual' particles possess extraordinarily short life spans, life spans so short that their existence ordinarily goes undetected. The question is: why are their life spans so short? What separates virtual particles from real particles which possess prolonged life spans?

The answer lies in the conditions prevailing in the universe today, as opposed to the conditions prevailing immediately following the completion of the Cosmic Inflation event when 'real' particles which possess prolonged life spans were being created. The major difference between these two periods is the prevailing temperature of the bubble of space-time. In the early universe, the high prevailing temperature allowed the quantum particles which were percolating out of space-time to be endowed with enough energy to pass beyond a 'virtual' state, and become (relatively) permanent manifestations. As the experiments confirming Casimir's theory demonstrated, quantum particles continue to percolate out of space-time to this very day, but the very much lower temperature of the bubble of space-time which prevails today does not provide energy sufficient enough to make virtual temporary particles become real permanent particles. So, despite the failure of the Michelson – Morley experiment to detect the presence of the ether (space-time), this interpretation of the “Casimir effect” provides yet one more piece of evidence for its existence.

During the 1970's particle physicists compiled what has come to be called the Standard Model of Particle Physics. The Standard Model is a catalogue of all the known sub-atomic particles and their properties in terms of their mass, spin, charge,

mode of decay, and their average lifetimes. The Standard Model is an impressive achievement but it is extremely complicated. Fortunately, it is not necessary to understand the mathematical intricacies of the Standard Model in order to obtain an adequate grasp of how the Game of Being functions.

One aspect of the Standard Model which does concern our inquiry is the existence in the universe of anti-matter. According to the Standard Model, every known type of matter particle has an opposite particle type of anti-particle which resembles the matter particle in every way except that it carries an opposite charge. Thus protons which have a positive charge are matched with anti-protons that have a negative charge. Negatively charged electrons are matched with positively charged 'positrons,' which are identical to electrons in every respect other than charge.

What is of interest to our current discussion is the fact that whenever a matter particle and a matching anti-particle collide, they annihilate each other and release electromagnetic radiation in the form of a gamma ray. Now, according to physicists' current understanding, in the early universe matter and anti-matter should have been created in equal amounts. But if this was true then all of the matter particles and all of the anti-matter particles would have annihilated with one another in a huge burst of energy, leaving nothing from which to build the stars and planets that exist in the universe today.

This imbalance between matter and anti-matter has been a long-standing mystery. Hooper states:

> "The fact that there is far more matter than antimatter in our universe flies in the face of everything physicists have learned from accelerator experiments about how both matter and antimatter behave . . . Somehow, much more matter than antimatter survived the first moments that followed the Big Bang." (63)

In 1967, Andrei Sakharov, the 'father' of the Russian nuclear bomb, proposed three conditions that must be met in order to explain the imbalance between matter and anti-matter. The second of these conditions states that "Nature must have a bias . . . that favours the creation of matter over antimatter. . ." (64) We believe that Sakharov's second condition contains the obvious solution to this mystery, and as we alluded to earlier in this discussion we have an idea which may explain the mechanism of that bias.

We have stated previously that the moment of Cosmic Inflation (however long it lasted) stretched the *necessary condition* of the Primordial Atom which preceded it, into the bubble of space-time of which the Field of Play consists today. We propose that this state of being then underwent a phase transition, brought about by the abrupt lowering of the temperature of the space-time that resulted from the inflation event. This phase transition brought into existence the first matter particles and the first anti-matter particles.

We propose that it may have been the case that after the bubble of space-time fully expanded and then recoiled to its final size, that a particular set of circumstances prevailed within the interior of the bubble. If this idea is correct, it would explain both the large-scale structure of the universe as we observe it today, and the imbalance between matter and antimatter as well. The idea is that after the universe had settled into a relaxed state, its heat was not equally distributed throughout the interior of the bubble. Some portions of its interior volume were hotter than others.

When we look out into the Field of Play, we see long tendrils of matter formed into galaxy super-clusters that stretch out for hundreds of millions or billions of light years that appear to join together at large junctions, and which are separated by huge voids where there is little or no matter. Cosmologist and Nobel laureate George Smoot has written:

"A nice image here is the way cobwebs, often

> unseen in ordinary light, become strikingly visible when dew that settles on their strands during the night is lit by the morning sun. The gossamer network of galaxies we see in the night sky is the shimmering dew on a cosmic cobweb, as visible matter outlines the shape of structures of invisible dark matter, to which it has been drawn by gravitational attraction." (65)

Now, we disagree with Dr. Smoot on the idea of dark matter, and we will return to that topic in due course, but the "cobweb" imagery is very useful.

At the Large Hadron Collider in Switzerland physicists smash sub-atomic particles together at speeds very close to the speed of light, releasing energy and creating new particles. The estimated temperatures achieved during these interactions range from approximately 10^12 degrees Kelvin to 10^26 degrees Kelvin. When new particles are created at *these temperatures* scientists have observed that matter and antimatter are always created in equal amounts. When a particle of matter collides with its antimatter opposite, they annihilate one another and disappear in a burst of pure energy. Since at the temperatures the LHC is able to achieve matter and antimatter are always created in equal amounts, physicists have been unable to explain how the universe came to be made primarily of matter particles. If matter and antimatter had been created in equal amounts at the beginning of the Game, all of it should have mutually annihilated and left nothing behind.

Our proposal is that when matter and antimatter began to percolate out of the hot bubble of space-time, some regions of the space-time bubble were hotter than others, hotter than 10^26 degrees Kelvin. At these higher temperatures, more matter than antimatter percolated out of those regions of space-time, resulting in a net surplus of matter particles after all the antimatter had undergone mutual annihilation. These regions of the space-time

bubble went on to form Smoot's “gossamer network of galaxies.” In 1986, the astronomer Brent Tully discovered that each 'strand' of this network is up to a billion light-years long, three hundred million light-years wide, and one hundred million light-years thick. Hereinafter we will refer to them as 'filaments.' Where these filaments of higher temperature space-time crossed over one another, a higher eventual density of matter was the result. These 'nodes on the cobweb' therefore contain a higher density of galaxies in the universe as we observe it now, than we find in the strands which connect the nodes. The astronomical object known as the “Great Attractor” is an example of this phenomenon. For the vast bulk of the hot space-time bubble's interior, the percolating out of matter and antimatter took place at temperatures lower than 10^26 degrees Kelvin, resulting in the creation of equal amounts of matter and antimatter, similar to the process that has been observed at the LHC. All of those particles mutually annihilated, leaving behind the huge voids separating the clusters and superclusters of galaxies that astronomers observe now. When the temperature of the hot bubble of space-time dropped to below approximately 10^13 degrees Kelvin, the production of matter and anti-matter ceased, after which the bubble of space-time was only capable of generating 'virtual' particles.

At this juncture we again deviate from the standard Big Bang cosmology. According to the standard cosmological model, after all the antimatter had been annihilated and had disappeared from the universe, a plasma of charged particles (protons and electrons) that had survived the annihilation process *was spread more or less evenly throughout the universe.* On this important point our model disagrees with the standard cosmological model. In our model this plasma existed only in those regions of the infant universe which would go on to become the filaments in the cobweb structure we observe in the universe today. The rest of the Field of Play was at that time devoid of any plasma as a result of the matter-antimatter annihilation event; these regions of the universe have remained empty right up to our current epoch.

Immediately following the end of the matter-antimatter annihilation event the surviving plasma underwent what is known as the quantum chromodynamic or QCD phase transition during which the first neutrons were created.

The standard Big Bang model as outlined by Hooper states that all these events took place within less than one minute after the end of the inflationary event. Thus far in this model, the spans of time required for each individual step to have taken place in the process of the creation of the sub-atomic particles that became the basis for the matter that exists in the universe today are necessarily somewhat speculative, being based on observations made of the results of particle collisions in accelerators such as the LHC; although it does seem clear that the span of time elapsed for each step was incredibly brief.

However, the amount of time required for the next step in the process is less speculative. The next step is known as the Big Bang Nucleosynthesis, during which the first atomic nuclei were formed by the bringing together of protons and neutrons. This step, during which the nuclei of deuterium, lithium, and helium atoms were formed is thought to have taken no more than twenty minutes. This is plausible because the time it takes for a free neutron to decay is well established at being a little over fifteen minutes. This known fact therefore sets an upper limit on how long the free neutrons, just created in the QCD phase transition, could be available for participation in the Big Bang Nucleosynthesis process. While all these steps were taking place, the overall temperature of the space-time bubble continued to rapidly cool.

In the standard Big Bang model the next major development was the beginning of the 'dark matter' era, thought to have begun approximately 50,000 years after the appearance of the “necessary condition.” We will skip over this step for now, and return to the issue of dark matter at a later point in our discussion.

In the standard Big Bang model the next major development occurred 380,000 years after the appearance of the

'necessary condition,' when the temperature of the plasma made up of hydrogen, deuterium, helium and lithium nuclei and free electrons dropped below 3000 degrees Kelvin. Something important did indeed take place when the space-time bubble dropped below that temperature. At temperatures above 3000 K the energy of the sub-atomic particles within the plasma is too great for the electrons to enter into stable 'orbits' around the atomic nuclei. At temperatures below 3000 K the attraction of the negatively charged electrons for the positively charged protons in the atomic nuclei becomes strong enough to overcome the electrons' energy, and binds the electrons to the nuclei. This much is very clear. However, the twin claims that this development took place 380,000 years after the beginning of the universe, and that this event gave rise to the cosmic microwave background (CMB,) are very much open to debate.

Chapter Twelve

THE LARGE-SCALE STRUCTURE OF THE UNIVERSE

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To begin with, the model developed in the previous chapter is based upon two assumptions of the standard Big Bang model: one, that the plasma of atomic nuclei and electrons *completely filled* the entire volume of the universe at that time, and two, that *this volume was steadily increasing* due to the continuing expansion of the universe after the cessation of the inflation event.

According to the standard cosmological model, as the volume of the universe increased (thereby providing more space for the plasma to occupy), the density of the plasma fell, thus lowering the overall temperature, which in turn allowed stable atoms to form. Furthermore, the model states that during this 380,000 year period, the 'photons' of light which were created by the interactions of the sub-atomic particles within the plasma were trapped within the plasma, because the plasma was so dense that the 'photons' could not travel very far without running into a sub-atomic particle and being absorbed. Accordingly, when the overall

temperature (temperature being defined here as a measurement of the kinetic energy of the sub-atomic particles making up the plasma) was lowered to the point where stable atoms could be created, the density of the matter in the universe dropped sufficiently for 'photons' to travel freely throughout the universe for the first time, supposedly giving birth to what is presently called the Cosmic Microwave Background. This entire chain of reasoning rests upon the two assumptions referred to above. (We have placed the word 'photons' in single quotes because the standard Big Bang model characterizes light in that manner, but the reader will know, from material previously presented, that natural light is a wave phenomena and does not come in individual particles.)

The first of these assumptions, that the plasma of atomic nuclei and electrons *completely filled* the entire volume of the universe after the matter – antimatter annihilation event, rests on no evidence at all; it is just an assumption. Furthermore, in order to explain the large-scale structure of the universe in the current epoch, this assumption requires the invention of 'dark matter,' a mysterious substance thought to account for 95% of all the matter in the universe, even though direct evidence for its existence has never been found. The notion of dark matter has been invoked to explain how the plasma, supposedly distributed smoothly and evenly throughout the early universe, came to be clumped together into the stars, galaxies, and clusters and super clusters of galaxies we observe now. The questions of how dark matter came into being, what it is made of, and why it cannot be found, are left unanswered.

But even the invention of dark matter does not resolve the major problem confronting the assumption that the early universe was *entirely filled* with a plasma of atomic nuclei and free electrons. The standard Big Bang model cannot account for how that smooth, evenly-distributed plasma came to be formed into the highly structured filaments we observe today, within the estimated span of time which has elapsed since the creation of the Field of

Play, currently estimated by the standard model to be about 13.5 billion years. The standard cosmmological model claims that the gravitational attraction between dark matter and ordinary energy-matter drew these elements together into clumps, and that these clumps were then gravitationally attracted towards one another, forming ever-larger clumps, which eventually became the galaxies we see today. The 'force' of gravity, acting over tremendous distances, then pulled galaxies into the highly structured filaments that astronomers observe in the present universe. (When we get to our discussion of the phenomenon of gravity, it will become clear why such a process cannot possibly provide an explanation for the large scale structure of today's universe.)

But the immediate problem is the huge size of the voids which separate the filaments in which there is virtually no energy-matter. How did these huge volumes of space-time, believed to once have been saturated with plasma, come to be completely cleared of all forms of energy-matter in the time allotted by the standard Big Bang model since the beginning of the universe? The problem is with the measured speed of galaxies through space-time. In his very informative book, *The Big Bang Never Happened,* Eric J. Lerner recounts that during the late 1980's an international team of astronomers

> ". . . looked very deeply into space in two opposing directions, scanning only narrow "wells" in space. To their surprise they found galaxies clustered in thin bands, evenly spaced some six hundred million light-years apart like the rungs of a titanic ladder. The entire pattern stretched across a quarter of a diameter of the observable universe, a distance of over seven billion light-years. The galaxies seemed to be moving very slowly relative to one another - - - no more than five hundred kilometres per second. At that speed, the gigantic void and

> shell pattern [Smoot's gossamer cobweb] appears to have taken at least 150 billion years to form - - - seven or eight times the number of years since the Big Bang allegedly took place." (66)

In response to these observations, adherents of the standard Big Bang model speculated that perhaps matter moved faster in the past than it does now, which would permit large structures to be built up more quickly. Regarding this idea, Lerner makes the following pithy observations:

> "So one unknown process accelerates matter to high speed, blowing it out of the voids, while another unknown process conveniently puts the brakes on, slowing the matter down to the observed sedate speeds before the galaxies form.
>
> But enormous velocities would be needed to form the Great Wall and the supercluster complexes in the time since the Big Bang - - - about 2,000 km/sec for the Great Wall, 3,000 km/sec for Tully's complexes, and a speedy 5,000 km/sec to hollow out the voids observed by the American – British – Hungarian team. If this matter is now moving at only 500 km/sec the energy tied up in its motion had to be dissipated. Just as a car's brakes convert energy of motion into heat, which is radiated into the air, so the vast energy of the primordial matter would have to be radiated away . . . where is this energy?" (67)

That energy is nowhere to be found. Thus it is clear that the standard Big Bang model, based as it is on the unsubstantiated assumption that the entire universe was at one time completely

filled with a plasma of atomic nuclei and free electrons, cannot explain the large-scale structure of today's universe. George Smoot, who we quoted previously and who is one of the chief architects of the currently accepted explanation for the cosmic microwave background (for which he received a Nobel Prize), and who is most certainly a believer in the standard Big Bang model, has himself been quoted as saying, “Using the forces we now know, you can't make the universe we know now.” (68)

As for the second assumption, that the volume of the universe was steadily increasing and thereby resulting in a lowering of the temperature of the plasma, it ultimately rests on the belief that the universe is still expanding today. But as we have demonstrated previously, that belief is itself based upon a misunderstanding of the cause of the red-shifting of light.

The '380,000 years' figure is based upon the idea that after that span of time, the universe would have expanded enough, to allow it to cool enough, to permit the creation of stable atoms, and to then allow 'photons' to travel freely. But if the universe was not in fact expanding at all during those 380,000 years, as we maintain, then that number obviously becomes meaningless.

(As an aside, we point out that the use of the term 'year' as a measure of the passage of a given amount of time, is, in this context, entirely arbitrary. A 'year' is commonly understood to be the amount of time required for our planet to orbit its star once. But in the context of events taking place in the early universe, the very possibility of measuring the passage of time in earth-years lay billions of those years into the universe's future.)

So how long did it take from the time when the first atomic nuclei were formed (the Big Bang Nucleosynthesis) until it was cool enough (3000 K is still very hot) to form stable atoms? We do not pretend to know, but it could have taken millions or perhaps billions of 'earth-years'. It is important to understand the very concept of heat in these circumstances. There are two ways to define the word 'temperature.' One is to say that temperature is a physical quantity measured by the average kinetic energy of

particles in matter. The other is to say that temperature is a property of a body or region of space that determines direction of net flow of heat with neighbouring objects or regions. We are using the second of these two definitions. We say that the plasma of charged particles was not 'hot' because of the high kinetic energy of those particles; rather, those particles possessed high kinetic energy because the medium (space-time) through which they were moving was still very 'hot.' Those particles had just percolated out of the hot bubble of space-time, which was itself still undergoing the process of cooling down as its heat radiated out of the bubble into the realm of the Mind of God.

We have proposed earlier that in the beginning, when the temperature differential between the bubble of space-time and the realm of the Mind of God was very great, the transfer of heat from the one region to the other occurred at velocities greater than the current speed of light. We believe that as the temperature of the bubble of space-time fell and the temperature differential between the two regions decreased, the rate at which the heat from the bubble flowed outward also decreased. We believe that this process of heat transfer from the bubble of space-time to the realm of the Mind of God is still happening today, but that because of the very small differential in the temperatures which now exists between the two regions, the rate of the heat flow is very low. The temperature of the realm of the Mind of God is once again at absolute zero, having radiated almost all the heat from the bubble out into infinity, and the temperature of the bubble of space-time, aka the universe, aka the Field of Play, now stands at 2.7 degrees K, just above absolute zero.

If this model of the universe and its evolution is correct, it may well prove to be impossible to calculate how long it took for stable atoms to form. Furthermore, it may be impossible to reliably estimate the age of the universe.

Currently, there are two methods relied upon to estimate the age of the universe. One is based on observations made of the oldest stars within galaxies, wherein a calculation of a star's age is

based upon the star's characteristics such as its mass, colour, and luminosity. Using this method the age of the oldest stars in the universe has been calculated to be around 12 billion years, and that therefore the universe is obviously at least 12 billion years old. This method assumes that there were no generations of stars that were born and died out prior to the birth of the stars now calculated to be 12 billion years old. This assumption may or may not be valid.

The other method of calculating the age of the universe relies upon an algebraic manipulation of Hubble's law. You will recall from our previous discussion concerning the causes of the red-shifting of light, that Hubble's law states that $v = H \times d$. This equation can be restated mathematically as $d = v \times (1 / H)$. Then, on the assumption that there has been no acceleration or deceleration in the rate of expansion over the history of the universe, and through a series of completely logical steps, the details of which need not concern us, cosmologists have reached the conclusion that the value of 1 / H must equal the time elapsed since the expansion began, ". . . provided that galaxies' recession velocities have remained unchanged throughout history." (69) By this they presumably mean the rate of expansion that supposedly set in after the Cosmic Inflation event, for obviously the rate of expansion *during* the period of inflation was greatly accelerated.

The value of 1 / H has varied widely since it was first formulated. In Hubble's day it gave an estimate for the age of the universe that was less than what was then thought to be the age of the Earth, about 2 billion years. In the 1950's the value of 1 / H yielded an age of the universe of about 19 billion years. Observations in the early 1990's suggested an age for the universe in the 10 to 12 billion years range, younger than the known ages for the oldest stars. The most recent estimates set 1 / H at a value that yields an age of the universe of approximately 14 billion years. The Hubble constant has been anything but constant.

As a method for estimating the age of the universe, there are two problems here. One is that since this calculation relies on

the supposed 'recession velocities' of *galaxies*, it does not account for the span of time between the end of the inflationary event and the formation of galaxies, a span of time which cannot be considered to be insignificant.

The other, much more fundamental problem, is that the calculation is based on cosmologists' flawed conclusion that the universe is, at this moment, still expanding. As our analysis of the causes of red-shift has demonstrated, the universe is not, in fact, presently expanding, and that therefore Hubble's law describes a phenomena which is not actually occurring. For these two reasons, the idea that the value of 1 / H must equal the time elapsed since the universe began is a mathematical fiction, and therefore cannot be relied upon as a method of estimating the age of the universe.

Cosmologists' calculations to determine the present-day size of the universe are similarly flawed. Their current reasoning goes like this: Galaxies whose light exhibits the greatest amount of red-shift are thought to possess the greatest recession velocities. Scientists arrive at an estimate of a given galaxy's recession velocity (the "v" in Hubble's law) based upon the amount by which that galaxy's light is red-shifted. They then multiply this figure by the currently accepted value of 1 / H (the supposed age of the universe) to arrive at the distance to that galaxy. Velocity x Time = Distance. The figure arrived at represents the distance to the galaxy at the time when the light we are observing now, left that galaxy. But the light we are observing now may have been travelling toward us for up to 14 billion years, the current value of 1 / H. During this span of time, that galaxy has been receding away from us at the velocity supposedly indicated by the red-shifting of its light. Furthermore, so goes the logic of the universe-is-expanding theory, the recession velocity of that galaxy has been increasing over the span of time represented by 1 / H. For galaxies whose light exhibits the greatest amount of red-shift, this supposed recession velocity is interpreted as a substantial percentage of the speed of light. Employing this chain of reasoning, cosmologists

have arrived at the mind-boggling conclusion that although the universe is only 14 billion years old, and although nothing can travel at a velocity greater than the speed of light, the universe is some 93 billion light-years in diameter. (Cosmologists get around this last point by claiming that Einstein's limit on how fast objects can move *through* space-time does not apply to the *expansion* of space-time itself.)

Of course, if the universe is not indeed currently expanding, then this entire chain of reasoning and its resultant conclusion is simply just so much nonsense. At this juncture we wish to point out yet another problem which is contained within current cosmology's adherence to the idea that the universe is expanding. Goldsmith writes:

> "Astronomers now know the value of the Hubble constant H within an accuracy of 10 percent, and they have created the Hubble diagram to show the relationship between galaxies' redshifts and distances. Once astronomers have made the painstaking observations that delineate the path that the redshift – distance relationship takes through the Hubble diagram, *every measured redshift will correspond to a particular distance."* (emphasis added) (70)

A Hubble diagram is simply a graph with a galaxy's red-shift plotted on one axis and its distance from us plotted on the other. On the one hand, this appears to be a recognition on the part of cosmologists that the primary cause of the red-shifting of light from distant galaxies is not their supposed recession velocity but, rather, is determined *by the amount of space-time* separating us from the galaxy under observation. Conceptually, this is a step in the right direction, although it does not constitute a complete understanding of the red-shift phenomenon.

On the other hand, this statement serves to highlight a

fundamental absurdity of the entire cosmological effort under the 'universe-is-expanding' regime. If the universe is indeed expanding, then any efforts to determine the distances to other galaxies is at best misguided, if not a complete waste of time. Because if that is the case, the distance to a particular galaxy measured today, will necessarily be less than the distance to that galaxy measured tomorrow. According to the current interpretation of the red-shifting of light from distant galaxies, those galaxies which are farthest away from us (those with the highest red-shifts) are receding from us at velocities which are a substantial percentage of the speed of light. For the sake of argument, assume we have observed a galaxy thought to be receding from us at a rate of 50% of the speed of light, 150,000 kilometres per second. This means that at the same time tomorrow that galaxy will be 1.6 billion kilometres further away from us than on the day we took our measurement. In a year's time that galaxy will be 591 billion kilometres further away from us than on the day its distance from us was originally measured. If the universe is actually expanding as cosmologists currently believe, then the effort to measure the distances between galaxies, one of astronomy's primary functions, seems to be somewhat of an exercise in futility. Although, upon reflection, we must admit that if the distance to our imagined galaxy could ever actually be accurately determined at some point, then it would be possible to say one year later that the distance to the galaxy would be the originally measured distance plus one-half of one light year. Of course, this problem only arises in a universe which is actually expanding, which we are certain is not the case.

The foregoing ruminations have not, however, been a waste of our time, for they have led to what is, at the very least, a minor epiphany. There is a simple test which will determine, conclusively, whether or not the universe is indeed expanding. If all the galaxies in the universe are indeed moving away from us at a velocity which is proportional to their distance from us (Hubble's constant,) then the amount of space-time between us and any

particular galaxy is constantly increasing. And if, as Goldsmith claims, *every measured redshift corresponds to a particular distance,* then as the distance to any particular galaxy increases, so too should the measured red-shift of the light from that galaxy.

Astronomers have been measuring red-shifts for about 100 years. It is a straight-forward task to check the red-shifts of the galaxies recorded by Hubble a century ago, and then to measure the red-shifts of the light from those same galaxies today, in order to make a direct comparison. If the universe is expanding in accordance with Hubble's law, then the red-shift of the light from each of those galaxies should have increased by a measurable amount, because the distance between them and us will have increased over the past 100 years. Hubble's original sample was limited in size - - - - only some 20 galaxies - - - - and if all of the galaxies which he studied showed increased red-shifts today, a possible explanation would be that the intrinsic motions of each of those galaxies is away from our position in space-time. In that case comparative studies of other galaxies first observed in Hubble's era would need to be carried out to confirm the hypothesis. However, such a set of observations would constitute irrefutable evidence that the universe is expanding.

On the other hand, if *any* of the galaxies studied by Hubble or his contemporaries were shown to have the same or smaller red-shifts today than 100 years ago, which could be accounted for by their motion towards us in the intervening period, it would be strong evidence that the universe is not generally expanding.

To the best of our knowledge, which, because we are neither a scientifically trained astronomer or cosmologist, is admittedly limited, no such comparative set of observations have ever been undertaken. One would expect that if such convincing evidence for the expansion of the universe has ever been obtained, the knowledge of it would have been widely disseminated.

Chapter Thirteen

THE COSMIC MICROWAVE BACKGROUND

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We turn now to the topic of the cosmic microwave background (CMB) and the serious error that cosmologists have committed in their interpretation of this particular phenomenon. As with the mistaken belief that the universe is expanding, the misinterpretation of the CMB has led to conclusions about the nature of the universe which are incorrect. As we did with "the universe is expanding" model, we must first lay out the current understanding of the CMB for the general reader before we can explain why this understanding is erroneous.

Lord Martin Rees introduces the topic of the CMB as follows:

> "The best evidence that everything really emerged from a dense 'beginning' is that intergalactic space isn't completely cold. This

> warmth is an 'afterglow of creation'. It manifests itself as microwaves, the kind of radiation that generates heat in a microwave oven but very much less intense. The first detection of the 'cosmic microwave background', back in 1965, was the most important advance in cosmology since the discovery of the expansion of the universe. Later measurements confirmed that these microwaves have a very distinctive property: their intensity at different wavelengths, when plotted on a graph, traces out what physicists call a 'black body' or 'thermal' curve. This particular curve is expected when the radiation has been brought into balance with its environment . . . it's just what would be expected if the microwaves were indeed a relic of a 'fireball' phase when everything in our universe was squeezed hot, dense and opaque." (71)

Remember the 'photons' we referred to earlier as being unable to travel very far before being absorbed by sub-atomic particles prior to the temperature of the universe dropping below 3000 degrees K? The current CMB theory states that once the temperature of the universe dropped below that level and neutral atoms were formed, those 'photons' of visible and infrared light were able to spread throughout the universe. Microwaves have longer wavelengths than do visible and infrared light. The theory states further that this light, which started out in the visible and infrared portions of the electromagnetic spectrum, has been stretched by the expansion of the universe over the last 14 billion years into the microwaves we detect today. Accordingly, so goes the theory, the CMB, which was created everywhere, is everywhere, and is coming towards us from all points of the sky and at very nearly the same intensity from every direction.

Cosmologists have interpreted small fluctuations in the intensity of the CMB (about 3 parts in a hundred thousand) as evidence of the first clumping together of matter in the universe. It is thought that these initial clumps coalesced around 'dark matter' to eventually form galaxies.

The ideas that light waves were 'set free' to travel through the filaments of matter that were left after the matter-antimatter annihilation was completed, and thus throughout the entire universe once neutral atoms were formed, and that the CMB is ubiquitous in the universe are correct, but the rest of the theory is erroneous. It is based on our two old friends: the assumptions that the plasma that preceded the creation of neutral atoms filled the entirety of the universe, and that the universe has been expanding ever since. We have previously established that neither of these assumptions is valid. In order to explain the large-scale distribution of matter in the universe we observe today, the first of these assumptions requires the invention of 'dark matter,' the existence for which there is no direct evidence; and we have demonstrated that the second assumption is based upon a misinterpretation of the causes of the red-shifting of light.

So if the source of the microwaves detected today is not the radiation released when neutral atoms first formed billions of years ago, what is generating the CMB? The answer is very straight forward.

Astronomers characterize the intensity of the CMB as a temperature. "The present average temperature of the universe is 2.728 degrees K above absolute zero." (72) We earlier quoted Rees as saying that the CMB is "an afterglow of creation." This is an absolutely accurate statement, for the CMB is indeed an afterglow; it is all the heat which is left over in the bubble of space-time billions of years after the incredibly high temperatures of the 'necessary condition.' Rees goes on to say that the CMB is "a relic of a 'fireball' phase." We find the use of the words "relic" and "fireball" in this context to be somewhat misleading. This may be nitpicking, but we believe that we must choose our words carefully

so as to minimize the possibility of misunderstanding. First, the use of the word “fireball” is quite inappropriate. It brings to mind a 'ball of fire,' the image being a ball of flames. But there were no 'flames' in the early universe; it was just very hot. Secondly, a “relic” is something that has survived the passage of time more or less unchanged from its original state of being. The temperature of the universe today, which is what the CMB is a measurement of, is trillions of degrees K different from that of the universe during its “fireball phase.”

The CMB is not, as is currently believed, made up of the same light waves released when neutral atoms were first formed, supposedly some 14 billion years ago, then stretched out into microwave wavelengths by the expansion of the universe. This cannot be the case because the universe is not expanding.

To understand the CMB, we must grasp the fact that there are two sources of electromagnetic radiation in the Field of Play. One source, the source which gives rise to the light we see everyday, is emitted as a result of the behaviour of particles of *matter*. The Sun is one such source, as are the light bulbs which light up our homes. However, the other source of electromagnetic radiation in the universe arises from that which is *immaterial*: the ever-cooling bubble of immaterial space-time. This is the source of the CMB. The same microwaves with the same wavelengths which we have detected in our vicinity of the Field of Play are being emitted currently and continuously, right now, everywhere within the bubble of space-time *by* the bubble of space-time, because everywhere within the Field of Play the temperature of the bubble of space-time has reached about 2.7 degrees K. As these microwaves travel towards us from different distant points within the Field of Play they experience, like all forms of electromagnetic radiation, a steady increase in wavelength. Since the amount of increase in wavelength depends on the distance travelled through space-time, and since the microwaves originate from all points within the Field of Play, a general background of varied wavelengths of electromagnetic radiation in the radio portion of the

electromagnetic spectrum results. This, of course, is what we observe.

Thus the CMB is not some “relic” from the universe's ancient past. Rather, the CMB is a direct measurement of the temperature of the bubble of immaterial space-time *at this present time.* Therefore, the CMB provides conclusive evidence for the existence of what we have been calling 'the bubble of immaterial space-time', and constitutes proof-positive that the conclusion reached by physicists concerning the non-existence of the 'ether' following the Michelson-Morley experiment of 1887 was incorrect.

The tiny variations in the CMB are not, as cosmologists currently believe, evidence of the initial clumping together of matter in the early universe. Rather, these variations are merely small differences in the temperature of the bubble of space-time itself today.

Finally, we must comment on the significance of the fact that the CMB exhibits a black body curve which Rees stated is to be “expected when the radiation has been brought into balance with its environment.” What is the “environment” of the bubble of space-time? The bubble of space-time, of which the Field of Play is composed, is itself completely immersed in the 'ocean' of the realm of the Mind of God, wherein the temperature rests at absolute zero. Thus the temperature of the space-time bubble, currently at just 2.728 degrees Kelvin above absolute zero, is almost completely in balance with its environment. At the boundary between the Field of Play and the realm of the Mind of God, heat radiation is still passing ever so slowly from the former to the latter. We are unaware of this because we have not yet detected that boundary; situated as we are somewhere within the interior of the bubble of space-time, perhaps we never will. From our vantage point, it may in fact be undetectable.

We will pause here for a moment to clarify our use of the word 'bubble' as a metaphor for that phenomenon we have called the Field of Play. A common usage of the word 'bubble' refers to a spherical-shaped film of liquid soap which encloses and traps

within it atmospheric gases. In that case the surface of the bubble, made of soap, is *materially different* from the gases which are trapped inside it. This is not the case with the 'bubble of space-time.' With the bubble of space-time, the surface of the sphere consists of the same 'stuff' as the interior of the sphere. The entire sphere is 'pure' immaterial space-time, through and through.

Chapter Fourteen

GRAVITY PART 2

* * * * * *

We return now to our discussion of the phenomenon known as 'gravity.' The situation is, as Alice said, “curiouser and curiouser.” For over 100 years, ever since Arthur Eddington demonstrated the truth of Albert Einstein's contention that matter deforms space-time in 1919, physicists have known that gravity is the result of space-time being curved by the presence of mass, and that the greater the concentration of mass in a particular location, the greater the amount of curvature exhibited by space-time in that region. All physicists are familiar with the popular demonstration of this concept: a sheet or blanket stretched tight with a ball of some sort placed in the middle, which results in a deformation of the material which increases as one progresses from the edge of the material towards the ball. We will employ this demonstration in this discussion. And yet, except when it comes to considerations of the phenomenon of black holes, and sometimes even then, the conceptual lens through which physicists for the most part view the workings of gravity is based upon Issac Newton's idea of gravity: that gravity is a mysterious *force* which compels matter to pull on all other matter, and that this force is infinite in range. Modern

physics states that gravity, along with the strong and weak nuclear forces, and the electromagnetic force, is one of the four fundamental forces of the universe. A great deal of mathematical 'wool-gathering' has gone into trying to explain why gravity is so much weaker than the other three forces.

Perhaps this is not so surprising. It appears that Einstein himself seemingly did not fully appreciate all the implications of his own General Theory of Relativity, which was published in 1916. This was because he could not fully commit himself intellectually to the idea of the ether, although he recognized that a complete understanding of the General Theory of Relativity required its existence, and he said so, as we have previously recounted. As a result, he evidently continued to believe that gravitational attraction is infinite in range; a mistake we will explain shortly.

We must remember just how limited human knowledge of the universe was at that time. The very existence of large conglomerations of stars other than those that could be readily observed was completely unknown. The words “galaxy” and “the Milky Way” had yet to come into popular usage. The universe itself was widely believed to be eternal, with no beginning in time, and static, a belief in which Einstein shared. In the spring of 1917, while studying his equations, Einstein concluded that a particular 'solution' to those equations which he had derived *required* that the universe could not possibly be static: “Instead, at any moment, all of space must be either expanding or contracting, and it could never remain at rest...” (73) This conclusion convinced Einstein that the equations of his General Theory of Relativity, as originally published, were incomplete. In order to make the General Theory conform to the then currently observed facts, Einstein introduced into his mathematical equation his famous 'cosmological constant,' which could be given a particular *mathematical value* which would allow his equations to describe a universe which was neither expanding nor contracting. Einstein did not specify what the actual mathematical value of the constant was; he simply stated “...that

nature had given the constant the exact value that allows a static universe to exist."(74)

It must be emphasized that the motivation for this idea was purely mathematical, invented by Einstein for purely mathematical reasons. It had no known correspondence to any phenomenological aspect or characteristic of the physical universe, by which we mean it was not based on some measurable process such as the amount of force required to accelerate a particular object to a given velocity. It was a purely mathematical contrivance, invented for the sole reason of making a certain solution to Einstein's General Relativity equations balance.

After Hubble 'discovered' the apparent expansion of the universe, Einstein would go on to say that his 'cosmological constant' was the biggest blunder of his career, but this episode discloses two relevant facts. One is that Einstein obviously continued to believe that gravity has an infinite range. The other is that just as a lawyer skilled in the use of ordinary language can make the false appear to be true, an equation in the hands of a skilled practitioner of the language of mathematics can make any concept seem reasonable. As we pointed out earlier in our discussion concerning the phenomenon of black holes, just because a mathematical equation is 'grammatically correct' does not mean that it necessarily corresponds to or accurately describes that which actually exists. Cows do not jump over the moon.

And yet. It is truly ironic that the understanding of the universe to which Einstein was trying to make his equations cohere, that the universe as a whole is static and is neither expanding nor contracting, has turned out to be true. The bubble of space-time for a brief time did go through a period of expansion (the Cosmic Inflation event). And hard upon the heels of that expansion, for an even briefer moment, the bubble of space-time underwent a period of contraction. But neither of these processes are underway in the universe now, nor will they ever be again. So the universe is not static in the sense that it is unchanging. Energy-matter in the form of galaxies is constantly on the move. To

experience constant change is one of the major reasons why the Creator created the Game of Being. But in the sense that the overall size of the bubble of space-time, the totality of the Field of Play, within which the galaxies are moving about, is unchanging and unchangeable, the universe is indeed static. About this Einstein's idea was correct, even though he did not understand why.

It really is a rather astounding situation. For more than one hundred years physicists have been taught that the curvature of light that Eddington observed is due to *a curvature in the four dimensional geometry* of the universe, as if the universe is 'made of' numbers! But numbers do not exist. Numbers are abstractions. They are, like any other language, pure products of the human intellect, and they do not possess an independent phenomenological existence anywhere in the universe outside of the human (and perhaps aliens') mind. No one can point to some location somewhere in the universe and proclaim, "There! There is the number five. That's where the number five exists." No such location exists. "But wait," you say, "I can take a pen and draw the symbol for the number five on a piece of paper. Then the number five would exist." But that is not actually the case. In that case the symbol for the number five would exist, and that symbol may be a part of an individual human being's reality. But what *exists* are atoms of what we call ink, making a mark of a particular shape upon atoms of what we call paper. The ink and the paper and the symbol exist; the number five itself does not.

So bound up in the unreal world of numbers are physicists that even the discovery of so-called 'gravitational waves' has been insufficient to persuade them of the actual existence of space-time. Physicists consider these gravitational waves to be minute contractions and expansions of the 'fabric' of space-time; but their use of the word 'fabric' is purely metaphorical. They do not believe that there is an actual phenomenological manifestation which is experiencing those contractions and expansions; in their minds there is only the four dimensional geometry of the universe.

This lack of insight on the part of physicists can be traced

directly back to the flawed conclusion reached by the scientific community following the Michelson-Morley experiment in 1887. It is an interesting and perhaps little-known fact that despite the inability of his interferometer to detect the presence of the ether, Michelson continued for the rest of his life to believe in its existence. He considered his famous experiment to have been a failure. However, understood properly, the Michelson-Morley experiment was a resounding success, for it revealed two important facts about the nature of the ether (space-time): one, that it is immaterial, and two, that it passes through apparently solid bodies effortlessly. To be strictly accurate, we must say that solid bodies (which are not really 'solid') pass through it, for it is solid bodies which are in motion while the ether rests in place. If physicists of that era had relied on the direct evidence provided to them by their senses (light is a wave phenomenon therefore *something must be waving!)* rather than placing their faith in the mathematical process of measurement, a century's worth of erroneous conclusions about the nature of the universe might have been avoided.

For the fundamental cause of physicists' lack of insight runs even deeper than the misinterpretation of the results of the Michelson-Morley experiment. It lies at the heart of the entire scientific endeavour: that is, the widely held belief in scientific circles that only the language of mathematics can truly reveal and describe the truths about the universe. Above all else, the purpose of the language of mathematics is to accommodate the *measurement of things.* Therefore things are of import only to the extent that they can be measured. Thus when Michelson's interferometer failed in its attempt *to measure* the effect of the ether 'wind,' the conclusion was that therefore the ether cannot possibly exist.

Physicists seek a 'Theory of Everything,' a set of mathematical equations that they say would completely describe the universe and solve all its mysteries. But this set of equations, if it was ever achieved, would be meaningful only to physicists. This situation is akin to that which existed in the Middle Ages when the

Bible was only written in Latin, and could only be understood by those within the Catholic church hierarchy and a few other scholars. Only those privileged few could truly 'understand' the word of God.

Physicists' strong belief in the revelatory power of quantification has blinded Science to what is the obvious solution to the questions regarding the fundamental nature of the universe. The General Theory of Relativity and Quantum Mechanics, the two pillars upon which modern understanding of the universe rest, are maps of quantification, drawn in the language of mathematics, guiding physicists in their search for greater understanding. The General Theory of Relativity is a mathematical map that correctly describes how *undifferentiated* space-time, imagined to be a four-dimensional geometric grid, behaves in the presence of *differentiated* space-time (energy-matter). Quantum Mechanics is a very detailed and extraordinarily accurate mathematical map which describes how *differentiated* space-time - - - energy-matter - - - interacts with other manifestations of energy-matter. Both of these maps have proven to be extremely useful. But Science, and theoretical physicists in particular, have become so dependent on mathematical maps that scientists have come to mistake the maps for the ground. These maps help us to understand *how* the Field of Play functions, but they do not tell us *what* the Field of Play is: they do not reveal that the universe is the immaterial Mind of God made manifest as space-time. Science has failed to see the fundamental forest for the mathematical trees.

And what, the reader may ask, does this latest digression have to do with gravity, the subject at hand? It has everything to do with it. Because Newton's equations describing how gravity works are so much easier to use than Einstein's, physicists have continued to use Newton's equations in most situations. Thus, for the sake of *mathematical convenience* (after all, it's all about the numbers) physicists have, for the most part, continued to conceptualize gravity in Newtonian terms, in which gravity is a mysterious, inexplicable *force* which causes all the matter in the universe to

somehow be attracted to all the other matter in the universe. They have even invented a particle, which has never been observed, the 'graviton,' that they imagine to be the carrier of this force. These conceptual blinders have allowed physicists to carry on with business as usual without having to bother themselves too much about the deeper implications of the theory that Einstein conceived and Eddington demonstrated was true: that gravity is not a 'force' at all, but, rather, is a distortion of space-time in the presence of matter. Erroneous conclusions have been drawn as a result.

We must begin our exploration of the phenomenon known as gravity with a review of the basics. In the Game of Being the Field of Play is a spherical object of tremendous diameter which is composed of what we have chosen to call "undifferentiated space-time." Undifferentiated space-time is immaterial and flexible; it can vibrate and bend or curve. While it is therefore capable of motion, it does not travel about or change its location, except, as we shall see, under a very specific set of circumstances. Shortly after the moment of its creation, when it was still very hot, the Field of Play was of a somewhat larger diameter than it is at the present time, but as it cooled it 'relaxed' down to its current size. We do not currently know the dimensions of its size. As the undifferentiated space-time cooled further it gave birth to differentiated space-time, tiny perturbations of itself, which we have chosen to call 'energy-matter.' There are four aspects of the energy-matter/undifferentiated space-time relationship which are crucial to an understanding of how the Field of Play functions. Energy-matter is in constant motion; and it has the ability to cause the undifferentiated space-time in its vicinity to bend or curve. The resulting curvature of undifferentiated space-time determines the path which the energy-matter perturbations will take as they travel through the undifferentiated space-time. Energy-matter also has the ability, like pieces of 'Lego,' to join together with other perturbations of energy-matter when they come into contact with one another. As a result of these four factors, over time individual energy-matter perturbations have taken paths through

undifferentiated space-time that have brought the perturbations together to form ever-larger agglomerations of energy-matter, which we call stars, planets, and moons, collectively known as galaxies.

Now, imagine a square framework built around an empty space in the middle of the framework. The framework is say, six feet on each side, and each side is topped with a 2" x 12" piece of lumber which is laid flat on its 12" side. Over this framework is stretched a piece of fabric which extends out beyond the outer edges of the 2 x 12's. The fabric is not stretched as tight as it possibly could be; there is some 'give' to it. The piece of fabric represents space-time. Now imagine a softball-sized sphere placed in the middle of the fabric. That softball represents the Sun. Because the fabric is not stretched as tight as it possibly could be, the softball's weight causes a deformation in the surface of the fabric, which is greatest at the central location of the softball and becomes gradually less deformed *in a smooth and steady progression* (this fact is significant) towards the inner edges of the 2 x 12's. To help you visualize this, imagine a string attached to the inner edges of two of the opposing 2 x 12's which passes over the centre of the softball. The distance between the surface of the fabric and the string will be greatest at the location of the softball, and be the least where the fabric meets the inner edge of the 2 x 12's.

Now imagine that there are eight marbles of various sizes that are travelling around the softball in separate slightly elliptical orbits, each of which is at a particular distance from the softball. The marbles represent the planets of our solar system. Although the space-time fabric is 'tilted' towards the softball, each of the marbles possesses enough momentum to keep it from sliding down the slope of the curved fabric and crashing into the softball. As this demonstration of how our solar system functions unfolds, you notice that the farther away from the softball any particular marble is, the lower is its orbital speed. In other words, *as the amount of the deformation in the fabric decreases* (this is also significant) as

the fabric stretches from the location of the softball towards the inner edge of the framework, the more slowly the marbles revolve around the softball.

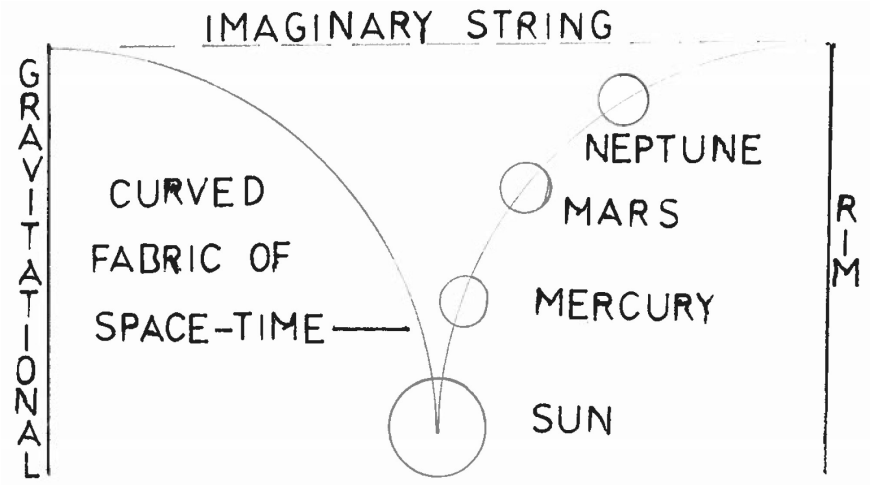

FIGURE 2
Gravitational Valley of the Sun

This demonstration is an accurate illustration of the actual functioning of the real solar system. Mercury, the planet closest to the sun and which therefore travels through the region of the most deformed (curved) space-time of all the planets, orbits the sun with a velocity of 48 kilometres per second. Mars, the fourth planet out from the sun, has a velocity of 24 km per second. Neptune, the planet which is farthest from the sun and therefore travels through a region of space-time which is the least curved of all the planets, has a orbital velocity of 5.4 km per second.

This demonstration illustrates the difference between

Einstein's conception of gravity and that of Newton. There is none of Newton's mysterious 'forces' at work here. (To be fair to Newton, we should note that he never pretended to be able to provide an explanation of *how* gravity functions. His brilliance was to describe a mathematical relationship concerning the motions of massive bodies.) Each planet simply follows a path through space-time which is dependent upon the amount of curvature of the space-time in that planet's region, and each planet's orbital velocity *depends directly upon the amount of the curvature of the space-time through which it travels* (this is very significant!)

Having left Newtonian 'forces' behind, it is at this point that we will also depart from Einstein's (and current cosmology's) belief that the range of gravity is infinite. Bearing in mind that our 6' x 6' framework has not been built to scale, we ask you to imagine that the 6' x 6' span of fabric represents a 'valley' in actual space-time. (See Figure 2.) The softball sun sits at the bottom of the valley, and the marble planets orbit at various heights up the sloping sides of the valley, which is surrounded on all sides by a flat level 'plateau.' In our demonstration this plateau is represented by the flat 12" surface of the 2 x 12's which are all still covered by the fabric which represents space-time. The inner edges of the 2 x 12's represent the valley's 'rim', the point at which the fabric ceases to be curved and is flattened out. In the actual solar system, this is the point at which the Sun's mass ceases to cause a curvature within the surrounding space-time. The inner edges of the 2 x 12's represent the valley of the Sun's *gravitational rim.*

Another marble, representing some object possessing mass, that travels along the 12" surface of the 2 x 12's (the flat level plateau within space-time) will only 'feel' the Sun's presence if it travels over the inner edge of the 2 x 12 and begins to experience a 'descent' down into the valley. Only if an object crosses over the edge of the valley of the Sun's gravitational rim in space-time will its motion be affected by the mass of the Sun. Therefore there is a limit, determined by the mass of any gravitating body, as to how great a distance from that body its mass will be able to induce a

curvature of space-time. *Therefore gravity is not infinite in range.*

Now imagine another framework of the same dimensions placed in a position adjacent to the framework representing our solar system. A softball placed in its centre represents Proxima Centauri, the star which is closest to our solar system. Proxima Centauri and its attendant planets occupy a valley created in space-time by that star's mass, complete with its own gravitational rim. Even though Proxima Centauri is the star closest to the Sun, its path through space-time (remember, all energy-matter is in motion) is influenced not at all by the relatively nearby (4.3 light years) presence of the Sun; nor is the path of the Sun through space-time influenced by the presence of Proxima Centauri. The paths of both of these stars lie beyond each other's gravitational rim.

All concentrations of mass, the Sun, the Earth, our moon, Proxima Centauri, each of its planets, your own body if you were adrift in space, each creates their own 'valley' in space-time. The dimensions and, as we shall see, the shape, of the valley are determined by how much mass is concentrated in a particular location. Each valley is surrounded by its own gravitational rim. It is *only* when the gravitational rim of one body intersects with or overlaps the gravitational rim of another body are the two bodies 'drawn towards one another.' Gravity is not infinite in range.

Now, consider the fact that the Sun and its valley, which contains all the planets of the solar system, are in motion, orbiting around the centre of the Milky Way galaxy. All of the space-time within the Milky Way is, to a certain extent, curved (deformed) by the presence of the massive neutron star (Sagittarius A*) at the centre of the galaxy - - - more on this in a moment - - - but as our solar system moves through space-time, the space-time in front of it is, relative to the valley of the sun, flat, It is part of the plateau. As our solar system moves into that region of space-time, that space-time bends into the shape of the valley of the sun. Meanwhile, the region of space-time which the solar system has just departed loses its valley of the sun shape, and returns to the plateau state that it was in before the solar system passed through

that region. Thus the space-time within a galaxy is in a constant state of flux. All of the billions of stars in a galaxy carry with them movable valleys, which are constantly deforming and then releasing the space-time through which they pass.

Before we proceed any further, we should acknowledge that we are employing a two-dimensional model, an image of a 'valley,' to create a picture of what is in actuality a three-dimensional situation. In actual space-time, the Sun creates a spherical-shaped depression, and all of the space-time encompassed within that sphere is curved towards the sun, but this is more difficult to visualize than the image of a valley. We mention this because we have previously criticized cosmologists for trying to portray a three-dimensional situation with a two-dimensional model. The difference in the two situations is this: in the 'valley' model of the solar system where the softball 'Sun' deforms the fabric and the marble 'planets' revolve around the softball with decreasing velocities as their distance from the softball increases and the deformation of the fabric decreases, the behaviour of the fabric (space-time) and the behaviour of the marbles (the planets) corresponds faithfully (in our imagination) to astronomical observation. We say “in our imagination” because in a real demonstration of this scenario the friction between the marbles and the fabric would cause the marbles to lose momentum and fall down the curve of the fabric towards the softball. This does not happen in the real solar system because the passage of the planets through space-time is almost entirely friction-less (we say “almost entirely” because, as we shall see, there are certain elements which are affected by the passage of space-time through them.) On the other hand, the attempt by cosmologists to model the expansion of the universe on the surface of an expanding balloon is directly contradicted by astronomical observation. The Andromeda galaxy is not moving away from us as the model predicts, but is in fact moving towards us.

Returning now to our model of massive bodies creating 'valleys' in space-time, we shall now imagine the entire Milky Way

galaxy as creating its own large valley, ever-moving through space-time, complete with its own gravitational rim. This galactic valley is 'carved out' of space-time by the presence of the massive agglomeration of the neutron star at the centre of the Milky Way, known as Sagittarius A* (A-star). Sagittarius A* is thought to have a mass equal to 4 million Suns. (During our previous discussion of the 'black hole' phenomenon we have provided an explanation of how Sagittarius A* came to possess so much mass and will not repeat it here.) For the purposes of our present discussion what is important to understand is that in the vicinity of a very massive object like Sagittarius A* space-time does not behave in the same manner as it does in the vicinity of an ordinary star like the sun. As our fabric, softball, and marbles model demonstrated, the amount of the curvature of space-time diminishes in a smooth and steady fashion as the distance from the Sun increases, with the result that the orbital velocities of the planets gradually decrease in a similar progression.

However, when confronted with a huge concentration of mass in one location as in the case of Sagittarius A*, space-time behaves differently. In our softball and fabric demonstration of how mass curves space-time, imagine replacing the softball with a cannon ball. The way in which the fabric distorts would be radically different. In such a case, the gravitational valley in space-time is deformed in five distinct stages. In the first stage, the space-time in the immediate vicinity of Sagittarius A* is stretched so taut that electromagnetic radiation cannot pass through it. The space-time within this region is inside the so-called 'event horizon.' No matter other than another neutron star can penetrate this zone; even a seemingly solid body such as the Earth or an asteroid would be shredded by space-time itself if its path took it into this region around Sagittarius A*.

The second stage, beyond the event horizon, is a region of space-time which is flexible enough to permit the passage of electromagnetic radiation, but which is still so stressed that it destroys the molecular and atomic bonds of any material bodies

(other than neutron stars) which stray within its boundary. Astronomers have now made observations which appear to confirm the existence of such a region around Sagittarius A*. In an article published on July 1, 2023, in New Scientist magazine, Andreas Burkert of University Observatory Munich in Germany and his colleagues announced that their observations have revealed that "[I]n the area immediately around Sagittarius A*, there are no stars with circular orbits, a phenomenon the researchers call a zone of avoidance . . . 'It's as if something forbids stars from going into the zone, *or the ones that do go into the zone get destroyed*,' (emphasis added) says Burkert." (See Figure 3.)

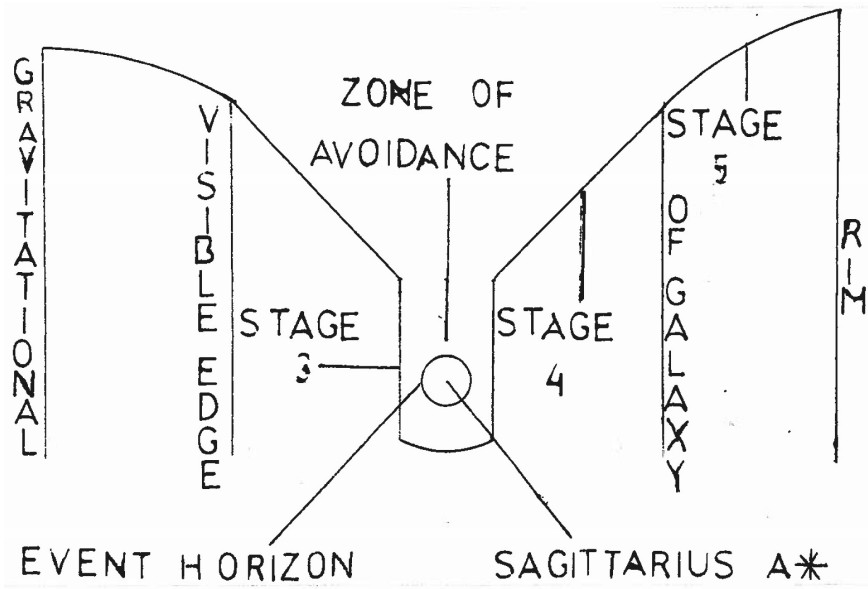

FIGURE 3
Gravitational Valley of the Milky Way Galaxy

Beyond the “zone of avoidance” the 'walls' of the valley begin to appear, marking the point in space-time when the third stage of curvature commences. Initially these walls are almost 'vertical' and the valley is more like a box canyon. The walls of this canyon are dimpled with rapidly moving deformations that orbit around Sagittarius A*: these are the valleys in space-time created by the stars that inhabit this region of the galaxy. Burkert and his colleagues “found a correlation between each star's distance from the galactic centre and the shape of its orbit - - - the closer a star is to the middle of the galaxy, the more stretched out, or eccentric, its orbit.” Because the space-time through which they move is so highly curved, the orbital velocities of these stars is much greater than those of the stars which are further away from the centre of the galaxy. This conclusion agrees with astronomical observation, and applies to the motion of stars up to a given distance from Sagittarius A*.

At that given distance (your author does not know what that distance is, but for the sake of argument say it is one-fifth of the radius of the visible portion of the galaxy) the amount by which the space-time is curved by the presence of Sagittarius A* rather abruptly changes, as the walls of the valley go from being nearly 'vertical' to that of a less steep incline, marking the point in space-time where the fourth stage of curvature commences. The important detail about this fourth stage of curvature is that the degree of its 'incline' stays the same from the point at which it begins, all the way out to the visible edge of the galaxy and beyond. This stage does not gradually 'flatten out' as is the case with the space-time around the Sun. As a result, since all the stars in the outer four-fifths of the visible galactic radius are travelling through space-time which is experiencing the same degree of curvature, *all their orbital velocities will be the same.* This conclusion is consistent with astronomical observation.

At some given distance from Sagittarius A* the deformation of space-time caused by the presence of Sagittarius A* enters its fifth stage. In this stage the degree of incline in the wall of the

galactic valley *does* begin to gradually decrease, similar to the behaviour of space-time observed within the solar system, differing only in the amount of space-time over which it is spread. This stage continues out into so-called *inter-galactic* space-time, that is, the region beyond the visible periphery of the galaxy, until it reaches the point where space-time is *no longer deformed* by the presence of Sagittarius A*. This point marks the valley of the Milky Way galaxy's gravitational rim.

We do not know precisely the distance from Sagittarius A* to the Milky Way's gravitational rim (the *actual not the visible* galactic radius). This distance is unique for each individual galaxy and depends directly upon the mass of the massive neutron star at the centre of the galaxy; in some cases the mass of a galaxy's central massive neutron star is millions of times greater than that of Sagittarius A*. In these cases the actual galactic radius, the distance from the massive neutron star at the centre of the galaxy to that galaxy's gravitational rim, will be much greater than in the case of the Milky Way. Furthermore, this distance can change over time. When galaxies collide their central massive neutron stars can merge and become even more massive, which in turn affects the shape and the diameter of the galactic valley which emerges as a result of the collision.

In the case of the Milky Way, it is possible to calculate an estimate of the extent of its galactic radius. When discussing distances within our solar system, astronomers use so-called Astronomical Units (AU) as the basic unit of measurement. One AU is the equivalent of about 1.5 x 10^11 meters, or the mean distance between the Earth and the Sun. The Oort cloud, the region in space around the Sun from which comets are thought to originate, is estimated to be some 50,000 AU away from the Sun. Assuming, purely for the sake of this calculation, that the Oort cloud marks the gravitational rim of the Sun's valley in space-time, we can calculate the radius of the Sun's valley to be 0.8 light years in extent. As previously noted, astronomers have estimated the mass of Sagittarius A* to be equal to some 4 million suns. Based

on these numbers, we can estimate the radius of the Milky Way galaxy's valley in space-time to be approximately 3.2 million light years. Any celestial body which comes within that distance of the Milky Way will have crossed the Milky Way's gravitational rim, and will therefore tend to be drawn into orbit around the centre of our galaxy. Equally important, the path through space-time of objects which remain beyond that distance from Sagittarius A* will in no way be affected by its presence. *Gravity is not infinite in range.*

3.2 million light years is a reasonable estimate because it corresponds with observation. We know that the Andromeda galaxy, which is somewhat larger than the Milky Way, is approximately 2.2 million light years away and is on a collision course with our galaxy. This is happening because the gravitational rims of these two galaxies have overlapped, and the central massive neutron star in each galaxy is now increasingly affecting the curvature of space-time in the other galaxy. Over the next four or five billion years, the valleys of these two galaxies will go through the process of being joined together.

Chapter Fifteen

THE GALACTIC CAROUSEL

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In order to more fully understand Sagittarius A* and the role that it plays in sculpting the space-time through which it and the rest of the Milky Way passes, it is necessary to view our galaxy from several different perspectives. To begin with, imagine (or actually do it) that you are holding the edges of a standard CD between the tips of your thumb and middle finger, and that you are looking down at it. The CD represents the Milky Way galaxy. The hole in the centre of the CD represents Sagittarius A*, and the CD itself represents the galactic plane, an imaginary line that stretches out from the centre of the galaxy and which divides the galaxy in half, like the two halves of a hamburger bun. Since we are viewing the Milky Way from above, imagine that you can see the curving spiral arms, each made up of hundreds of millions of stars, stretched out from and rotating around the centre of the galaxy. It is truly an awe-inspiring sight.

Now hold the CD out in front of you at eye level, so that you are looking at it edge-on. Extending for some distance above and below the CD - - - which represents the galactic plane - - - imagine that you see a thick band of stars orbiting in a

counterclockwise direction. If you watch for long enough, you will notice that in addition to their counterclockwise orbit individual stars are moving up and down relative to the galactic plane, as if riding on a carousel. This is known as 'vertical oscillation.'

In Figure 4 a star rises upwards relative to the galactic plane to a certain point, where it will cease its upward motion and then begin to move downwards towards the galactic plane, eventually passing through the plane and then continuing to fall to a point below the plane that will be equidistant to how high it previously rose above the plane. It will then reverse course once again and proceed to rise back up through the galactic plane, carrying on until it reaches its previous high point. Then the pattern repeats. The vertical arrows indicate the curvature of space-time towards the galactic plane.

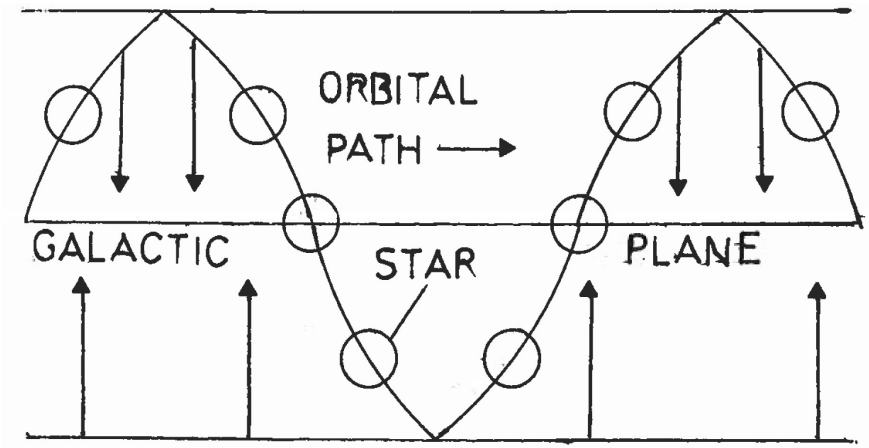

FIGURE 4
Vertical Oscillation of a Star Through the Galactic Plane

Now, the conventional explanation for this vertical oscillation is that once the star reaches its high point, there are more stars in the galaxy below it than above, and the combined gravitational force of all those stars pulls the star back down through the galactic plane. When it reaches its lowest point in the cycle there are more stars above it than below, and their combined gravitational force pulls the star back up through the galactic plane. But this explanation cannot be correct. Einstein showed that gravity is not a 'force;' rather, it is the sculpting of space-time by massive objects; and we have shown that gravity is not infinite in its reach but is limited to the volume of space-time which falls within the gravitational rim of any given massive body; and we have shown that, in general, the gravitational rims of individual stars within the galaxy do not overlap, so the stars in any given region of the galaxy do not affect the orbital paths of their neighbours. So what is the explanation for stars' vertical oscillation?

To answer this question we must perform a thought experiment, the first part of which could actually be carried out but which we will perform only in our imaginations. Imagine a blanket suspended about 7 feet above the ground. The blanket has grommets in each of its corners and in the middle of each of its sides. Ropes run through the grommets and are attached to stakes that have been driven into the ground in the appropriate positions. The blanket is stretched out and fairly taut. The blanket represents a portion of the space-time encompassed by our galaxy. Now imagine that you are standing underneath the centre of the blanket with your arm reaching out above your head so that you can touch the blanket. Your feet represent Sagittarius A*, and your legs, body, and outstretched arm represent the galactic plane. Now grab the blanket with your extended hand and pull down. A furrow, representing a narrow valley in space-time, will appear on the surface of the blanket. Before you commenced pulling, the surface of the blanket was flat. But now the regions of the blanket on either side of the furrow slope downwards towards the furrow.

Now imagine that same scenario but that a miniature version of yourself is lying down on the CD with your feet in the hole where Sagittarius A* resides, and your outstretched arm reaches out to the edge of the CD (the visible edge of the galaxy) and is pulling on the space-time fabric that is situated there. From this perspective when you look up at your hand you are looking out through the edge of the galaxy into intergalactic space. Remember that you are lying on the galactic plane and are part of it. You are pulling on the fabric in such a way that the furrow that forms in the blanket of space-time runs parallel to the edge of the galactic plane (the edge of the CD); from your perspective the furrow will run from left to right and form a valley that runs around the rim of the CD.

Now imagine that you are walking along the floor of that valley (you are walking around the rim of the CD, that is, the edge of the galaxy.) You are wearing a special set of glasses which allows you to see space-time. Ahead and behind you the horizon of the valley curves away out of sight. Although it would be a long walk - - - some 300,000 light years - - - if you kept travelling in the same direction you would eventually arrive back where you had started. With your special glasses you can observe that the space-time on both sides of the valley slopes up and away from the valley floor in a gentle curve.

In Figure 5(a) we are seeing the galaxy as we would if we were standing on the rim of the CD (which represents the galactic plane) and looking along its curved edge. The orbital path of the star which is situated part way up one of the sides of the 'valley' in space-time is out of the page. Note that from this perspective both sides of the 'valley' appear to rise up above the galactic plane. Therefore no matter which side of the 'valley' the star ascends, it will be travelling 'uphill' relative to the galactic plane. The curves in both diagrams have been exaggerated for effect.

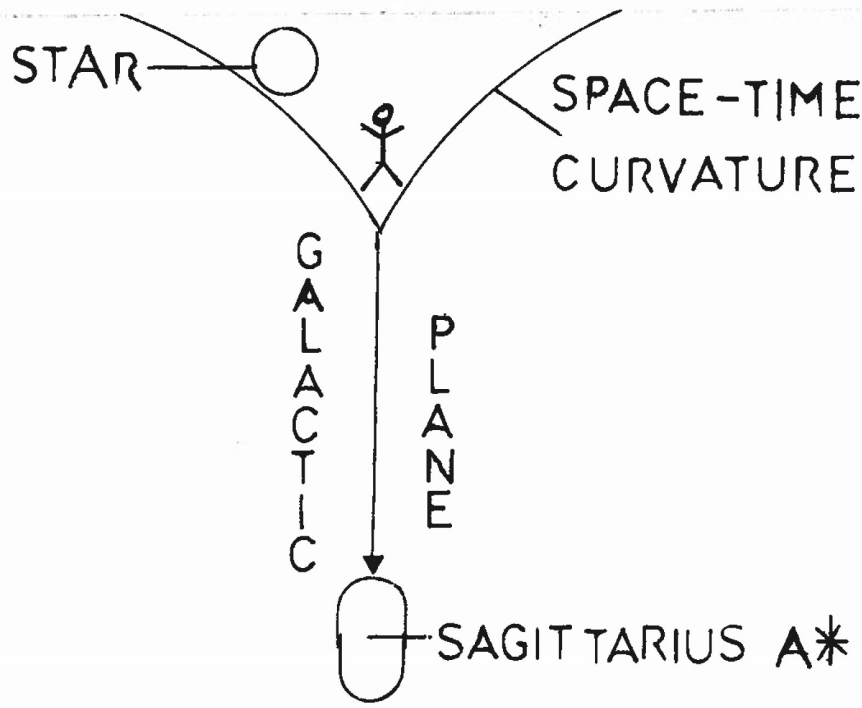

FIGURE 5(a)
Cross-section View When Positioned Parallel to Galactic Plane

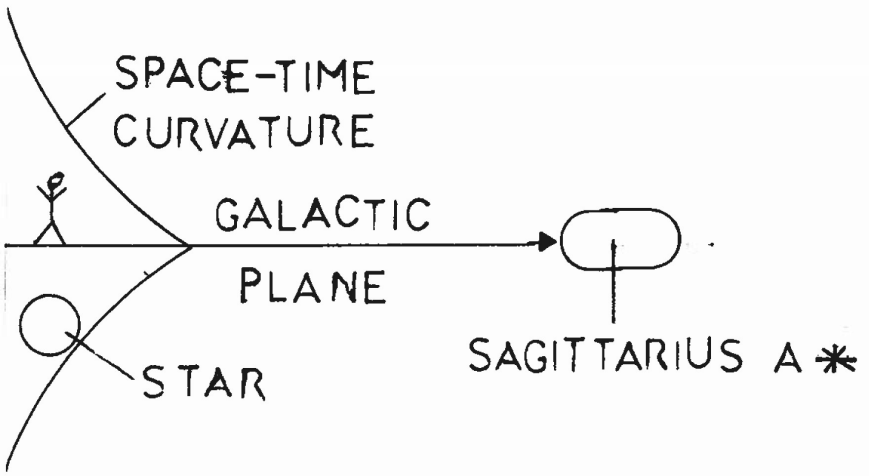

FIGURE 5(b)
Cross-section View When Positioned Perpendicular to Galactic Plane

In Figure 5(b) we are seeing the galaxy as we would if we were standing on the flat surface of the CD and looking down the length of the 'valley,' which would now be turned on its side. From this perspective one side of the 'valley' rises above the galactic plane, while the other side falls away below it. Therefore when the star traverses the side of the 'valley' which is falling away below the galactic plane, it is moving 'uphill' relative to the galactic plane (we know this from Figure 5(a)) even while it is moving steadily lower relative to the position of the galactic plane in the galaxy. At some point the slope in space-time which the star is travelling up

will halt the star's momentum and, changing its direction, it will proceed to fall back down the slope towards the bottom of the 'valley' (the galactic plane), even while its position relative to the galactic plane in the galaxy rises (see Figure 4.)

Thus we see that the explanation for the vertical oscillation of stars up and down through the galactic plane is not some mysterious magical force exerted by the rest of the stars in the galaxy; rather, it is the sculpting of space-time by the galactic plane which is responsible for this phenomena. The star 'falls' down one side of the valley, crosses the valley floor, and then its momentum carries it up the other side of the valley. When its momentum can carry it no further, it changes direction and 'falls' once again toward the floor of the valley. The question then becomes: by what means does the galactic plane sculpt the space-time surrounding it in this fashion?

Relative to the space-time beyond the Milky Way's gravitational rim in intergalactic space, all of the space-time within that boundary is curved towards Sagittarius A*. The closer one moves towards Sagittarius A*, the greater the curvature of the space-time. But the amount of curvature is not evenly distributed in all directions away from Sagittarius A*. This is due to its shape. This super-massive neutron star is not a perfect sphere; rather, it is an oblate spheroid. Like the Earth but more extremely so, it is flattened at the poles and bulges at its equator. This means that its equatorial regions pull more effectively on the space-time surrounding it than does the rest of the star. The galactic plane extends outwards 360 degrees from Sagittarius A*'s equator. Because of the equatorial bulge, the space-time occupying the galactic plane is pulled more strongly towards Sagittarius A* than is the space-time surrounding the star's northern and southern hemispheres. This also pulls on the space-time immediately above and below the galactic plane, curving those regions of space-time towards it and creating the valley shown in Figures 5(a) and 5(b).

The ability of a massive object like Sagittarius A* to affect inter-galactic space-time does not end at our galaxy's gravitational

rim. That point simply marks the location in space-time where space-time can no longer be *curved* by the presence of Sagittarius A*; it is the point at which a passing celestial body, should it cross it, will begin to move towards the centre of our galaxy. There are a number of so-called 'dwarf' galaxies that are within the Milky Way's gravitational rim, such as the Large and Small Magellanic Clouds and the Sagittarius dwarf galaxy, which orbit the Milky Way at various distances and which will eventually collide with the Milky Way.

It is now thought that the dwarf galaxy Sagittarius has previously passed through the Milky Way three times. Imagine placing a marble on the rim of a soup bowl and allowing it to fall down the side of the bowl towards its centre. The marble will gather momentum as it goes down, will cross the centre of the bowl and travel some distance up the far side. There it will reverse course and fall back down towards the centre of the bowl and back up the side it originally fell down, but not as high as before. How many times this happens depends on the shape of the bowl and the mass of the marble. This process is essentially what is taking place in the interaction between the Sagittarius dwarf galaxy and the Milky Way, as the dwarf galaxy 'falls down' the side of the Milky Way's valley in space-time, is carried by its momentum up the far side, only to be halted and drawn back down towards the centre of the Milky Way once again. It is the same process as the marble and the soup bowl, the only difference is that it is being played out over several billion years instead of seconds.

But the ability of Sagittarius A* to affect truly inter-galactic space-time extends for at least several million light years beyond the gravitational rim of the Milky Way. At these distances space-time is no longer deformed or curved by Sagittarius A*, but is progressively less 'stressed'. This stressing of inter-galactic space-time by the massive neutron stars at the centre of galaxies becomes more pronounced as the space-time crosses over a galaxy's gravitational rim. The stress undergone by any given volume of space-time increases as one moves from a galaxy's gravitational

rim towards the centre of the galaxy. The amount of stress occurring at any particular point in space-time can be considered to be a measure of how 'taut' the space-time in that region is being pulled. As we shall see, the amount of stress experienced by any given region of space-time affects the rate at which light experiences red-shifting as it passes through that region, and it is also a contributing factor in the determination of the path taken by galaxies through space-time.

It should now be clear why we stated earlier that the elastic bubble of space-time was once stretched out to its maximum extent, and then 'relaxed' to its current size. That relaxation provided 'give' in the system, which is what allows space-time to be sculpted by the presence of mass. In our fabric, softball, and marbles demonstration of the solar system, we specifically stated that the fabric was not stretched over the framework to be as taut as it could be. If that had been the case, the deformation in the fabric by the softball would have been minimal, and would not extend outwards to the inner edges of the framework, and thus the 'gravitational effect' (the curvature of the space-time through which the marbles were travelling) would not occur. The phenomenon of gravity is a result of the curvature of *elastic* space-time. That present-day elasticity can occur because it was built into the system when the bubble of very hot space-time stretched to its maximum extent, and then relaxed to its present size. The fact that the hot bubble of space-time had stretched until it could not be stretched any further was what caused the Cosmic Inflation event to end.

Chapter Sixteen

DARK MATTER PART 2

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We return now to the highly problematical theory of 'dark matter.' There is a fundamental principle in science of long historical standing known as 'Occam's Razor.' This principle, first enunciated by the 14th century theologian William of Ockham, states that "entities should not be multiplied beyond necessity. It urges us to choose the simplest explanations or models for any phenomenon we observe." (75) Like the notions of 'black holes' and 'dark energy' which we have already discussed, the invention of dark matter by modern cosmology represents a serious violation of this principle. The idea of dark matter was invented to explain away three problems confronting cosmologists in the late 1970's, one theoretical in nature, and two which were observational. We begin our discussion by once again quoting Eric J. Lerner:

> "Dark matter is perhaps the strangest feature of conventional cosmology. According to most cosmologists nearly 99 percent of the universe is unobservable - - - dark, emitting no radiation at all. The universe we do see - - - stars, galaxies,

> and all - - - is only 1 or 2 percent of the total. The rest is some strange and unknown form of matter, particles *necessitated by theory* (emphasis added) but never observed." (76)

The theoretical necessity for the invention of dark matter arose because of the inability of the standard Big Bang model to account for the large-scale structure of the universe. As we have previously recounted, cosmologists were unable to explain how the smooth plasma, which was *assumed* to fill all of the early universe, came to form the clusters and superclusters of galaxies we observe today, within the time available since the purported beginning of the universe. For standard Big Bang model theorists, dark matter was the ingredient, the missing mass, that was required to 'jump start' the process of gravitational attraction that pulled the matter, which was theorized to be everywhere, into the structures observed today. We have already discussed how that theory fails to account for the huge voids that separate the filaments of the cosmic web. To that critique we can now add the question of why was dark matter apparently not distributed more evenly throughout the universe? Was it simply not present in what are now those voids? Why would that be, or, more precisely, *how* could that be? We have already discussed why there is no logical explanation within the standard Big Bang model for how the voids came to be created. All of these difficulties, and the *theoretical necessity* for the invention of dark matter, can be swept aside if we simply accept that the *assumption* that the early universe was *entirely filled* with plasma after the mutual annihilation of matter with the available anti-matter is unwarranted and invalid.

More or less at the same time that Big Bang theorists were turning to the idea of dark matter in an attempt to explain the large-scale structure of the universe, it was an idea hit upon to explain two different types of astronomical observations. In 1977, the astronomers Vera Rubin and Kent Ford

> ". . . began testing a new technique for studying the motion of stars within spiral galaxies . . . [Using this technique] they were able to determine the velocities of stars at all distances from the centre [of the galaxy]. This was a first in astronomy. Newton's law of gravity makes a simple but firm prediction about each star's velocity, depending on its distance from the centre of the galaxy. . . . [However, when the results of the new observational technique were reviewed] the predicted relationship between the velocity of a star and its distance from the centre of the galaxy did not hold up. The results showed that even stars in the galaxy's far periphery orbited at nearly the same speed as those closer to the centre. There were only two possible explanations: Either Newton's law of gravitation fails at galactic scales, which would have shaken physics to its foundations; or galaxies are not what they seem." (77)

Indeed. Readers who have already grasped the full significance of our galaxies-as-valleys-in-space-time model will immediately understand that both of those "two possible explanations" are simultaneously true: Newton's law of gravitation *does* fail at galactic scales, *and* galaxies are not what they seem, and that understanding in no way requires the invention of dark matter.

Newton's law of gravitation fails at galactic scales because it is conceptually flawed. Gravity is not a mysterious attractive force acting between massive bodies as Newton imagined; rather, it is the warping of space-time by massive bodies as Einstein imagined. As our galaxies-as-valleys-in-space-time model demonstrates, on galactic scales, due to the presence of the very massive bodies at their centres, space-time is warped in a manner

which is not consistent with Newton's law, which is accurate only at the scale of individual star systems.

And galaxies are not what they seem. Galaxies like the Milky Way and Andromeda are huge valleys in space-time which extend far beyond their visible edges, with diameters of some 6 million light years. Equally important for our understanding of how the cosmos functions, the gravitational 'reach' of galaxies is not infinite, but is limited to each galactic valley's gravitational rim, the point in space-time where the massive neutron star at the galaxy's centre ceases to cause the warping of space-time.

Finally, aside from those stars at the very centre of spiral galaxies, all the stars in such galaxies orbit with the same velocity not because of the presence of some mysterious 'dark matter' which nobody can seem to find; they all orbit with the same velocity because they are all travelling through space-time *which is experiencing the same amount of curvature.* (See Figure 3, Stage 4, p.185.) It is the amount of curvature of the space-time through which a celestial body travels which determines its velocity, and not, as Rubin and Ford discovered, its distance from a central gravitating body. As our earlier discussion demonstrated, this principle applies to both the scales of individual star systems and that of entire galaxies.

Thus the question of why most of the stars *within* spiral galaxies orbit the centres of such galaxies at the same velocity is resolved without recourse to the invention of dark matter. The other observational problem to which dark matter was proposed as a solution was in regard to the observed motion of entire galaxies through space-time. Once again we will outline the problem by quoting Eric J. Lerner:

> "The evidence [for dark matter] was in studies of the rotation of galaxies, and of the motions of galaxies in groups and clusters. Galaxies rotate like pinwheels and move through galactic clusters in looping orbits. By measuring

> the redshifts of stars or gas clouds in galaxies, or of galaxies in clusters of galaxies, astronomers could deduce the speed of rotation of the galaxies *and* the speed of the galaxies themselves. Now if the galaxies and galactic clusters were *held together by gravity, as astronomers assumed must be the case,* (emphasis added) the mass of a galaxy or cluster could be found from Newton's law of gravity. The greater the velocities of the stars in a galaxy, or of galaxies in a cluster, the stronger the force needed to hold them in orbit; the stronger the gravity, the more mass there must be producing the gravitational attraction . . .
>
> "Astronomers found that there seemed to be more mass in galaxies, measured in this way, than could be accounted for by the stars. There also seemed to be more mass in clusters than in the galaxies that made them up - - - five to ten times more. Perhaps, astronomers thought, this extra mass is the dark matter." (78)

The perceptive reader will have immediately recognized the fundamental problem of this analysis: that being the Newtonian conception of how gravity functions. "The greater the velocities of the stars in a galaxy, or of galaxies in a cluster, *the stronger the force* (emphasis added) needed to hold them in orbit," writes Lerner. But as by now should be abundantly clear, gravity is not some mysterious force attracting massive bodies towards one another. Gravity is the warping of space-time by massive bodies. Employing this understanding of gravity we have, without recourse to imaginary dark matter, explained why the majority of stars in spiral galaxies orbit the centre of those galaxies with the same velocity. This deals with the problem enunciated by Lerner in the first half of the first sentence in the above quote.

The problems associated with the second phrase of that sentence, *the motions of galaxies in groups and clusters,* (emphasis added) arise because the conventional understanding of those motions rests upon two fallacies. The first of these is the Newtonian idea that the reach of the force of a gravitating body is infinite. It is this infinite force which is thought to be what holds galaxy clusters together. But there is no such 'force;' there is only the curvature of space-time by massive bodies. And as our model of galaxies-as-valleys-in-space-time clearly demonstrates, there is a limit to how far from the centre of a galaxy space-time will be deformed by that galaxy's massive neutron star: the galaxy's gravitational rim.

The second fallacy ultimately rests upon the mistaken notion, which permeates all of modern cosmology, that the universe is expanding. This false notion has caused astronomers to draw incorrect conclusions from the observations they have made of the red-shifting of light emitted by distant galaxies. Because astronomers believe that all galaxy clusters, and all the galaxies within any particular cluster, are moving away from us (because they believe the universe is expanding), they have concluded that it is possible to calculate an 'average' of the amount of red-shift of all the light from all the galaxies in any particular galaxy cluster, based on the idea that since all the galaxies in that cluster are more or less the same distance from us, they will all be receding from us at more or less the same rate. Upon this basis, when comparing the amount of red-shift of light from any one galaxy within a galaxy cluster, to the calculated 'average' of all the red-shift for the entire cluster, which supposedly describes the average 'recession velocity' of the members of the cluster, they have concluded that the motions of individual galaxies within the cluster can only be explained by the presence of dark matter.

But the entire line of reasoning rests upon the mistaken notion that the universe is expanding. As we have stated repeatedly, this is not the case. Since this is not the case, for reasons we have previously explained, it cannot be assumed that all

the galaxies in a distant galaxy cluster are in fact moving away from us; in any given galaxy cluster that is almost certainly not true. Therefore, it is not possible to calculate the average 'recession velocity' for the cluster as a whole because some of the galaxies in the cluster are not receding. And for those galaxies in a cluster that are in fact moving away from us, it is not because the universe as a whole is expanding, it is due to the intrinsic motion of each galaxy through space-time. To repeat ourselves one more time: the largest portion of the red-shifting of light from distant galaxies is not caused by their motion; it is uniquely determined by the mass of the massive neutron star at the centre of each galaxy, and more so by the total amount of space-time through which the light emitted by each galaxy passes on its journey to our telescopes.

Due to their basic misunderstanding of the cause of the red-shifting of light, and due to their erroneous belief that gravity is a 'force' with an infinite reach, astronomers came to believe there is not enough visible mass, in the form of stars and clouds of gas, in distant galaxy clusters to explain the motions of individual galaxies within those clusters. The notion of 'dark matter' was invoked to provide the apparently 'missing' mass.

However, in the 1980's, even while labouring under the same misapprehensions concerning red-shift and gravity as their fellow astronomers, the work of three astronomers, Mauri Valtonen, Gene Byrd, and E. Shaya, demonstrated that, due to observational errors, the calculated mass of galaxy clusters was being greatly exaggerated. Lerner writes:

> "In fact, Valtonen and Byrd found that these . . . errors would account for *all* of the "missing mass": in pairs of galaxies, groups of galaxies, and clusters there is *no* dark matter. And when they examined the motions of small nearby companions, they found the galaxies themselves weighed just as much as the visible matter composing them. . .

> "These results have been published in leading journals, yet have stirred little discussion and no attempts at refutation. They completely eliminate any evidence for dark matter - - - what you see in the universe is what there is." (79)

Lerner's book was first published in 1991. Over the intervening three decades huge amounts of time and money have been spent in the devising of ever-more sensitive experiments designed to detect the presence of dark matter. It will come as no surprise to our readers that these efforts have come to naught. Dark matter does not exist. In keeping with the principle of Occam's Razor, there are simpler explanations for the phenomena for which dark matter was invented to explain. A correct understanding of the causation of the red-shifting of light, and a correct understanding of the functioning of gravity at galactic scales, concepts over which the astronomical and cosmological communities are currently deeply confused, explains it all.

Chapter Seventeen

THE MAINTENANCE OF THE COBWEB

* * * * * *

However, there are questions still to be answered. For instance, why are galaxies grouped together in clusters and superclusters? Our model states that the filaments of Dr. Smoot's cosmic cobweb, which are made up of clusters and superclustsers of galaxies, exist today because those are the regions in the hot bubble of space-time where a surplus of matter survived the matter-antimatter annihilation era in the early universe.

After the Big Bang Nucleosynthesis process was completed, during which the nuclei of deuterium, helium, and lithium atoms were created, these filaments, which you will recall, were (and are) many millions of light years long, wide, and thick, consisted of a hot dense plasma of positively and negatively charged particles. These filaments were completely surrounded by empty space-time - - - the voids in the cobweb - - - where little or no matter remained after the matter-antimatter annihilation era. The positively and negatively charged particles of the plasma were

hot and highly energetic, constantly slamming into one another to make atoms, only to be instantly blown apart again in another collision. This state of affairs continued until the temperature of the hot bubble of space-time, and thus the temperature of the plasma, dropped below 3000 degrees K, The length of time during which this condition prevailed is unknown, but the question before us now is, what kept the plasma confined within the filaments? Why did it not spill out into the voids which surrounded it?

(If you have ever been confused about the concept of positive and negative 'charges,' there is no need to be. This terminology is simply physicists' conceptual shorthand to describe *the behaviour* of the various types of perturbations, manifest as energy-matter, of space-time itself. Physicists talk of protons 'carrying' a positive charge and electrons 'carrying' a negative charge, as if a 'charge' is something protons and electrons haul around in a suitcase. But it is really just a way of describing the behaviour of these sub-atomic particles. According to current theory, unless forced to by the so-called 'strong nuclear force,' 'positively charged' protons simply avoid being in close proximity to other 'positively charged' protons, and 'negatively charged' electrons similarly avoid being in close proximity to other 'negatively charged' electrons. In due course we will introduce a specific explanation for these observations.)

The answer to the questions asked at the end of the previous paragraph is conceptually simple, but the detailed workings of the concept are comparatively complex and beyond the scope of this book. Basically, when charged particles move through space-time they create magnetic fields around their path. The magnetic fields thus created direct the path of the charged particles through space-time. This process is analogous to that concerning large concentrations of mass and space-time. Massive bodies 'tell' space-time how much to curve, and curved space-time 'tells' massive bodies where they can go. When charged particles, which are tiny concentrations of matter, travel through space-time they create magnetic fields which are, in effect, localized

curvatures of space-time, which in turn 'tell' the charged particles where they can go. The overall magnetic field created by the motion of the charged particles through the hot filaments of space-time which existed after the nucleosynthesis process was completed thereby confined the charged particles to the space-time within the filaments, not allowing them to escape into the surrounding voids. This situation existed until the temperature of the filaments dropped below 3000 degrees K, which then allowed the formation of electrically neutral atoms.

It was at this stage that the process we know as 'gravity' began to take effect. The newly stable atoms, mostly of hydrogen and helium, caused minute individual deformations of space-time, very tiny 'valleys,' which had the effect of drawing the paths which the atoms traversed through space-time together, slowly but steadily forming increasingly larger and denser agglomerations of gas. Without the presence of any clumps of dark matter to 'jump start' the process of gravitational 'attraction,' this process could have taken a very long time, perhaps as much as several billion years before enough hydrogen gas was concentrated in clouds dense enough to begin the process of star formation. For that to happen, it was necessary for the temperature of the space-time in the filaments to drop to a level which would permit the hydrogen gas to form into dense clouds; and for that to happen, the overall temperature of the entire bubble of space-time would also have had to sufficiently decrease. However long this process took, from the creation of stable electrically neutral atoms, to the formation of the first clouds of hydrogen gas cool enough and dense enough to develop into stars, the main point is that it was the tiny deformations of space-time caused by the atoms of hydrogen and helium - - - the first effective stirrings in the universe of the process we call 'gravity' - - - that prevented those atoms from wandering off into the voids, confining them to the filaments that have existed ever since the end of the inflationary event, and which we observe today.

The other major question which arises as a consequence of

our model of the large-scale structure and functioning of the Field of Play is what keeps individual galaxies, which are in constant motion, within the bounds of the filaments in which they were formed? Why do galaxies not stray out into the voids that separate the strands of the cobweb?

The conventional answer to this question, the belief currently held by the astronomical and cosmological communities, is that galaxies are held together by the 'force' of gravity, which supposedly keeps them bound together in groups, clusters, and superclusters. But our model makes it clear that gravity is not a 'force' which attracts; rather, it is the curvature of space-time by mass. Galaxies are therefore not attracted towards one another across inter-galactic space-time by some mysterious force. *Galaxies are only induced to move directly towards one another* when their more-or-less random motions through space-time happen to position two galactic valleys close enough together so that their individual gravitational rims overlap, which results in a 'gravitational attraction' between them, as they 'fall down' the sides of their respective valleys towards each other. This is the situation which the Milky Way and Andromeda galaxies are just beginning to undergo.

So, if galaxies are in constant motion, and if they are not bound to one another across space-time by the force of gravity, why have they remained within the bounds of the filaments in which they were formed, and where we observe them to be today, for billions of years? Why have they not moved out into the huge voids which separate the filaments?

We have stated previously that massive bodies move by pulling themselves through space-time. In general, the *velocities* of massive bodies through space-time are determined by the curvature of the space-time through which they travel, but the fact that they are in motion in the first place is due to their ability to pull themselves through space-time. The Earth is pulling itself through the curved space-time of the valley of the Sun at the rate of 30 kilometres per second relative to the Sun. The Sun and the

rest of the solar system - - - the Sun's valley in space-time - - - is orbiting the centre of the Milky Way galaxy at some 230 km per second. The velocity of our entire galaxy itself through space-time is thought to be slightly less than 600 km per second, which means that space-time is constantly passing through your body at that rate. There may be exceptions to this general rule concerning the velocities of massive bodies. Astronomers have now calculated that as a result of the forces created when a merger of two stellar-mass 'black holes' occurs, (our readers know that so-called 'black holes' are actually massive neutron stars), a 'recoil' effect can accelerate the resulting even more massive neutron star to velocities as large as ". . .1500 kilometres per second, which may be fast enough to propel it out of its home galaxy." (80)

We have previously explained that the space-time extending beyond the gravitational rim of any given galaxy is stressed by the presence of the massive neutron star at the centre of that galaxy. This stressing of space-time can extend for up to millions of light years beyond a galaxy's gravitational rim, and contributes to the red-shifting of the light that passes between galaxies. Within any given say, 30 million light-year diameter volume of the space-time within a cobweb filament, there may be dozens of galaxies. Each of them will be contributing to the stressing of the space-time in their region of the filament by a certain amount, determined by the mass of the massive neutron star at their centre. Thus we can say that all of the space-time in that region of the filament will be 'under stress.' By extension, we can say that all of the space-time *within* a cobweb filament will be more highly stressed than the space-time which exists outside the boundary of the filaments in the voids of the cobweb structure.

In order for a massive body to pull itself through space-time, that space-time must be 'stressed.' It is only when space-time is sufficiently stressed that a massive body can get a strong enough 'grip' on the space-time to pull itself forward. The space-time which makes up the voids in the cosmic cobweb is not stressed; it is in a 'relaxed' state of being.

The path that any galactic valley takes through the space-time within a filament is determined by the path taken through space-time by the massive neutron star at its centre. When such a neutron star approaches the edge of the filament in which it resides, it begins to travel through space-time which is progressively less stressed. In order to maintain its momentum, it arcs away from the edge of the filament where the space-time is in an increasingly relaxed state of being, back towards the filament's centre, where it can maintain a better 'grip' on the more stressed space-time which exists within the filament, dragging the rest of the galaxy along with it. This makes it look like the galaxy is being 'pulled by the force of gravity' towards the other galaxies in that region of the filament, but that is not the case. Gravity is not an attractive force. It is the curvature of space-time by matter. Such curvature only occurs within the gravitational rim boundary of any given galaxy.

The galaxy in our example moves away from the edge of the filament and back towards the other galaxies in its region of the filament not because of 'gravitational attraction' but because the space-time nearer the centre of the filament is more highly stressed than the space-time nearer the edge of the filament, allowing the massive neutron star at the galaxy's centre to obtain a better 'grip' and to move through space-time more efficiently. Played out over billions of years, this process inevitably results in the galactic valleys of some of the galaxies within a given volume of the cobweb filament to overlap, resulting in their merger and the creation of ever-larger galaxies.

The process laid out over the last few pages is our proposed explanation for how the large-scale structure of the universe, the cosmic cobweb, was created and has been maintained over the course of billions of years.

Chapter Eighteen

TIDES

* * * * * *

There is one more topic which is bound up with science's (mis)understanding of the nature of the phenomenon we call 'gravity' to which we must now attend, and that is the topic of 'tides.' It has been known for centuries that the moon is the cause of the tidal actions of the oceans on the Earth's surface. However, the details of the current understanding of why the tides occur is based on Newton's erroneous idea that gravity is an attractive force wherein matter pulls on matter. Based on this idea, the current understanding of the tides goes as follows:

> "The gravitational force of the Moon, and to a lesser extent the Sun, raises the ocean tides on Earth. A great bulge of water is pulled up on the side of the Earth facing the Moon, and held there. As Earth rotates beneath the bulge, *high tides* occur. Because of Earth's rotation, the tide seems to move from east to west. If there were only one bulge, we would have only one

> high tide a day. But there are two tidal bulges which cause two high tides each day - - - one every 12 hours and 25 minutes, each followed by a *low tide.* What causes the second tidal bulge?
>
> "Gravitation, remember, weakens as distance becomes greater. So the Moon tugs with greater force on that side of Earth facing the Moon, with less force on matter at Earth's center, and with the least force on Earth's far side. A second tidal bulge thus forms on the far side where a hill of water is "left behind." Since this water is farthest away from the Moon, it is tugged with the least force . . .
>
> "Whenever the Sun, Moon, and Earth are lined up, the Sun's gravitational force added to that of the Moon causes especially strong tides. We call these *spring tides* (but they are not related to the seasons). They happen twice a month, once at new Moon and again at full Moon. When the Sun, Moon, and Earth form a right angle with Earth at the corner, we have especially weak tides called *neap tides."* (81)

The problem with this description of how the Moon creates tides on the surface of the Earth is that, while not, strictly speaking, inaccurate, it camouflages the true explanation. It relies upon the idea that by some mysterious means the matter making up the Moon exerts a 'force' (Newton) that pulls upwards on the matter which makes up the waters of the oceans on the Earth. But Einstein's General Theory of Relativity makes clear that gravity is not some inexplicable force by which matter is attracted to matter; rather it is the curvature of space-time in the presence of massive bodies. Matter does not pull on matter. Matter pulls on space-time. General Relativity states that matter tells space-time how to

curve, and curved space-time tells matter how to move. This is true at all scales, from the galactic down to the sub-atomic. Space-time surrounds and penetrates all material bodies (except neutron stars which are impenetrable), and it is continuous. It is *everywhere*, making up the entirety of the Field of Play. Space-time *is* the Field of Play. So when the Moon pulls on the space-time surrounding it, that 'pulling' is transmitted to, and felt by, the space-time which is penetrating the atoms which make up the waters of the oceans here on the Earth, because the space-time surrounding the Moon and the space-time penetrating the atoms are all one continuous thing. When the space-time penetrating the atoms is pulled upon in this fashion it curves towards the moon (matter tells space-time how to curve,) and then the material parts of the atoms - - - the protons, neutrons and electrons - - - follow that curvature (curved space-time tells matter how to move,) and thus the waters of the oceans rise up towards the Moon in what we call tides.

Therefore it is misleading to simply state that "The gravitational force of the Moon, and to a lesser extent the Sun, raises the ocean tides on Earth," and to leave it at that. That statement implies that some mysterious *inexplicable* 'force' is responsible for raising the tides. But there is nothing mysterious or inexplicable about it. Once we accept the presence of immaterial space-time as a true facet of the fundamental nature of the universe, all the mystery concerning the phenomenon of gravity evaporates.

Nor does the Moon cause the second tidal bulge on the side of the Earth facing away from the Moon by 'tugging' on that water "with the least force," so that "a hill of water is 'left behind.'" No body of water on the side of the Earth facing away from the Moon is "tugged" upon by the Moon, and nothing is "left behind." The fact is that while both high tides are connected to the position of the Moon in the sky, the specific cause of each high tide is actually quite different, one from the other.

Like the Sun and the Earth and all massive bodies, the

Moon creates a valley in space-time as it orbits the Earth, and thus a portion of the Earth is always inside the gravitational rim of the Moon, just as the Moon is within the gravitational rim of the Earth. While the gravitational valley of the much more massive Sun stretches some 1.6 light years from rim to rim, the gravitational valley of the Moon is much smaller. At any given point in time the side of the Earth which is facing the Moon is partially covered by a circular 'valley' in space-time, the diameter of which is approximately 10,380 km, which means that at any given time about 33% of the side of the Earth facing the Moon is within the gravitational rim of the Moon. However, because the Moon's orbit around the Earth is elliptical, this percentage varies as the distance between the Earth and the Moon changes over time. Because the Moon is spherical, the centre of the valley (which, of course, is constantly in motion) experiences the greatest amount of space-time curvature.

Whenever a portion of the Earth's surface comes under the influence of this valley, the space-time which is penetrating the atoms of the matter making up that portion of the Earth is curved towards the Moon, dragging the matter it is penetrating - - - both liquid and solid - - - along with it. Although not so apparent as the tides of the oceans, the land masses of the Earth also feel the influence of the Moon's valley, moving up to 55 centimetres per day in a phenomenon known as 'terrestrial' tides.

Now, imagine the Moon to be positioned in the sky such that the western rim of the valley is situated over the west coast of North America. At this point, in general, the west coast of North America will be experiencing or about to experience a low tide. As the Earth rotates on its axis from west to east, the western rim of the valley will move out over the eastern waters of the Pacific Ocean. As this happens the waters of the eastern Pacific will begin to rise up as the space-time penetrating those waters is increasingly curved towards the Moon.

It is at this point that the Rule of Twelfths comes into play. The Rule of Twelfths is a rule of thumb which can be used to

predict when the tidal flow will be at its strongest. On average, tides change from a low tide to a high tide (the 'tidal range') over a period of 6.2 hours. The Rule of Twelfths states that during the first hour after a low tide, 1/12 of the total amount of the water that will create the next high tide will flow onto the shoreline. During the second hour, 2/12 of the total amount of the incoming tide will flow onto the shoreline. During each of the third and fourth hours since low tide, 3/12 of the total flow will take place. It is during these two hours that the Moon will be the closest to being directly overhead, and thus it is the period when the Moon will most effectively pull on the space-time on the Earth's surface, because it is at this point that the round surface of the Moon is closest to the round surface of the Earth. During the fifth and sixth hours after low tide, as the Moon's gravitational valley moves westward, 2/12 and 1/12, respectively, of the total flow will pile up on the shoreline to create a high tide. This explains why the Moon always appears to be overhead about two hours before the high tide point is reached. At this time the eastern rim of the Moon's gravitational valley will have cleared the west coast of North America, and an ebb tide will commence. The ebbing tide will depart the shoreline in accordance with the Rule of Twelfths.

By the time the eastern rim of the moon's valley crosses the west coast of North America a 'bulge' of water has been piled up along the coastline, resulting in a high tide. Once formed, this bulge continues to maintain its shape due to the Coriolis effect and the friction between the ocean floor and the waters above it, and it then travels across the Pacific from east to west as the Earth rotates underneath it from west to east. As the valley moves westward away from North America the waters along the west coast recede from the coastline, and approximately six hours and twelve minutes later another low tide occurs there.

This dynamic accounts for one of the two tidal “bulges” that occurs each day. The high tide that results from this bulge is called the 'sublunar' high tide. But what causes the other high tide, when the space-time valley of the Moon is on the opposite side of

the Earth? Despite a prolonged effort on our part we were unable to satisfactorily solve this puzzle, so we were delighted to discover astrophysicist Dr. Becky Smethurt's online video titled “Why are there two high tides per day?” which provided us with the correct answer. The cause of that other high tide each day is due to so-called 'centrifugal force.' Here's how it works.

Centrifugal force is calculated according to the formula: Fc = mrw^2, where m is the mass of the object, r is the radius of the circular path, and w is the angular velocity. Imagine an empty 4 litre paint can to which is tied a 3 metre piece of rope. The rope has a ribbon wrapped around it at the 1 metre and 2 metre marks. If we grasp the rope at the 1 metre mark and spin the can around in a circle, the can will experience a certain amount of centrifugal force. If we then grasp the rope at the 2 metre mark and spin the can around in a circle, the can will experience 2 x the amount of centrifugal force as it did initially. The amount of centrifugal force generated is directly proportional to the radius of the circular path.

Now, most people believe that the Moon is revolving around the Earth. But in fact the Earth and the Moon are both revolving around a common point which is called the barycentre. In the Earth-Moon system the barycentre is actually located within the Earth, approximately 4600 km from the centre of the Earth. Imagine that you are situated on the Earth at the point at which the Prime Meridian (0 degrees longitude) crosses the equator (0 degrees latitude) and that the Moon is directly above you. Although there is no land mass there, this point on the globe is known as Null Island. At this point the distance between the barycentre and Null Island is the radius of the Earth (6378 km) minus the distance the barycentre is from the centre of the Earth (4600 km) equals 1778 km. Now imagine a rope of that length connecting the barycentre to Null Island, which is equivalent to the paint can in our earlier calculation. While the barycentre remains fixed in place (for the purposes of our demonstration we will ignore the motion of the Moon because it is relatively minimal) Null Island is moving in a circular motion eastward at a rate of 15

degrees per hour. As a result the distance between the barycentre and Null Island steadily increases, meaning that the 'rope' connecting those two points must lengthen. After twelve hours Null Island has traversed 180 degrees, and is now directly opposite the position it occupied on the globe when we began. The distance between the barycentre and Null Island (the length of the rope) is now the distance from the barycentre to the centre of the Earth (4600 km) plus the radius of the Earth (6378 km) equals 10978 km. Since the amount of centrifugal force is directly proportional to the radius of the circular path, this means that the waters around Null Island (the paint can) are now experiencing a centrifugal force which is 6.2 x as strong as that experienced 12 hours earlier. This increase in the centrifugal force thrusts the waters through which it passes up into the second bulge, creating the second daily high tide experienced by most coastal locations on the planet. This high tide is called the 'antipodal' high tide.

As Null Island continues to rotate around the globe back towards the position of the Moon in the sky, the 'rope' between the barycentre and Null Island is steadily 'reeled in,' reducing the radius of the circular path and consequently reducing the centrifugal force experienced by the waters around Null Island, allowing the bulge to gradually dissipate, until they once again come under the influence of the Moon's valley in space-time and then, twenty-four hours and fifty minutes after the cycle began (the extra fifty minutes are due to the motion of the Moon,) the pattern repeats.

How does this centrifugal force raise up the waters situated along the west coast of North and South America, and the west coasts of Europe and Africa? Imagine that we are back on the west coast of North America which, following a sublunar high tide as previously described, is now experiencing a low tide. The effect of the centrifugal force upon those low tide waters is gradual, and increases steadily over a 6.2 hour period. The waters closest to the coastline feel the effects of the centrifugal force first. As they are thrust upwards by that force, the waters further to the west flow in

underneath them and, in turn, are thrust upwards by the increasing effect of the centrifugal force, as the distance between the west coast of North America and the barycentre steadily increases. This process of up-thrust and inflow continues until the western coastline of North America is 180 degrees from the point on the globe where a line drawn between the barycentre and the Moon crosses the surface of the Earth. At this time the west coast of North America will experience an antipodal high tide.

These two processes, which result in the sublunar high tide and the antipodal high tide, are responsible for creating the two tidal bulges that traverse the waters of the oceans each day. In neither case is some inexplicable force, wherein matter somehow tugs on matter, responsible for the bulge. But these bulges do not determine the specifics of the tidal range or the precise timing of a high tide at any given location. These specifics are determined by the geography of the particular coastal region under consideration, the shape (the 'bathymetry') of the ocean floor, and the harmonic components of what is known as the 'tide-generating potential,' which are complex and which we need not to go into here. The winds and the barometric pressure can also sometimes be a factor.

Now, why do we have 'spring' and 'neap' tides? It is not because some mysterious forces, projected outwards by the Sun and the Moon, have been added together. There are no such 'forces.' We have spring tides twice a month; once at a 'new' Moon, when the Moon is between the Sun and the Earth; and once at the 'full' Moon, when the Earth is between the Sun and the Moon. The key to understanding the phenomenon of spring and neap tides is the realization that even if the Moon wasn't there, we would still have tides on the Earth, albeit lesser ones. Because the Sun is so much farther away from the Earth than is the Moon, its valley is much less able to curve the space-time on the surface of the Earth than is that of the Moon, and thus a purely solar high tide would be lower than a purely sublunar high tide.

During a 'new' Moon the Moon is directly between the Sun and the Earth. In that situation the Sun and the Moon are both

facing the same side of the Earth, which means that their respective valleys combine to pull on the space-time on the Earth's surface more strongly than otherwise, resulting in higher 'spring' tides.

During a 'full' Moon, the Earth is directly between the Sun and the Moon. In this situation the oceans on the side of the Earth facing the Moon are not affected by the valley of the Sun because it is on the opposite side of the Earth, and thus the spring tides experienced by the side of the Earth facing the Moon are purely an effect of the influence of the Moon. During this period the side of the Earth facing the Sun continues to experience the pulling on its space-time generated by the Sun's valley and, usually one or two days after the full Moon, the Sun's valley combines with the centrifugal force that creates the antipodal high tides to produce the highest (and lowest) tides in the entire cycle.

The weakest tides or 'neap' tides occur when the Sun, Moon, and Earth form a right angle with Earth at the corner. In this configuration, which also happens twice a month as the Moon orbits around the Earth, the effect of the Sun's valley in space-time works against the effect of the Moon's valley in space-time. In this situation the valley of the Sun 'drains off' some of the water which would otherwise flow into the valley of the Moon, resulting in less water piling up against the edges of the continents as the Moon moves over them, and hence there are lower high tides.

Thus we see that there is an explanation for tidal activity which is entirely consistent with Einstein's General Theory of Relativity, in which space-time is shaped by matter into interacting valleys, and that it provides an explanation which does not rely in any way upon an inexplicable 'force' as imagined by Newton.

Chapter Nineteen

OUR JOURNEY THUS FAR

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We are nearing the end of our initial foray into the world of physics, into our attempt to provide a basic understanding of how the universe came to be and of how the Field of Play functions. A brief review of our journey is in order.

The universe is a large spherical object with a minimum radius of some 14 billion light years. It is composed of a flexible 'stuff' which, like the Mind of God from which it sprang, is immaterial. We have named this stuff, for now, 'space-time.' Space-time has given rise to 'energy-matter,' which are semi-permanent perturbations of space-time. These perturbations come in a variety of sizes but are all very tiny. Some of them connect together, not altogether unlike pieces of Lego, to form the material objects scattered about the Field of Play.

During the course of our journey we have proposed theories that are alternatives to the currently accepted theories for the phenomena known as 'black holes,' explained the appearance and disappearance of primordial anti-matter, arrived at a more logical explanation for the source of the cosmic microwave

background, and obviated the theoretical need for the ideas of dark energy and dark matter. We have reviewed the history of humanity's understanding of the nature of light, and, per Zajonc, have made the important discovery that light in the form of 'photons' is not a natural occurrence.

In the prologue to this book we stated that Science has made three assumptions about the nature of the universe which we maintain are invalid, and which have led to conclusions about how the Field of Play functions which are incorrect. Thus far we have dealt with two of those assumptions. We dealt first with the assumption underpinning the current interpretation of the Michelson – Morley experiment; the assumption being that the 'ether' (the then current term for what in these pages we call space-time) is, in Einstein's words, "ponderable." When that experiment failed to detect a ponderable ether, Science concluded that no such phenomenon exists.

We have done away with that assumption, and posited instead that the phenomenon of space-time (the ether) exists, but in a non-ponderable, immaterial state of being. We have provided several examples of how this phenomenon makes its presence apparent.

In due course we dealt with the second assumption made by Science which we believe to be invalid, this one made by Isaac Newton; this being the idea that the phenomenon of gravity is effectuated by a force that attracts one material body to another. Hewing closely to Einstein's insight that gravity is not a mysterious force connecting two separate bodies but is rather a result of the curvature of space-time, we have demonstrated that gravity does not extend infinitely outwards so that each gravitating body in the universe is gravitationally attracted to all other bodies in the universe as proposed by Newton, but, rather, that each gravitating body creates a 'valley' in space-time which is surrounded by a 'gravitational rim;' each such valley being limited in scope and relatively local in effect, depending upon the mass of any particular gravitating body.

Putting these two ideas together, the idea of the existence of immaterial flexible space-time with the idea of a localized curvature of space-time by massive bodies, we have concluded that individual galaxy's motions within the Field of Play are generally random, and that therefore all the galaxies in the universe will not, at some future point in time, come crashing together in a 'Big Crunch;' nor is the universe as a whole undergoing a state of generalized expansion. Thus the size of the Field of Play, composed as it is of immaterial space-time and its progeny energy-matter, is, whatever that size actually may be, the same now as it was immediately following the Cosmic Inflation event. Since that time stars, planets and galaxies have been created and begun to move about within the Field of Play, but the overall size of the Field of Play itself has remained constant. The agglomerations of energy-matter within the Field of Play appear to be structured. Individual galaxies are grouped together in clusters, clusters of galaxies are grouped together in super-clusters, and these groupings are separated by vast voids that appear to contain no energy-matter at all.

We have now reached the point in our exploration of the large-scale structure and functioning of the Field of Play where we can, for now, put aside our studies in the field of physics, and turn our attention to a historical review of humanity's understanding of the nature of God. But before doing so, we will take the time to comment on the ultimate goal of physics - - - a set of mathematical equations that would constitute the 'Theory of Everything.' Albert Einstein spent the last twenty-five years of his career on a fruitless quest for this Theory. Modern physics rests upon the twin pillars of the General Theory of Relativity and Quantum Mechanics, two descriptions of the structure and functioning of the universe expressed in the language of mathematics. Bewitched as they are by the power of mathematics, physicists are convinced that if they could only discover a way of combining the equations of these two theories together, the end of their search would be at hand. Like all true believers, physicists are certain that if only the combination

of the equations of these two theories could be successfully achieved, humanity's quest for a true understanding of the universe would be over. It would consist of a few lines of numbers and other symbols from the language of mathematics, and voila, the answer would be revealed. The fact that for 99.9999% of humanity these lines would be just so much gibberish is thought to be of no consequence. The priesthood of Science would know and understand the Truth, and that would be sufficient.

The Holy Grail is thought to be a mathematical description of those forces and particles that existed at the moment of Creation, the Big Bang, or, what we have come to call the 'necessary condition.' Science would then supposedly be able to understand the workings of the force of gravity on the quantum scale. But this Grail is a complete mirage. Gravity is not a 'force.' It is the warping of space-time by matter, and during the time span of the necessary condition, neither space-time nor matter had yet come into existence. Space-time itself only came into existence as a result of the Cosmic Inflation event, and matter, which percolated out of the hot bubble of space-time, only came into existence after the Cosmic Inflation event had been completed. During the time span of the necessary condition, there was only the Mind of God, undergoing transmutation.

Chapter Twenty

Interpreting the Song of Being

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Setting aside for now our exploration of the field of physics, we turn now to the metaphysics of the Game of Being which will involve a study of the implications of the Song of Being. A thorough appreciation of the Song of Being is key to obtaining an understanding of the fundamental nature and purpose of the Game of Being.

Recall that in Part Two we recommended that the reader commit the Song of Being to memory, and that you recite this prayer, ideally, three times each day. Why was this advice given? The purpose of the Song of Being is to teach you how to perceive the world around you in a new and fundamentally different way; not merely as a collection of objects with which you engage in various interactions, but to come to the realization that each and every thing you encounter as you progress through your daily routine and your life in general, animate and inanimate alike, is a direct manifestation of the Mind of God. Like the acquisition of any new skill, this new way of perceiving the universe requires practise and reinforcement. This is particularly important when the ideas are new to you and have not yet been forged into an

innate and routine perspective upon the world. Even after this state of being has been achieved, the regular repetition of the Song of Being is of great value. Life is full of aggravations, both minor and major, and amidst the hurly-burly of it all it is easy to momentarily forget that God is all around us, and that therefore all that we encounter, particularly our fellow humans, are deserving of our love, compassion, and respect.

It is important to be aware in advance of what will happen when one fully embraces the teaching of the Song of Being: that we are all surrounded by the Mind of God made manifest. The objects that make up the world will not suddenly begin to glow. People will not inexplicably acquire halos of light around their heads. There will be no miracles. These teachings do not change the world around you; rather, they change the way in which you, the reciter of the Song of Being, perceives the world. The prayer does not change the world; it changes you. Over time the regular recitation of this prayer will prompt you to become more patient, more tolerant of the foibles and failures of both others and yourself. As you absorb the lessons of the Song of Being you will find it easier to feel compassion for others, and that you are less likely to respond to the actions of others in an inappropriate and unhelpful manner. The deepening awareness on your part that those with whom you interact are direct manifestations of the Mind of God will promote within you the wisdom required to engage peaceably with others in all circumstances, treating each person with dignity and respect no matter what their station in life may be. You will become more grateful for those things that life has given you - - - inanimate objects are also direct manifestations of the Mind of God - - - and be more appreciative of the mere fact of your existence as a human being, and that, as such, you are so privileged to yourself be a manifestation of the Mind of God which is capable of playing such a complex and profound role in the Game of Being. The ultimate goal of the Song of Being is to create within the reciter the state of being known as 'agape,' in both senses of the word: one, as in being wonder-struck by the beauty

of the universe; and two, as a feeling of abiding love for all that the universe contains. To attain such a state of being, even momentarily, is to experience the ecstasy with which God regards the Game of Being.

We shall begin at the beginning:

O God!
Magister of the Game of Being,
Creator of all that is,

These lines are intended as a daily greeting to God, and a recurring acknowledgement on the part of the reciter that there is a Creative Intelligence which is responsible for the existence of the universe. The exclamation mark is employed to add emphasis and to focus one's mind on the task at hand: giving thanks to God for the miracle that is the creation of the Game of Being.

The Song of Being then continues:

We thank Thee
For Thy precious gift:
This miraculous illusion,
This condition we name 'existence,'

With these lines the reciter expresses their gratitude to the Creator for having created the Game of Being. It is only because of the bestowing of this precious gift that our presence within the Field of Play, our being-ness, is made possible. It is only because of the effort made by God to create the Game of Being that there is something rather than nothing. This gift is described as a "miraculous illusion." What do we mean by this phrase?

The Game of Being is "miraculous" because its existence is the consequence of an act of God, and an act of God is, by definition, a miracle. The miraculous creation of the Game of Being proceeded in four distinct stages: one, the creation of the Primordial Atom from the immaterial Mind of God; two, the

endowment of the Rules of the Game unto the Primordial Atom; three, the pressurization and resultant heating of the Primordial Atom, resulting in its transmutation into the 'necessary condition;' and four, the releasing of the pressure confining the Primordial Atom resulting in Cosmic Inflation and the birth of space-time.

We describe the Creator's gift as an “illusion” because it is illusory in several important respects. First is the illusion of the existence of objects. From the point of view of the Creator, which is indubitably the correct point of view, there are no objects, only events. This is so because, as we noted earlier, consciousness is a process. A process is made up of a series of connected events. The belief that the universe is made up of objects moving about in space-time is an illusion caused by the way our brains evolved in order to facilitate the survival of our bodies, and because of our limited frame of reference in regards to time. What appears to be objects moving through space-time are actually a series of events of various duration occurring within the Field of Play. If objects are actually events, and if events are connected parts of a process, and if consciousness is a process, then 'objects' are actually consciousness made manifest. Ultimately, from this perspective there is only the Pure Consciousness of the immaterial Mind of God made manifest, through and by which God experiences an ongoing series of events.

The illusion of the existence of objects gives rise to the illusion of differentiation. We consider ourselves, our bodies, to be different from other objects such as rocks, trees, automobiles, buildings, bodies of water, etc. But at the most fundamental level all things are made up of various combinations of the same four constituent elements: protons, neutrons, electrons, and space-time. Outwardly things appear to be different from one another, but actually they are all just varying forms of the same stuff.

The illusion of differentiation gives rise to the illusion of discreteness, the illusion that we are separate from the objects around us, when in fact everything is connected and a part of a whole. Albert Einstein explained this illusion as follows:

> "A human being is a part of the whole, called by us the "Universe," a part limited in time and space. He experiences himself, his thoughts and feelings as something separate from the rest - - - a kind of optical illusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from the prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty. Nobody is able to achieve this completely, but the striving for such achievement is in itself a part of the liberation and a foundation for inner security." (82)

The regular recitation of the Song of Being is an integral element of the striving to which Einstein is here referring.

Another illusory aspect of the Game of Being which humans experience is the illusion of the solidity of material bodies. For example, a baseball appears to us to be solid and impenetrable when we grip it, but we know for certain that the atoms of which the baseball is made are themselves composed mostly of immaterial space-time, which separates the atom's electrons from its nucleus of protons and neutrons. Like almost all of the material objects roaming around within the Field of Play, the baseball is not really 'solid' at all.

A further illusion of the Game of Being which humans experience is the illusion of stillness, or non-motion. When you are sitting on your couch watching television, you are unaware of the fact that you are hurtling through space-time at the not inconsiderable speed of 30 km per second. In keeping with the Creator's decree that everywhere within the boundary of the Game change shall be unceasing, all material manifestations of the Mind

of God are continuously in motion through space-time, yet we are completely unaware of this motion.

A final illusion of the Game of Being, which is peculiar to human beings, is the illusion of free will. The Game of Being is thoroughly deterministic. The general rule can be stated succinctly: "The inevitable always happens." The key word in the rule is the word 'always.' Its inclusion in the rule means that at all times, and in all places, whatever happens, happens inevitably. The position and momentum in space-time of any given particle at any given moment is uniquely determined by that particle's momentum and position in space-time in the moment immediately preceding that moment. In the long string of moments since the beginning of the Game of Being, each moment in time has been simultaneously both cause and effect, being the effect of the moment immediately preceding it, and the cause of the moment immediately following it. Hence the universe at large is obviously deterministic. It is illogical to think that humans, who are, after all, simply another manifestation of the Game of Being, would somehow be exempt from such a fundamental rule.

With humans this picture is more complex because we are capable of behaviours that are dependent not only on our moment-to-moment position in and momentum through space-time, but which are also dependent on our state of mind. Our state of mind at any given moment is not necessarily uniquely determined merely by our state of mind *in the moment immediately preceding it.* As complex lifeforms we have been endowed by the Rules of the Game with the capacity to formulate memories; mental records of events that have occurred in the recent or distant past. Thus when we find ourselves in a given situation to which a range of alternative reactions (behaviours) is possible we may say to ourselves, "I was in a similar situation last Tuesday. I reacted (behaved) in such and such a manner which brought about such and such a result." You also may say, "I was again in a similar situation last Friday. At that time I reacted in this manner and experienced a different result." Your mind may then evaluate the

two different previous outcomes of the situation in which you currently find yourself, and based upon that evaluation your mind makes a 'choice' about how to proceed (behave) in your present situation. The process described here often takes place without conscious awareness of it on our part. The point, however, is that although it appears to you that you have exercised your free will to make a 'choice' in the present moment, your 'choice' has in fact been determined *by events that occurred in the past.* Thus your behaviour has been inevitably predetermined, and the apparent exercising of your free will is an illusion.

What happens when you find yourself in a situation which is entirely novel to you? In that case you have no memories of previous personal experience to draw upon and evaluate. Your mind will then comb through your memory searching for any information that may be relevant to your current situation. Any such relevant information will then be evaluated by your mind so that a 'choice' can be made as to how to proceed. But here again, while it appears that you make a choice about how to proceed in the present moment, the possible alternatives from which that choice is made, are determined by information concerning prior events that has been stored in your memory.

What if you find yourself in a novel situation and have no information whatsoever which is relevant to that situation in your memory? Then you must proceed solely upon an evaluation of the facts on the ground, that is, the details of the situation in which you find yourself. But those facts on the ground, however they may be arranged, are so arranged as a result of a prior series of events. So once again, any choice made by you concerning how to proceed in any given set of circumstances will have been determined by events that have taken place in the past, and those prior events will have determined the options available to you in the present.

This is not to say that humans do not make 'choices.' Clearly we do. But the choices we make are not 'free' in the sense of being unconstrained. The choices available to us are limited to

the options which are presented to us in any given situation. We cannot choose chocolate ice cream if only strawberry or vanilla are available. Our choice of either strawberry or vanilla or to have no ice cream at all will then depend upon our experiences with those two flavours *in the past.* And the very availability of those two flavours and no other will have been determined by a series of *prior* occurring events. Karl Marx stated this idea much more eloquently when he wrote:

> "Men make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstances existing already, given and transmitted from the past." (83)

Thus as the present continuously evolves out of the past the details of that evolutionary process are determined by prior events, and the experience that we have of making a 'free will choice' in the present moment is an illusion, and so the general rule, that the inevitable always happens, holds. Having said that, humans will continue to act and to structure their societies on the belief that as individuals we possess 'free will.' That is the nature of an illusion. Like the other illusions we have referred to, such as the illusions of solidity and non-motion, the illusion of free will is so complete and overwhelming that we are compelled to live our lives as if it were an actual facet of our experiences in the Game of Being. This analysis of the illusion of free will makes more profound George Orwell's insight that "He who controls the present controls the past, and he who controls the past controls the future."

The next line of the Song of Being is "This condition we name 'existence.'" The significance of this line is two-part. The word "condition" refers to our over-all state of being, the fact of our existence, *that* which is *conditioned by* the illusions to which we have just referred. The second part of this line is intended as a recurring alert to the reciter to be continually aware of the pitfalls

that accompany our everyday usage of the tool of language.

Of all the tools invented by humankind probably none has been more consequential than the invention of language. Virtually all that humans have shown themselves to be capable of are dependent upon the tool of language, which allows us to exchange ideas and convey concepts. The various civilizations that have risen and fallen over the course of human history clearly could never have existed without this most basic of tools. Language is obviously a very useful and a very powerful tool. Ronald J. Parsons, a member of the Baha'i faith, expressed some keen insights into the power of language in a pamphlet entitled *The Veils of Names:*

> "One of the obvious characteristics of we human beings is our interest in names. Not only do we have names for ourselves, but we put names on everything around us. This is certainly a most practical habit. How could we communicate clearly with one another without having generally acceptable names for all things on earth, and in heaven too? Helpful as it is to classify the whole of creation, there are some hidden dangers in doing this.
>
> "Names are oftentimes intended to define, or at least to convey something of the reality of, the things to which they have become attached. Especially in ancient times, we are told that the knowledge of the correct name of something or someone, the grasping of its secret essence, could bestow a special power upon the one who had uncovered that secret. Naming was then, in this respect, an attempt by primitive man to control the otherwise uncontrollable, mysterious, and dangerous world around him.
>
> "Unfortunately, names can also be hurtful

> things as anyone who has been on the receiving end of prejudicial remarks can readily testify. Some of us may recall this sort of taunting rhyme used when we were young to deflect the sting of name-calling: 'Sticks and stones may break my bones but names can never hurt me!' The truth was, of course, that names could and did hurt a great deal. Certain kinds of names can become so hurtful that they release destructive forces which cause immense human suffering, and generate hatreds which can endure for generations." (84)

Thus the tool of language, like many powerful tools, is a two-edged sword. While its utility cannot be denied, it does have some drawbacks. The naming of a thing draws a veil over that thing which tends to obscure our perception of it. The writer Amit Chaudhuri has noted, "Once we're aware of language it becomes, for us, the world it refers to." (85) The naming of a thing comes between us and our direct experience of that thing. When, in our minds, we substitute the name of a thing, a symbol, for the direct experience of that thing itself, we begin the process of taking the existence of the thing for granted. Because we have names for everything this process becomes pervasive and all-encompassing, and we then perceive our world as being filled with innumerable mundane objects. This process blinds us to the truth that *every object* is a direct manifestation of the Mind of God, a precious being which is a part of the unfolding miracle that is the Game of Being. The poet Paul Valéry has written, "To see is to forget the name of the thing one sees." (86)

Thus language acts as a powerful reinforcement of the illusions of differentiation and discreteness, the illusions that, as individuals, we are different and separate from the rest of the manifestations that populate the Field of Play. These illusions lie at the base of all human strife, divisiveness, and conflict. It is

important to grasp that these two illusions are necessary aspects, perhaps indeed the ultimate goals, of the Game of Being. For the Creator thought, 'Through my playing of this game *I* shall experience existence, *in all its myriad forms*.' So the existence of apparently different and separate manifestations is essential to the fulfillment of God's purpose in creating the Game. However, as highly complex purposely aware manifestations within the Game it is equally important, and to our benefit, for humans to grasp that these illusions shroud the essential 'Oneness" that underlies all that exists. Thus the thrice-daily repetition of the phrase "this condition we name 'existence'" is intended to regularly alert the reciter to the illusions in which our lives are enmeshed, and to how our practice of naming things contributes to these illusions, while at the same time raising our awareness of the Oneness of the Mind of God which is the source of all things.

The Song of Being continues:

And for allowing us,
Awareness of Thy presence,
As all transitory phenomena.

These lines express the gratitude of the reciter to the Creator for the fact that, due to the complexity of our Awareness Connectivity Systems (more on that presently), humans are privileged to be able to conceive of the idea of a Creative Intelligence which is responsible for all that exists, and that this Creative Intelligence is present as all the objects that surround the reciter. The last line reminds the reciter of the transitory nature of all the manifestations which make an appearance within the Field of Play, in keeping with God's decree that 'all beginnings must have an ending.'

The second verse of the Song of Being begins with the lines:

Wherever we look,

We see Thy face.

We have stated previously that the Creator's primordial state is formless, shapeless, featureless, and that therefore in that state of Pure Consciousness, *without* the boundary of the Game of Being, God has no face. However, *within* the boundary of the Game of Being, where all things are direct manifestations of the Mind of God, each and every object, animate and inanimate alike, can, and we suggest should, be interpreted as a revealed representation of the face of God. The purpose of these two lines is to encourage in the reciter the belief that they are enveloped by the presence of God, and should therefore interact with the manifestations which they encounter in an appropriate manner of reverence and respect, especially those manifestations who share in our sentience.

To continue, the Song of Being says:

Whenever we listen,
We hear Thy voice.

In the primordial state the Creator possesses no lips, tongue, or vocal chords, no hands to clap, no fingers to snap, no legs to rub together cricket-like, no way to make a sound. Moreover, in God's realm of Pure Consciousness there is no atmosphere, no air in which a sound wave could propagate. Here, however, on this planet within the Field of Play things are different. All things within the Field of Play are direct manifestations of the Mind of God, and so it follows that all the sounds that contribute to our experience as manifestations of the Game of Being are properly regarded as the voice of God. The ringing of a bell, the robin's song, the roar of a Harley-Davidson motorcycle, an aria sung by a soprano, a baby's cry, the wail of a siren; these and all other sounds are the voice of God speaking to us.

When it comes to words spoken by humans the situation is more complicated. Humans, like everything else, are direct manifestations of the Mind of God and therefore the sounds they

make are also properly considered to be the voice of God. However, due to the complexity of the human Awareness Connectivity System, the spoken (and by extension the written) word must be understood as communication by God that has been *transposed* by the human intellect.

The manifestations of the Mind of God known as 'humans' are complex beings. The core of their Awareness Connectivity System, their brain, is the most complex single object in the known universe. When we try to come to grips with an understanding of human behaviour, a comparison with a computer program is somewhat helpful. It is a fact that the more complex a particular computer program is, the more 'bugs' its early versions will contain. In this context, humans may be thought of as a program that is still plagued by serious 'bugs.' Humans are a tempestuous lot, given to indulging in reckless passions. Whether in error or purposefully, they frequently communicate in ways that are inaccurate, hurtful, or hateful. These behaviours arise primarily because humans are confused about, and unaware of, what they are. Thus their communications often reflect this confusion and lack of awareness.

How, you may ask, can the Creator, whom we have assumed to be perfect, make inaccurate statements? The answer is that the Creator is perfect, without flaw, but that the manifestations of the Mind of God which appear in the Game of Being are not. When it comes to understanding human behaviour, a useful metaphor is to think of God as a vehicle and humans as the driver of the vehicle. Sometimes, humans, enmeshed as they are in a fog of illusions and confused as to what they are and why they are here, crash the car.

The three traditional monotheistic religions dominant in the world today, Judaism, Christianity, and Islam all make the claim that their 'sacred texts' are, by definition, the words of God delivered to special messengers who recorded those words for posterity. Those beliefs are not incorrect. These 'sacred texts' are undoubtedly the words of God. It is not possible for them to be anything else. Their error, common to all three of these religious

traditions, lies in the narrowness of this definition, and the error is compounded by a stubborn and illogical belief that their particular messages (because these messages, and these messages alone, are 'the words of God') are inerrant. History clearly demonstrates that these twin errors inevitably bring the adherents of these three belief systems into conflict.

These competing claims concerning their 'sacred texts' have blinded their adherents to the truth: that all the words that have ever been spoken or written are the words of God, *as transposed by the human intellect.* Because the human intellect is a manifestation of the Mind of God that resides within the Game of Being and is therefore imperfect, the particular messages contained in these 'sacred texts' are, since they are the products of the human intellect, necessarily and inevitably incapable of being free from error. These 'sacred texts' are no more, and no less, the words of God than any other statement ever made in any place or at any time, and like any other statement ever made these texts are not inherently inerrant.

This truth, that all spoken and written words are the voice of God made manifest, imposes a great responsibility upon humans, both as the speakers of words and as the hearers of words. As the speakers of words it is incumbent upon each human to make accurate and truthful statements, and to deliver them in a manner that is consistent with the ideals of love, acceptance, and compassion. As the hearers of words it is incumbent upon each human to exercise sound judgment in the evaluation of the words received. The Rules of the Game have equipped humans with a 'logic calculator' which should be regularly employed to evaluate any messages received. Can the speaker be relied upon to be truthful? Is the speaker's message self-serving? Does the speaker appear to be motivated by the ideals of love, acceptance, and compassion? Does the message seem to be crafted to appeal to logic and reason, or is its content and delivery designed to appeal to emotions and to arouse reckless passions?

It is of vital importance that humans apply these questions

to the messages they receive, particularly when it comes to messages that can affect entire societies, for terrible things can result if they do not. Logical consistency demands that the words of Adolph Hitler be considered to be the words of God every bit as much as the words of Moses or Jesus Christ or Muhammad. But Hitler's words were not motivated by the ideals of love, acceptance, and compassion; rather they were hateful, destructive, and dangerous. The German people did not use their faculties of reason to question the path down which Hitler was leading them, and too late and to their great dismay did they realize that they had been taken in by the ravings of a sociopath. The inability or unwillingness of the German people during the 1930's to live up to their obligations to carefully evaluate the message they were being given led directly to the deaths of millions of people.

These last four lines of the Song of Being which we have been examining, beginning with "Wherever we look" and ending with "We hear Thy voice," are also a useful shorthand that can be employed as an aid in maintaining our equanimity in our interactions with other humans. When disagreements arise, humans, in their current stage of evolution, are frequently psychologically predisposed to attack other humans personally and as groups of individuals. In these circumstances the silent repetition of these four lines serves as a gentle reminder to us that we are engaged in an interaction with a manifestation of the Mind of God, who is thereby deserving of being treated with dignity and respect, regardless of any differences of opinion you may share. This practice and mindset can go a long way towards reducing emotional argumentation and open conflict.

The Song of Being continues:

In all that we touch, taste, or scent,
We find the essence of Thy being.

These two lines affirm that in all the ways that humans gather information about the world around them, that information

arises from the omnipresence of the Mind of God made manifest.

The next verse of the Song of Being begins with the lines:

Our journey of experience is Thy journey,
Our quest for happiness, Thy quest.

From the moment of our conception to the moment of our death, the wandering path that we take is a path, one of many, many paths, taken by the Creator. All that we experience, the Creator experiences. Our search for happiness is innate and is driven by the Creator's desire for happiness which, as you will recall, is one of our theology's basic assumptions concerning the nature of God.

The Song of Being continues:

And our grateful acceptance
Of its joys and sorrows, toil and wonder,

To exist as a human being is a complex challenge, far more so than being an inanimate object, say a chair, or another animate being, such as a tree. The journey of each individual human is along a path that is sometimes level and smooth, sometimes rocky and steep. If we can learn to traverse both segments of the path with an attitude of grateful acceptance, we can approach the state of mind possessed by the Creator who walks, through us, the same path we do. The Creator exults in the joys and wonders, and gratefully accepts the sorrows and toil, in the full knowledge that they, too, are an inevitable portion of the journey of being human.

The Song of Being continues:

Revealing our deep devotion
To one another,
And to all that exists
Not least,
The manifestation we call our 'self,'

Is the fulfillment of Thy desire.

When we accept the idea that all things are a direct manifestation of the Mind of God, and if we cultivate an attitude of grateful acceptance towards all that we experience, we will find that feelings of devotion towards all the other manifestations populating the Field of Play flow naturally from the achievement of that state of mind. It is important to emphasize that what is required is a particular *state of mind*. What under girds this revealing of devotion towards others is a conscious decision, an intellectually based choice, to believe that all things are a direct manifestation of the Mind of God, and an understanding and acceptance of the fact that the inevitable always happens, and that therefore whatever happens should be gratefully accepted. Given the current state of human civilization, this is frequently no easy task.

The revelation of devotion to others depends upon a specific thought process. There are some religious denominations, notably so-called 'born again' Christians, who preach that the path to this goal involves 'opening your heart' to Jesus. This is nonsense. The heart is a mere pump whose function is to pump oxygen laden blood around your body. Unless done by a skilled surgeon, if you open up your heart you will die. What humans need to open is not their hearts, but their minds.

This passage also serves as a reminder that these feelings of devotion should be extended to ourselves. Our bodies are manifestations of the Mind of God and are therefore deserving of an appropriate standard of care. The word 'self' is in quotes in order to remind the reciter that it is merely a symbol, a written representation of the miraculous being that the reciter actually is: an element in the unfolding miracle that is the Game of Being, and is something that in no way should be taken for granted. When we structure our minds in this manner, it becomes possible to align our thoughts and thus our behaviour in such a way that leads to the fulfillment of God's desire.

Chapter Twenty-one

CONSCIOUSNESS, AWARENESS, AND REALITY

* * * * * *

The fourth verse of the Song of Being begins:

For Thee are we,
And we are Thee,
Burst forth from singularity.

These phrases are the most direct, most clarifying statements of the belief that humans (and everything else) are direct manifestations of the Mind of God. The thrice-daily repetition of these words serves to instruct and remind the reciter that since he or she is the Creator made manifest in human form, and since one of our basic assumptions is that God loves the Game of Being and all that it contains, every individual human being should therefore behave accordingly, by endeavouring, to the greatest extent possible, to love all that exists.

The last of these lines reflects humanity's current understanding of how the Field of Play came into being. The

metaphysics of the Game of Being posits that the universe began when a portion of the immaterial Mind of God was compressed into a hot dense state some have called a 'singularity,' a single point of apparently infinite density, which subsequently expanded and evolved into the Field of Play as we observe it in our time.

Another interpretation of this last line is that in the act of Creation the Mind of God - - - the formless, shapeless, featureless, nebulous non-corporeal field of Pure Consciousness - - - burst forth from its singular state into the multiplicity of forms which today populate the Field of Play.

The fourth verse of the Song of Being continues:

Each being all,
All beings each,
A continuum, complex, ever-changing yet,

The poet Robinson Jeffers has stated:

> "I believe that the universe is one being, all its parts are expressions of the same energy and they are all in communication with each other, influencing each other, therefore parts of one organic whole." (87)

There is now evidence from the field of quantum mechanics which supports these ideas. But before we explore this evidence we must first achieve some badly needed clarity regarding the definitions of some basic essential concepts, the two most important of which are 'consciousness' and 'reality.' The field of study investigating these concepts is littered with a confusing mélange of over-lapping terminology which inhibits the achievement of a clear understanding of these concepts. In the literature one comes across the following words and phrases: that consciousness is something that is possessed by certain manifestations; that other manifestations may possess a

rudimentary or primary form of consciousness; we read of conscious awareness; that those who possess consciousness are said to be conscious; we find references to a pre-conscious universe; a pre-conscious reality; objective reality; subjective reality; material reality; physical reality; pre-existing physical reality; reality-in-itself; nested realities; classical reality; and real reality; among others. Given this hodgepodge of terminology it is little wonder that 'consciousness' and the related phenomenon of 'reality' are considered to be 'the hard problem.'

The metaphysics of the Game of Being provides a simplified solution to this situation. This metaphysics claims that prior to the creation of the Game of Being, before the Field of Play came into being, there existed a 'field' of Pure Consciousness, which we have labelled the 'Mind of God.' This field of consciousness is infinite in extent and is eternal; it has always been and always will be. The field, being composed of thought, is, like thought, immaterial. The field is self-aware and is capable of remembrance. The field is capable of experiencing what humans would recognize as 'emotions'. The field possesses abilities and powers about which humans can only speculate. Using these powers this field of Pure Consciousness took a portion of itself - - - that being the only 'stuff' available - - - and in a deliberate process, the individual steps about which we have previously speculated, set in motion the creation of the Field of Play. Thus we arrive at the understanding that the Field of Play, and all that inhabits it, are 'made of' the Pure Consciousness of the Mind of God. Therefore consciousness is not something we 'possess'; rather, it is what we humans, and all the other manifestations within the Field of Play, are. Everything is the Pure Consciousness (thought) of the Mind of God made manifest.

At root, consciousness in action is the unfolding of the continual process of becoming ever new and different manifestations within the Game of Being. This definition is consistent with our view, previously stated, that the Game of Being consists of events, rather than objects. We are the fleeting thoughts

of the Creator who directly experiences those thoughts when they are made manifest within the Field of Play in accordance with the Rules of the Game.

There are three main categories of the Pure Consciousness of the Mind of God as it is manifest within the Field of Play. These are, in order of their relative amounts present within the Field of Play, space-time, inanimate objects, and lifeforms. Space-time is the basic component of the Field of Play and it plays multiple roles. We have already discussed its role as the medium by which electromagnetic radiation and gravitational waves propagate, and the role it plays in the phenomenon we call 'gravity.' Beyond these 'physical' roles (remember that space-time is in itself immaterial) space-time plays an important additional metaphysical role in the Game of Being: it is the presence, the mechanism, through and by which the Creator is made aware of the events taking place within the Field of Play. It is, in effect, God's sensory system. This is possible because space-time envelopes and permeates all things - - - with the exception of neutron stars - - - that exist within the Field of Play.

We stated earlier that the Mind of God is self-aware. Space-time, being the immediate direct manifestation of the Mind of God, shares in that awareness. We define this awareness as possessing the ability to perceive one's environment. Thus the Creator is able to perceive the events which occur within the Field of Play via the omnipresence of space-time.

The other two main categories of things inhabiting the Field of Play, inanimate objects and lifeforms, (in general, those manifestations which are *material*) though they, too, descended as they are from space-time, are the Pure Consciousness of the Mind of God made manifest, are unlike space-time in that they do not innately possess the capability of awareness. The capacity for awareness is what divides lifeforms from inanimate objects, and that capability is made available to lifeforms through what we call Awareness Connectivity Systems, which connect lifeforms to the state of awareness inherent in the space-time which surrounds and

permeates those lifeforms.

All lifeforms, animal and plant, possess an Awareness Connectivity System, which vary in their capacity to connect to the awareness inherent in space-time. In general, the more complex and sophisticated the Awareness Connectivity System (ACS) a given lifeform possesses, the more detailed, dynamic, and profound is the reality that lifeform will be able to construct.

As an analogy, a comparison to word processing programs is appropriate in this regard. Just as Microsoft Office is a more complex and sophisticated program than is Wordpad, granting the user access to a more detailed and dynamic set of word processing tools, so too does the ACS of a human being grant that human being access to a more dynamic, detailed, and profound reality than does the ACS of, say, a frog, or a tomato plant.

Because space-time is itself immaterial and all-enveloping and permeating, there is no discernible signal between a given ACS and space-time. The signal is ethereal and cannot be detected or observed.

The human ACS, consisting of our brain, nervous system, and the five senses constitutes the most sophisticated ACS we have yet observed. The human brain is the most complex single object in the known universe.

> "The adult human brain weighs about 3 pounds and contains about 100 billion nerve cells, or neurons. The most recently evolved outer corrugated mantle of the human brain, the cerebral cortex, contains about 30 billion neurons and 1 million billion connections, or synapses. If we counted one synapse per second, we would not finish counting for 32 million years. If we considered the number of possible neural circuits, we would be dealing with hyperastronomical numbers: 10 followed

> by at least a million zeros. (There are 10 followed by 79 zeros, give or take a few, of particles in the known universe.)" (88)

You might expect that a communications device as complex and sophisticated as the human brain would have an on/off switch, and indeed it does. This function within the brain is carried out by the so-called reticular activating system and it operates like a dimmer switch. It is located in the evolutionary older part of the brain, which suggests that it may well be shared with other animals. Edelman and Tononi state:

> "It is now well established that the activity of the reticular activating system is essential for maintaining the state of [awareness.] For example, this system is important in determining whether we are awake or asleep. During wakefulness, when this system is active . . . thalamocortical neurons . . . respond well to incoming stimuli. During dreamless sleep, this system becomes less active or inactive; thalamocortical neurons . . . are hardly responsive to incoming stimuli. Moreover, if this system is lesioned, all [awareness] is lost, and a person enters a state of coma. On the basis of these observations, it has been suggested that the reticular activating system may have *a privileged and direct connection* (italics added) to conscious experience." (89)

(We have inserted [awareness] where Edelman and Tononi used the word "consciousness" for reasons which will become clear in a moment.)

In other words, in our view, the reticular activating system plays the role of connecting the human ACS with the universal awareness made available by the all-encompassing presence of space-time, thereby conferring the capability of being aware onto each individual human being.

It is worth noting that, while all human brains share the same general structure, due to their vast complexity each human brain is unique, which obviously means that each human being is a unique manifestation of the Mind of God.

All animals, even the most rudimentary, possess an ACS to some degree. The most basic of microbes, with no brain or identifiable nervous system, have been shown to be capable of being aware of their environment.

It is now very clear that plants, as lifeforms, also possess an ACS. According to Vladimir Karamanov, director of the Laboratory of Biocybernetics of the Institute of Agrophysics in Leningrad, it is an obvious fact that plants are aware of their surroundings:

> "That plants are able to perceive the surrounding world is a truth as old as the world itself. Without perception, adaptation does not and cannot exist. If plants had no sense organs and didn't have a means of transmitting and processing information with their own language and memory, they would inevitably perish." (90)

In recent years more and more research has demonstrated that plants are aware of their environment, communicate with one another, possess the capacity for memory, and are able to adapt to a change in their situation. In other words, plants are capable of learning. All of these behaviours are possible because, while they lack a complex brain, plants do possess a type of 'nervous system.'

That nervous system constitutes their ACS, which allows them to connect to the universal awareness made available by the all-surrounding and all-penetrating presence of space-time.

One plant that has for centuries intrigued scientists with its amazing behaviour is called *Mimosa pudica,* popularly known as 'touch-me-not.' In an article titled "The Sensitive Plant," published in Lapham's Quarterly, the author Virginia Morell writes about this plant saying:

> "A member of the pea family, *M. Pudica* is a small plant with tiny leaflets paired along the length of each stem and pretty lavender-pink globular flowers . . . that exhibits a fascinating behaviour: if you touch a single leaf, the plant will swiftly fold up all its leaves before your eyes. Only a soft touch is required to bring on this collapse; after a while, you can also watch as the wilted-appearing mimosa sets about righting itself, and reopening its leaves . . . mimosas, in addition to touch, also droop as soon as the sun sets, when they are bumped, when water droplets fall on them, or when a slight breeze stirs their leaves." (91)

Further on in her article Morell relates the work done with mimosas by the ecologist Monica Gagliano at the International Laboratory of Plant Neurobiology at the University of Florence in 2013. Gagliano devised a simple experiment to test whether or not mimosas could learn from past experience. The basis of the experiment was the idea that the observed behaviour of the mimosa was a defensive tactic in response to a perceived threat. Gagliano's experiment, involving seventy-two mimosas, tested the plants' response to being repeatedly dropped a short distance, and in a

separate test, being gently shaken. Initially, after undergoing the drop test, each mimosa immediately folded up its leaves as expected. But Gagliano found that after allowing the plants to recover after each drop, and then dropping them multiple times over a short period of time, the mimosas stopped curling up their leaves when dropped. It took only four to six drops for this change in behaviour to occur. Clearly, the plants had concluded that being dropped a short distance was not a threat.

After learning this lesson the mimosas were placed on a vibrating plate which gently shook them. Every plant tested immediately folded up its leaves, demonstrating that they perceived the shaking motion as a new threat, which they differentiated from that of being dropped. After being allowed to recover from the shake test the mimosas were immediately put through one more drop test to see whether or not they had retained a memory of this earlier experience. During this test not one of the mimosas that had gone through the drop test training folded up its leaves. Three days later, and then one month later, Gagliano performed another drop test on the mimosas. None of them folded up their leaves in response. She wrote, "They had the faculty of memory, and their behaviour was not hardwired in DNA, but learned."

Later in her article Morell notes that in the nineteenth century Charles Darwin concluded that "...a plant was basically an inverted animal, with its brains [the roots] on the bottom, growing in the dark, while its sexual organs were on top, waving about in the sun." Morell goes on to report:

> "The idea of "plant memory" has taken much longer to develop, but few scientists today---perhaps none---currently oppose it. Since the 1980s researchers have discovered that certain plants remember experiences of drought, salinity, extreme temperature variations, diseases, and herbivore attacks . . .

> But where in plants do memories reside, and how are they formed? . . . Intriguingly, scientists have discovered that memories, or "stress imprints," in plants involve calcium channels as well as the stress hormone abscisic acid, epigenetic regulation, and transcription priming---basically, the same mechanisms and chemicals animals use to form memories
> . . .
> [Whether or not all plants have memory is an open question,] however, it's likely that many do, simply because memory . . . is such a useful thing to have. After all, the challenges that every living organism face are the same: finding a suitable habitat and enough to eat, and surviving long enough to reproduce and ensure our offspring's survival. The apparent solution for all of these would be to develop the ability to remember the good and bad moments, and to draw on these memories to help overcome future pitfalls. There's something reassuring about living among beings that, as a consequence of shared origins, use similar mechanisms to solve life's basic problems." (92)

There are many other examples of plants being aware of and responding to changes in their environment. Writing in the September 25– October 1, 2021 edition of the weekly magazine New Scientist, Heidi Appel, of the University of Toledo in Ohio, who does research on how plants respond to the vibrations that occur naturally in their environment noted:

> "We know that plants can sense some vibrations that are important to them. Some plants like tomatoes are "buzz pollinated" and only release pollen when the anthers in their flowers experience the wing beat frequency of a pollinator." (93)

In their July 31-August 6, 2021 issue under the headline "Tomatoes' inbuilt attack warning," New Scientist staff member Clare Wilson reports:

> "Tomatoes that are being eaten by insects use electrical signals to send an alert to the rest of the plant, similar to the way our nervous systems warn of damage. The messages seem to help the plant muster defences such as releasing hydrogen peroxide, a chemical that combats microbial infections of damaged tissues.
>
> "Plants lack the neurons humans have for sending electrical signals, but they do have long, thin tubes called xylem and phloem for moving sap between their roots, leaves and fruit. Charged ions flowing in and out of these tubes can propagate electrical signals around different parts of the plant in a similar way to neurons.
>
> "Previous work found that leaves that are damaged send electrical signals to other leaves. Now, Gabriela Niemeyer Reissig at the Federal University of Pelotas in Brazil and her colleagues have found this also happens with fruit. They studied small cherry tomato plants by placing them inside Faraday cages, which block external electrical fields, and confined caterpillars of the moth *Helicoverpa armigera* on the surface of fruit within plastic bags.

> "Electrodes placed in the fruit stalks showed that the patterns of electrical activity changed during and after the caterpillars started eating (Frontiers in Sustainable Food Systems, *doi.org/gpfr*). "We can find a [distinct] pattern in the electrical activity when an insect attacks," says Niemeyer Ressig. There was also a rise in levels of hydrogen peroxide produced by untouched fruit and leaves all over an attacked plant." (94)

Dr. Suzanne Simard, professor of forest ecology at the University of British Columbia and author of the book, *Finding the Mother Tree: Uncovering the wisdom and intelligence of the forest,* announced in 1997 that she had discovered what she called the "wood wide web." In an interview with Simard in the May 1-7, 2021 issue of New Scientist, podcast editor Rowan Harper writes:

> "[Simard] had discovered that forest trees share and trade food via fungal networks that connect their roots . . . Among other things, [her] research shows that the wood wide web is like a brain and can communicate information throughout the entire forest, *that trees recognize their offspring and nurture them* (italics added) and that lessons learned from past experiences can be transmitted from old trees to young trees." (95)

During the interview, Simard stated that her research has revealed that the plants in a forest are all connected by what is called a mycorrizal network which is made up of a number of different species of fungi. She has found that these fungi

> "all have different roles in extracting resources

> and moving things around. If you change the composition of that fungal community, you actually change how nutrients and carbon and water are moved around . . .[Significantly] the chemicals that are moving in those networks include glutamate, which is one of the dominant neurotransmitters in brains." (96)

Simard believes that the forest system as a whole demonstrates a kind of intelligence, and that trees in particular, by showing that they are capable of recognizing and favouring their kin, exhibit wisdom. If one defines wisdom as the act of making the best choice available from among a number of alternatives, her view may not be as far-fetched as it sounds.

These examples make it obvious that Karamanov is absolutely correct, and that plants demonstrate an awareness of their environment in a manner which is very similar to that of humans and other animals. From whence does the awareness of each individual lifeform arise? The fact that all lifeforms demonstrate an awareness of their environment may be taken as evidence for the proposition that the universe at large is aware. While the structural specifics are different, it is clear that plants, as lifeforms, possess an ACS which provides them access to the universal awareness that is embodied in space-time.

Thus the metaphysics of the Game of Being teaches that consciousness is not something peculiar to humans, but is rather that of which all manifestations within the Field of Play, animate and inanimate alike, are formed. All animate manifestations possess an Awareness Connectivity System, which provides them with the ability to perceive their environment. The structure and capability of any particular ACS varies from one type of lifeform to another, and varies in precise detail from one individual to another in those animate manifestations which possess a highly evolved and sophisticated type of ACS, such as humans and other 'higher' animals. In general, the more complex the ACS, the wider is the

'bandwidth' of its connection to the universal awareness embodied in space-time. The interaction between each individual ACS and its environment gives rise to an individual reality for each lifeform. The wider the 'bandwidth' possessed by a given lifeform, the more detailed and profound is the reality it can fabricate. On the scale of the entire universe, this structure to the Field of Play and its contents provides the Creator, who directly experiences all those individual realities, with an almost unlimited variety of experiences, which is, after all, the purpose for which the Game of Being was created.

The structure of the ACS in humans is so advanced that humans are not merely aware of our general environment, we are also aware of being aware, and are able to ruminate on the fact of our own very existence. As far as we have thus far been able to discern, we are the only lifeforms on the planet capable of this kind of introspection. For all we know, and very possibly for all we will ever know, humans may be the only manifestations anywhere in the universe who possess an ACS which is capable of providing this function. It is a generally held belief that this capability of being aware that we are aware is what is meant by the term "consciousness," and that therefore consciousness is a phenomenon that is indeed unique to the human experience. It should be obvious from the foregoing discussion that we do not accept this definition. We believe that it is too narrow and restrictive, and that it leads to confusion and misunderstanding. The human ability to be aware of being aware is not consciousness, but, rather, is an advanced form of awareness itself, conferred on humans through their possession of a highly evolved ACS. Consciousness, on the other hand, is not something we possess; it is what we are. This statement is consistent with the belief that the universe as a whole consists of the Pure Consciousness of the Mind of God made manifest.

This approach to an understanding of consciousness resolves the age-old debate over what consciousness is and who, and who does not, possess it. At the same time it allows for the

recognition that all lifeforms are aware, a category of behaviour sometimes formerly (and confusingly) referred to as 'conscious awareness.' Further, it resolves the argument over the status of potential android beings such as the fictional character 'Data' on the TV series *Star Trek Next Generation.* If it ever becomes possible to create such a being, they would obviously be made of atoms and would therefore be, like all manifestations, Pure Consciousness made manifest. And Data was obviously aware, which means that, by necessity, he must have been in possession of a human-made ACS. Whether or not the creation of such a being will ever be possible only time will tell. Progress towards such an outcome is being made with modern computer technology. It can be argued that the voice command system known as 'Siri' possesses a limited form of awareness. Who knows what the future will bring?

This careful differentiation between the phenomenon of consciousness and the phenomenon of awareness provides clarity to the formerly confused understanding of these concepts. Through the embrace of this formulation we arrive at clear idea of *what* these phenomena are, which is a field of study proper to philosophy in general, and to metaphysics in particular. What this formulation does not resolve is the specifics of *how* any given ACS works. That is a question to be answered by the fields of neuroscience and neurobiology.

At the beginning of our discussion of the concept of consciousness we quoted the poet Robinson Jeffers who believes that the universe is one organic being whose constituent parts are in communication with one another, and stated that there is evidence from the field of quantum mechanics which suggests this may be true.

In classical physics, i.e. physics as it was understood before the advent of quantum mechanics, there was a bedrock principle known as the principle of local causes. Albert Einstein was very committed to this principle. This principle states:

". . . that a physical event cannot simultaneously

> influence another event without direct mediation such as the sending of a signal. This means . . . that a measurement of one particle cannot simultaneously affect the measurement of [a] second particle in a space-like separated region." (97)

"A space-like separated region" simply means that the two particles in question are separated from each other in space. In 1982 physicist Alain Aspect and his colleagues at the University of Paris-South published the results of an experiment, which have since been replicated by others, that invalidated the principle of local causes. Their experiment showed that if you take a pair of 'entangled' quantum particles such as electrons or photons ('entangled' means that the two particles are correlated with regard to certain states such as spin, momentum, or polarization,) separate them by some arbitrary distance, and make a measurement on one particle, the act of measurement will instantaneously affect the corresponding state of the second particle no matter how far apart from each other the two particles may be, be they across the room or across the galaxy. "This change in the corresponding state of the second particle occurs in apparent violation of the upper limit at which signals can travel in the universe---the speed of light." (98) This phenomenon is called 'non-locality.' According to Menas Kafatos and Robert Nadeau, the existence of non-locality as a fundamental phenomenological aspect of the universe infers that ". . . one need make . . . only a very small leap of faith to come to the conclusion that the universe is conscious." (99)

It is at this point that Kafatos and Nadeau become entangled in the widespread confusion over the use of the words 'conscious,' 'consciousness,' and 'reality.' Commenting on the significance of the Aspect experiments they write:

> "Yet what cannot be measured or observed "in principle" in this experimental situation is the

> reality that exists between the two points [of measurement] . . . Thus the reality whose existence is inferred between the two points in the Aspect experiments should properly be viewed, as we understand it, as a reality that underlies and informs all physical events in the universe. And yet all that we can say about this reality [which they later refer to as "reality-in-itself"] is that it appears to be an indivisible whole whose existence is "inferred" when there is an interaction with an observer, or with instruments of observation, and that it also appears to exist outside of or beyond space-time. (100)

We believe that there are three problems with these observations. First, one can almost sense their struggle to make themselves clear within the confines of the commonly accepted definitions of the terminology used. As we shall discuss shortly, in order to avoid confusion the term 'reality' should be used only in specific reference to the interactions between lifeforms and their environment. Therefore the word 'reality' in these comments could be usefully replaced with the phrase 'that which is' or 'that which exists.'

The second difficulty arises with their use of the word "conscious" when what they are obviously referring to is a state of awareness. The third difficulty with their statement is the claim that the "indivisible whole" from which this awareness emanates "appears to exist outside of or beyond space-time." Precisely what they mean by "space-time" is left unclear, but it is doubtful that they use it in the same sense as we have used it throughout this discussion, in which space-time is considered to be an objective immaterial flexible state of being which constitutes the Field of Play, which endows lifeforms with the capacity to possess awareness, and by which the Creator is made aware,

instantaneously, of all the events that take place in the Game of Being. In our understanding, the "indivisible whole" is a reference to the Pure Consciousness of the Mind of God without using the word 'God,' and space-time is properly understood as the immaterial mechanism through which God experiences physical being. Thus the explanation for the results of the Aspect experiments does not lie outside of or beyond space-time. Space-time, being the Mind of God made manifest, is at all times and in all places within the Field of Play instantaneously aware of all events that transpire in the Game of Being. The correlation of behaviour of quantum particles observed in the Aspect experiments constitutes direct evidence in support of this idea.

Later in their book Kafatos and Nadeau do (sort of) reconcile their confusion with the words "consciousness" and "awareness," while at the same time taking some pains to avoid the implication that their ideas could be viewed as support for the idea that there is a Creative Intelligence which is responsible for the existence of the universe. As professionals with doctorates and scholarly reputations to protect, they obviously felt a need to tiptoe around the central issue here. They write:

> "Since the suggestion that the universe is conscious is likely to be met by large measures of skepticism, if not outright ridicule, by some, perhaps we should pause for a moment and better explain what we mean by it. We do not mean that this consciousness is in any sense anthropomorphic, or that it embodies or reflects the conscious content of human consciousness. Our present understanding of nature neither supports nor refutes any conceptions of design, meaning, purpose, intent, or plan associated with any mytho-religious heritage . . .
>
> Since the universe evinces on the most fundamental level an undivided wholeness, and

> since this wholeness in modern physical theory must be associated with a principle of cosmic order, or there would be no order, this whole manifests order in a self-reflective fashion. It must, in other words, be self-reflectively aware of itself as reality-in-itself to manifest the order that is the prior condition for all manifestations of being. Since consciousness in its most narrow formulation for human beings can be defined as self-reflective awareness founded upon a sense of internal consistency or order, we can safely argue that the universe is, in this sense, conscious. (101)

The metaphysics of the Game of Being obviates this kind of pussyfooting. It clearly differentiates between consciousness as being what we are, and awareness as being a state that we possess. It states plainly that there are varying levels of awareness represented within the Field of Play. Inanimate manifestations such as a stone possess no awareness of their environment because they possess no ACS; however because stones, like everything else, are enveloped by and permeated by space-time which is inherently aware, the Creator experiences the experience of being that stone. Lifeforms possess a level of awareness that is dependent on the complexity and sophistication of their Awareness Connectivity System. The ocean of space-time in which all the manifestations within the Field of Play are submersed is itself aware and is the source of awareness in the Game of Being, and through the omnipresent mechanism of space-time the universe at large, and hence the Mind of God, is constantly, instantaneously, and simultaneously aware of every event that takes place within the Field of Play. The presence of this capability in the Game of Being is what is demonstrated by the phenomenon of non-locality. Finally, this metaphysics claims that humanity's present understanding of nature does indeed support the idea that there is

evidence for both design and purpose in the structure of the universe, topics which we will turn to presently.

We turn now to a discussion of the concept known as 'reality.' As we have previously noted, there is a great deal of confusing terminology associated with this concept. In general, the various ideas attached to the word reality can be narrowed down to two opposing but interactive categories: objective reality and subjective reality. The phrase "objective reality" is usually used in reference to aspects of the physical universe, to matter-energy, to that which materially exists. 'Subjective reality' usually refers to the inner experiences, the thoughts and emotions experienced by an individual lifeform, usually in the context of human experience. The idea that the concept of reality can be divided into these two categories is a false dichotomy which only causes confusion. Neither of these categories is sufficient unto itself to be equated with 'reality'. It is the intersection of these two categories, things that exist interacting (via information) with perception (made possible by the presence and operation of the ACS of an animate manifestation which is connected to the mode of awareness inherent in space-time) that together combine to permit the emergence of reality. Therefore we believe that the terminology of 'objective' and 'subjective' reality should be abandoned, and that henceforth the word 'reality' should be defined exclusively as the ever-evolving framework for the individual experiences, no matter how simple or complex, of all lifeforms.

The reason for this suggestion is that it is becoming more and more common to be told that certain groups of people, due to their ideas and beliefs, often in a political context, are 'out of touch with reality.' To make this allegation is to misunderstand the nature of reality. Unless a person is knocked unconscious, is in a state of dreamless sleep, or is in a coma, it is quite impossible for that person to be out of touch with their reality.

In our view it would add a great deal of clarity to our understanding of reality if the concept was restricted to *the interaction* of the ACS of a given individual lifeform with its

surrounding environment. In this formulation, what was previously known as 'objective reality' would be referred to as 'that which is' or 'that which exists.' Reality is therefore not something which materially exists, but is a process that structures what we experience.

Table #1 diagrams the structure of reality according to the metaphysics of the Game of Being. The basis of the structure of reality is the Pure Consciousness of the Mind of God by which, through the miracle of creation, thought was made manifest as the Field of Play. The Field of Play is divided into space-time and energy-matter. Space-time is the most basic component of the Field of Play, and is the originating source of energy-matter.

Space-time is also the source of awareness within the Field of Play, playing the role of the Creator's sensory system, and endowing lifeforms with the capacity to themselves be aware of their environment. Within the arena of space-time, forms of energy-matter come together to create change, which, consistent with the design of the Creator, is unceasing within the Field of Play. Change is continuous and is made manifest via the appearance of an ongoing stream of individual events. Human beings are an example of such events.

Individual events and the interactions between events give rise to the generation of information. Edelman and Tononi argue that, at root, information is a biological concept; in their view stimuli only become information when that stimuli interacts with a manifestation that is capable of changing its behaviour as a consequence of the interaction. Thus the light which is streaming out of my computer screen and striking my retinas, where it is turned into a signal which “informs” my brain about what appears on the screen, is information; while the light which is essentially the same but which passes by on either side of my head and strikes the wall behind me is not; that light may be considered to be raw unprocessed data, or as a signal sent which has not found a receiver, but it is not considered to be information. Those authors state:

THE STRUCTURE OF REALITY

Pure Consciousness
(aka The Mind of God)

The Field of Play
(aka the Universe)

Space -Time
(Universal Source of Awareness)

Energy-Matter

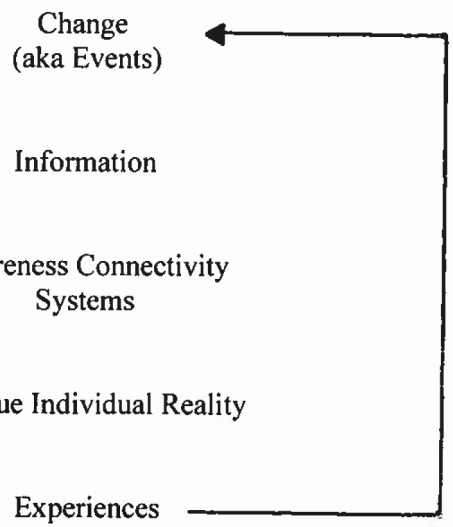

TABLE #1

> ". . .for signals or physical states to constitute information, several conditions should be met: (1) pattern recognition must be involved that includes but goes beyond the scientific laws of physics or chemistry: A bee dance involves information, but formation of a crystal does not. The reason is that some prototypical value, based on historical and evolutionary constraints, is involved in the first case but not in the second. (2) Living organisms with brains and physiology permitting choice and communication must be at the origin or terminus (or both) of a stimulus or signal for it to constitute information. This requirement rules out molecular interactions, however sophisticated, events at submicroscopic or cosmic scales, and organisms (for example, amoebas) that are incapable of rich memories." (102)

We are in general agreement with this definition of information but with a couple of caveats. We believe that their second condition is too narrow and restrictive. Not everyone would accept Darwin's suggestion that plants are "inverted animals" whose brains are below ground, in which case, according to Edelman and Tononi, the signals sent and received by plants would not qualify as information. Yet as we have previously shown, plants demonstrate the capacity for memory and for changing their behaviour in response to stimuli arising from their environment. Though they may lack brains there is little doubt that plants are 'informed' by the signals they receive, and adapt their behaviour in response to those signals. A similar argument can be made for the simple amoeba which, while lacking the capacity for

rich memory, does respond to changes in its environment. The differences in response to stimuli between a tomato plant, an amoeba, a lab rat, and a human are differences in degree, not in kind. Logical consistency requires that all interactions between the external environment and the ACS of every lifeform be considered to be information. Anything less than this perpetuates a form of human chauvinism which clouds our understanding of what constitutes reality.

A second caveat is that, if it hasn't happened already, the definition of the concept of information as being strictly biologically based will in itself become too narrow in the future. The advances being made in the fields of Artificial Intelligence and cybernetics will require an expansion of the definition of information to include interactions between the general environment and non-biologically based entities. *Star Trek's* fictional android Data was clearly 'informed' by his interactions with his environment. Roboticists around the world are already busy creating robots that are capable of differentiating between different types of signals and responding accordingly. As this trend continues, a purely biologically based definition of information will no longer be sufficient.

When raw data is captured by a lifeform's ACS, thereby being transformed into information, we call this process perception. Perception is focused awareness. Each individual act of perception is a separate experience. Over time those repetitive interactions between information and the ACS of a given lifeform create a historical framework which serves to filter and interpret future experiences. The processing of new experiences by this framework is what we call learning. That historical interpretive framework, which becomes more and more unique to every individual lifeform as the complexity of a given lifeform's ACS increases, is that lifeform's reality. Therefore there are as many realities as there are individual lifeforms. Thus reality, like the Pure Consciousness of the Mind of God, whose manifestation is the Field of Play and all that it contains, is not a material thing, but a process; a process

which occurs at the intersection of information and an ACS. Only when and where lifeforms exist does this process occur, resulting in realities being created. On lifeless planets and in the centres of stars there are signals but no Awareness Connectivity Systems to receive them and thus no information, and therefore there are no realities in those situations.

Since an ACS is constantly being bombarded with a steady stream of fresh information, the construction of the framework of reality is a dynamic process, always under pressure to adapt and change. In some cases fresh information reinforces the existing structure of the framework of reality; while in other situations it causes changes to be made to that framework. In humans, who possess a highly evolved ACS, this dynamic process is extremely complex. The human ACS is capable of storing large amounts of information in both short and long-term memory. By drawing on the information stored in memory and evoking what we call our imagination, our brains can run simulations of future courses of action to help us decide what we should do next. The philosopher Henri Bergson wrote:

> "The primary function of memory is to evoke all those past perceptions which are analogous to the present perception, to recall to us what preceded and what followed them, and so to suggest to us that decision which is the most useful. (103)

The human ACS is also capable of generating intense experiences which we call emotions. Crucially, our brains are capable of communicating in highly structured languages. All these elements contribute to the framework of human realities.

Thus, in this view, reality is a dynamic framework which is built up over time by the interactions between an ACS and information, which serves to evaluate, order and organize subsequently acquired information. The philosopher Will Durant

described this process as follows:

> "Sensation is unorganized stimulus, perception is organized sensation, conception is organized perception, [knowledge is organized conception,] science is organized knowledge, wisdom is organized life: each is a greater degree of order, and sequence, and unity." (104)

With this understanding of what reality is, we are able to grasp why the allegation that some people are 'out of touch with reality' is invalid. No one, not even someone who is experiencing hallucinations, can be 'out of touch' with their unique individual reality. For the person hallucinating, the hallucination is a genuine aspect of their reality.

In our times we have seen the pervasive and troubling rise of so-called misinformation and disinformation. These distortions of fact and truth are causing serious rifts within our societies. This process is facilitated by the existence of the internet, which makes it far too easy for unscrupulous individuals to spread lies and nonsense. The problem is that while misinformation and disinformation may be inaccurate and not reflective of the truth, they are nevertheless still information writ large, and are thus readily incorporated into individual realities, particularly when humans are repeatedly exposed to such information. These types of information are sometimes called 'propaganda.'

Once a piece of information, whether it is factually accurate or otherwise, becomes established as a part of the structure of an individual's reality framework, over time it becomes increasingly resistant to being removed from that structure; that piece of information now functions as an evaluating filter for any subsequently acquired information. Fresh information which conflicts with the information stored in the filter is often rejected out of hand, being deemed unworthy of evaluation. In these cases only information which is not in conflict with the filter is accepted

for evaluation and storage as a part of the individual's reality, further reinforcing the influence of the filtering information. This process becomes an insidious self-reinforcing cycle which even well-established facts based on solid evidence cannot penetrate, and can result in a situation in which that individual's reality drifts ever further away from a correspondence with the truth, with that which exists. Gary Zukav describes this process as follows:

> "Reality" is what we take to be true. What we take to be true is what we believe. What we believe is based upon our perceptions. What we perceive depends upon what we look for. What we look for depends upon what we think. What we think depends upon what we perceive. What we perceive determines what we believe. What we believe determines what we take to be true. What we take to be true is our reality. (105)

Zukav is obviously writing purely in terms of human realities here, but in general, the more complex and sophisticated the ACS possessed by a given class of lifeforms, the more varied and idiosyncratic will the realities created by the individual members of that class be. There is more variation in the realities created from one human compared to another than there is from one lab rat to another. Yet while human realities differ one from another in their details, there exists a significant overlapping of particular elements of which those realities are constructed. Large amounts of information are widely shared. This sharing of realities is the basis for organized religions, cultural beliefs, political and economic systems, and the social cohesion necessary to maintain nation-states.

The final step in our understanding of the structure of reality is our experiences. Our experiences and the behaviours which constitute those experiences are first, determined by, and

then second, evaluated and interpreted by, our realities. The first of these two steps is the result of the fact that the values held in our realities choose for us the behaviour we will exhibit in any given situation. The second step is facilitated by a feed-back loop that connects the experience and change steps as outlined in Table #1. Our individual behaviours are each events, parts of the ongoing process of change, each generating fresh information which is captured by our ACS, which in turn instigates a renewal of the process of evaluation and interpretation by our reality.

Another way of rounding out our understanding of reality is to consider the idea that our individual realities, those mental frameworks which both dictate and interpret our experiences, constitute and are equivalent to our 'self'; the 'I' in the statement 'I am.' The philosopher Daniel Dennett has said that “selves are not independently existing soul-pearls, but artifacts of the social processes that create us.” (106) These “artifacts of the social processes that create us” are our realities. This perspective goes some distance towards explaining the beliefs and behaviours that are prevalent among significant portions of the populations present in western societies today.

There are now large numbers of people in the west who possess realities that have an increasingly tenuous correspondence with truth, with that which exists. Confronting these people with established facts which contradict the content of their realities has little effect. Demanding of them evidence to support their beliefs often results in avoidance or defensiveness, and in some cases, aggression. These are reactions that are well understood responses to the experience of fear. Why are these people fearful? It is because once they have made a commitment to a certain set of beliefs, that is, once certain information has been incorporated into the framework of their reality, any challenge to the validity of those beliefs is experienced as a threat to their 'self,' to their very innermost sense of who they are. To have one's sense of self cast into doubt is very dislocating, and humans in general will go to great lengths to avoid such an experience.

The psychology of this process is well understood. It is called 'self-deception.'

> "In social experiments, people consistently overrate their own skill, honesty, generosity and autonomy. They overestimate their contribution to a joint effort, chalk up their successes to skill and their failures to luck, and always feel that the other side has gotten the better deal in a compromise. People keep up these self-serving illusions even when they are wired to what they think is an accurate lie-detector. This shows that they are not lying to the experimenter but lying to themselves. For decades every psychology student has learned about "cognitive dissonance reduction," in which people change whatever opinion it takes to maintain a positive self-image. . . .
>
> "Self-deception is among the deepest roots of human strife and folly. It implies that the faculties that ought to allow us to settle our differences - - - seeking the truth and discussing it rationally - - - are miscalibrated so that all parties assess themselves to be wiser, abler, and nobler than they really are. Each party to a dispute can *sincerely* believe that the logic and evidence are on his side and that his opponent is deluded or dishonest or both. Self-deception is one of the reasons that the moral sense can, paradoxically, often do more harm than good . . ." (107)

In order for a society to remain cohesive, a certain minimum amount of overlapping of the content of the realities among the members of that society is required. When the realities

possessed by large portions of a society are increasingly divergent, the potential for divisiveness and fragmentation can rapidly accumulate. This process is apparent in a number of western societies today, and is most pronounced in the United States. There, irresponsible individuals on social media platforms and established media organizations both pour out a steady stream of misinformation and disinformation, with the deliberate objective of stoking fear, anger, bitterness, resentment, and distrust among their viewers. To a significant degree humans are the products of their environment. The inevitable results of these actions are a serious divergence of realities between groups of people, and a constantly growing corrosive threat to the cohesion required to hold the society together.

While the current outlook for the future well-being of our societies may be discouraging, we hasten to add that the understanding of what reality is, as outlined in the foregoing discussion, is a cause for hope. ". . . [M]ost evolutionary psychologists attribute systematic differences among people to their environment and attribute only random differences to the genes." (108) If the structure of our realities is dependent upon the information obtained from our environment imprinted upon our ACS, this means that it is possible to construct messages that are designed, not to divide people with intolerance and hatred but, with appropriate messaging, to condition the members of a society to be more patient, tolerant, and compassionate. Right now across western societies the forces of division are on the march, with a deliberate concerted message that is designed to make us fearful and resentful of one another. If the ongoing damage to the cohesion of our societies is to be halted, a potent messaging process that promotes tolerance, compassion, and love will be required.

There is one more aspect of 'reality' that we wish to touch upon in the form of this question: does the phenomenon of non-locality create 'realities;' that is, do entangled electrons or photons possess a reality? Even though they change their characteristics in

response to a 'signal' received, we believe that the answer to this question is no. There are two reasons for this. The first of these is that since these quantum objects are inanimate, they do not possess an ACS and therefore cannot create memories or make judgments. The second reason is that we do not consider the 'signal' sent between the entangled pair, however this process may occur, to be 'information.' This is because the transmission of information requires the passage of time, however brief, and the 'signal' between entangled pairs of quantum objects is instantaneous. In light of this, we propose that the 'signals' which make possible the phenomenon of non-locality be referred to as 'instants.' (These are not to be confused with 'instantons,' which are defined as 'topologically nontrivial solutions of Yang – Mills equations that absolutely minimize the energy functional within their topological type.' If the reader can understand the previous sentence then you know far more physics than does this author.)

Chapter Twenty-two

APPROACHING THE GODHEAD

PART 1

* * * * * *

Having made an attempt to rationalize our understanding of the concepts of consciousness and reality, we will now continue with our explication of the Song of Being. The next two lines of the Song are:

'Tis within our reach
To understand the purpose of,

It is important to fully appreciate the significance of the phrase “our reach.” It refers, of course, to the reach of the species known as homo sapiens, who are, as far as we can tell, the only species on this planet that is capable of contemplating the possible existence of a Creative Intelligence which is ultimately responsible for the existence of our species and of all that the vast universe around us contains. Furthermore, as far as we know, and very possibly as far as we will ever know, homo sapiens are the only animate manifestations anywhere in the Game's entire Field of Play

that is capable of such contemplation. If that is true- - - and it may well not be, but it is unlikely that we will ever know one way or the other for certain - - - then homo sapiens is unique in the universe, and therefore extremely valuable to the Creator.

People often ask, “What is the meaning of life?” Humans have been asking that question for millennia and yet no satisfactory answer has been forthcoming. That is because it is a futile question. Words have a meaning. Sentences have a meaning. But life does not have a 'meaning.' Life is a process and processes do not have a meaning; they have a purpose. Thus we should ask not “What is the meaning of life?' but, rather, “What is the purpose of life?”

For an answer to this question, let us turn our attention now to the claim in the Song of Being that “'Tis within our reach / To understand the purpose of” the complex and ever-changing continuum, of existence itself. From the Creator's perspective your body, dear reader, is an event, *in the guise* of a bio-electric device, generated in accordance with the Rules of the Game, so that God, can have the experience, of being you. *This* is your life's primary purpose: to provide God with a variety of experiences over the course of your lifetime. This is *why* you are here, so that, through you, God may experience being human.

Recall the Creator's thoughts prior to the creation of the Game of Being:

> 'In this game
> My mind will be manifest
> As space-time and energy-matter.
> Through my playing of this game
> *I* shall experience existence,
> In all its myriad forms.'

You, my friend, are one of all those myriad forms. You are indeed a direct manifestation of the Mind of God. This is not a new idea. 2300 years ago, the 4th Century BC Taoist sage Lieh-

Tzu expressed this same idea in the following dialogue:

> The Legendary Emperor Shun asked one of his Ministers: "Can one Possess the Tao?"
>
> "Your own body is not your Possession. How can you Possess the Tao?"
>
> "If my own body is not mine, whose i it?"
>
> "It is the Form lent you by Heaven and Earth. Your Life is not your Possession. It is a Harmony granted you for a time by Heaven and Earth. Your Life-Destiny is not your Possession. It is a Flow granted you for a time by Heaven and Earth. Your children and grandchildren are not your Possessions. Heaven and Earth have lent them to you to be cast off as an insect sheds its skin. You are the Breath-Energy of Heaven and Earth. How can you ever Possess that?" (109)

The universe is, in its essence, God's virtual reality technology. Zukav comments on this idea as follows:

> "According to Buddhist theory, reality is "virtual" in nature. What appear to be real objects in it, like trees and people, actually are transient illusions which result from a limited mode of awareness. The illusion is that parts of an overall virtual process are "real" (permanent) things. "Enlightenment" is the experience that "things," including "I," are transient virtual states devoid of separate existences, momentary links between illusions of the past and illusions of the future unfolding in the illusion of time." (110)

Over the past couple of decades humans have begun to develop our own versions of a virtual reality technology. If we

understand the universe to be a manifestation of God's virtual reality technology, then we can observe that there are large differences in terms of scale, scope, and levels of detail between it and the versions of human-generated virtual reality technology created thus far. We will limit ourselves to two specific comparisons between these virtual reality technologies, based on the perspectives and experiences of the users of the technologies; namely, God on the one hand, and individual humans on the other.

The first of these comparisons can be termed the 'singular' experience compared to the 'universal.' Imagine yourself standing on the holodeck of the Star Ship Enterprise, commanded by Captain Jean-Luc Picard. You say, “Computer, run program 'A Walk in the Forest'.” Suddenly you find yourself on a path surrounded by huge trees, ferns, salal, salmon-berry and huckleberry plants. As you walk along and observe these manifestations, your experience is limited to only what you, the observer, experiences. You do not, and cannot, experience what it is like to be the hologram of the cedar tree you just walked past. Human-generated virtual reality technology does not allow you to experience the “being-ness” of other manifestations. Your experience is singular to you.

Now imagine yourself walking along a path in an actual forest, surrounded once again by huge trees and a variety of forest-dwelling plants. But this time imagine that you are experiencing the scene from God's point of view. God's virtual reality technology allows God to simultaneously experience what it is like to be you, the hiker, the cedar tree, the ferns, the dirt on the path, all the manifestations that contribute to the overall scene. God's experience is universal.

How could it be possible for the Creator to simultaneously experience being all those seemingly separate and individual manifestations? There are several answers to this question.

First, to quote Robinson Jeffers again, “the universe is one being, all its parts are expressions of the same energy.” Accordingly, it is possible for God to experience the being-ness of

all the manifestations that appear anywhere within the Field of Play at any time.

Secondly, an examination of our own mode of awareness may be instructive. Imagine that you are standing in a room deep in conversation with another person with a glass of wine in your hand. There is a picture hanging on the wall behind the person to whom you are speaking which is in your field of vision. Perhaps the window is open and sounds from the street can be heard, or there is music from a radio in the background, or a television is on in the corner of the room. Now it may be that because you are concentrating on the conversation in which you are engaged, you are unaware of all the other signals that are apparent in the room. While all these other signals are impinging on your sensory systems of vision and hearing, your awareness is focused on just two sets of signals: the expression on the person's face and the words they are speaking. Although there are other signals which are available to your awareness, you are selectively tuning them out. Then the smell of freshly roasted turkey wafts by your nose. Now you take a sip of the wine and another signal, the taste of the wine, enters into your awareness. In that moment you are simultaneously aware of four signals: the expression on your companion's face, the sound of their voice, the smell of the turkey, and the taste of the wine. This example demonstrates that our Awareness Connectivity System is capable of simultaneously accommodating more than one signal at a time, while also simultaneously muting other signals.

Our mode of awareness is made available to us via the link between our Awareness Connectivity System and the awareness that is inherent in space-time. Our mode of awareness is thus a microcosm of the greater, more general awareness that permeates all of space-time, through which God experiences all the events which occur within the Field of Play. Since our mode of awareness is capable of simultaneously experiencing more than one signal while at the same time blocking out other signals, we may safely assume that God is capable of performing the same feat, and on a

much much, much much, much much, much much grander scale. So while it is possible for God to experience what it is like to be a rock on a beach, it is possible, perhaps probable, that the Creator does not put a lot of effort into focused awareness of that particular experience.

But even if the Creator limits God's active focused awareness to just lifeforms, that is still billions upon billions of data points just from our planet alone, to say nothing of the unimaginable numbers of lifeforms which we are confident exist on other planets in the cosmos. How is that possible?

A potential answer to this question arises from the burgeoning field of quantum computing. There are an estimated 10^80 (that is a 1 with 80 zeros behind it) atoms in the visible universe. Experts in the field of quantum computing have forecast that it will someday be possible to construct a quantum computer that would be capable of keeping track, simultaneously, of each of the universe's atoms. This suggests that it would be theoretically possible for the Creator to simultaneously keep track of a huge number of events as they occur across the Field of Play.

We are not stating here that God is some sort of computing device; only that the Creator may possess capabilities that are similar to those of an advanced quantum computer. There are some people who have suggested that our universe is a simulation, a program being run somewhere on some highly sophisticated computer. We do not accept the notion that our universe has arisen from a pre-planned series of ones and zeros in some more-or-less mechanized setting of chips, bits, or qubits. We believe that God's virtual reality technology, which makes possible the Game of Being, has arisen from what we might consider to be a more 'organic' source: the immaterial Mind of God itself. What makes the Game of Being possible is not some massive computational process. Rather, it is the omnipresence of space-time, the Creator's sensory system, the immaterial Mind of God made manifest.

We have compared God's virtual reality technology with human virtual reality technology in respect of their range of

experiences, the universal compared to the singular. The other comparison we wish to touch upon concerns the matter of control.

Let us return to the holodeck of the Enterprise. Once again you find yourself walking along a path through a magnificent, but virtual, forest. You come upon a fork in the trail. You may choose to proceed down the left fork, or you may choose the right fork. Or you may choose to turn around and retrace your steps. Most significantly, when you wish to end your excursion, you can say, "Computer, end program." Instantly the forest scene will disappear and you will find yourself standing on the empty holodeck. With the virtual reality technology available on the holodeck *you decide* which experiences you wish to have, and how long you wish to have them. You are in control.

God, on the other hand, exerts absolutely no control whatsoever over what happens in the virtual reality technology known as the Game of Being. Having set the Game in motion, the Creator is utterly incapable of turning it off. Furthermore, the sequence of events of which the Game of Being consists is ordered, not by God, but by the Rules of the Game. The Rules, which were established by God prior to the creation of the Field of Play, are inviolable and unalterable, and cannot be tampered with, not even by their Creator. Thus God does not determine the fate of *any* of the myriad manifestations which serially make an appearance within the Field of Play. *The Rules determine.*

Currently, there are many people on the Earth who believe, erroneously, that the events which take place on this planet are determined by the will of God, the Creator. As the Muslims say, "Inshallah!" This deeply flawed idea, that the Creator can somehow reach into the Game to direct or influence what transpires here, in furtherance of some preordained plan, or to reward or punish human behaviour, or for any other purpose, constitutes a grave misapprehension concerning the role played by God in the Game of Being, and is the source of much confusion. God *does not intervene* in the Game. God *is* the Game.

To be clear: God, the Creator, does not determine what *we*

experience. On the contrary, insofar as human manifestations are concerned, *we determine what God experiences.* All that we experience, God experiences.

Therefore: if you live a life of anger and bitterness and resentment, then God experiences anger and bitterness and resentment. If you live a life of hatred and cruelty and violence, then God experiences hatred and cruelty and violence. If you live a life of love and acceptance and compassion, then God experiences love, and acceptance, and compassion.

So, my friends, *the* fundamental question to be answered by each and every individual human manifestation is: What kind of experience am I providing for God?

In response to these ideas, some might pose the question, "Why should I care what God experiences? What's that to me?" In her book, *A History of God,* religions scholar Karen Armstrong notes that historically the relationship humans have had with their gods has always been what in modern parlance would be called 'transactional.' Humans have agreed to worship certain gods because of the belief that those gods would, in return for being worshipped, take care of the worshippers. Armstrong recounts the Old Testament story of Jacob, son of Abraham, who had a dream in which angels were going up and down a ladder that stretched from Earth to Heaven. Upon awakening, Jacob named the site where the dream had occurred Beth-El, meaning the House of El; "El" being the name of the god that Jacob worshipped. "J" is the name given by biblical scholars to the 8th Century BC person who supposedly authored this portion of the Old Testament. Armstrong writes:

> "Before he left Beh-El, Jacob had decided to make the god he had encountered there his elohim: this was a technical term, signifying everything that the gods could mean for men and women. Jacob had decided that if El (or Yahweh, as J calls him) could really look after him in Haran, he was particularly effective. He struck a

> bargain: in return for El's special protection, Jacob would make him his elohim, the only god who counted. Israelite belief in God was deeply pragmatic. Abraham and Jacob both put their faith in El because he worked for them: they did not sit down and prove that he existed; El was not a philosophical abstraction . . .This pragmatism would always be a factor in the history of God. People would continue to adopt a particular conception of the divine because it worked for them, not because it was scientifically or philosophically sound." (111)

Now, while we believe this story of Jacob's dream to be purely mythological - - - "J" was spinning a good yarn - - - it serves to illustrate the way in which ordinary people approached their relationship with the gods in the ancient world. This transactional approach to our relationship with God has changed little over the ages. Armstrong writes:

> "In the Roman empire of late antiquity, people worshipped the gods to ask for help during a crisis, to secure a divine blessing for the state and to experience a healing sense of continuity with the past. Religion was a matter of cult and ritual rather than ideas; it was based on emotion, not on ideology or consciously adopted theory. This is not an unfamiliar attitude today: many of the people who attend religious services in our own society are not interested in theology, want nothing too exotic and dislike the idea of change. They find that the established rituals provide them with a link with tradition and give them a sense of security. They do not expect brilliant ideas from the

sermon and are disturbed by changes in the liturgy." (112)

This transactional attitude towards our relationship with God is still very much prevalent in the modern age. In return for worshipping God, humans expect God to grant them justice; protect them from evil; provide them with rights; take their side in war; forgive their sins; and give them life ever-lasting. God, of course, can do none of these things, since God does not and cannot intervene in the Game of Being. As Deepak Chopra has written, humans have locked God in a cage of their own fantasies.

In so doing, humans have committed a very basic conceptual error. It is not God's role to fulfill our desires. On the contrary, it is our role to fulfill God's desires, and one of our fundamental assumptions about the nature of God is that God seeks happiness. So why should we care what God experiences? Why should we care if God is happy? We should care because if God had not created the Game of Being, we would not be here to experience the miracle of existence. *We owe God.* And how do we best show our gratitude and appreciation for being permitted to participate in this miracle? Not by bending our knees in superstitious worship of some imagined entity in the forlorn hope of obtaining that entity's favour, but by showing love, acceptance, and compassion towards our fellow direct manifestations of the Mind of God.

Continuing now with our explication of the Song of Being, the next two lines state:

And, to grasp that logic,
Shall lead to love.

We speak here not of romantic or sexual love, but of agape, universal love, "love that persists without the expectation of reciprocation," (113) the love of God for Creation, and the love of humanity for God. If you believe that it is wise and proper to love

and revere God, and to thank God for your very existence, and if you accept the idea espoused by the Game of Being metaphysics that, by definition, all things are a direct manifestation of the Mind of God, then it follows, logically, that it is wise and proper to love and revere all things, including of course, your fellow humans.

Jesus Christ taught that we should "love our neighbours as ourselves." The Reverend Dr. Martin Luther King said "Love is the only way." Burt Bacharach and Hal David wrote "What the world needs now is love, sweet love." The mystic and musician Bob Marley sang "What we need is love." John Lennon wrote "Love is the answer, and you know that for sure." The message has been delivered to humanity over and over and over again, and the message is clear: love, universal love, agape, is the solution to humanity's problems.

Now, there are those who will scoff at this notion as being naive; saying that given mankind's proclivity for resolving disputes by resorting to violence, it is hopelessly idealistic. But they are mistaken. While it is most certainly idealistic, it is not hopelessly so.

We have shown that the Game of Being is a strictly deterministic process, an evolving series of cause and effect resulting in a continuous chain of ever-new events. But the Game has blessed humans with the illusion of free will so that we may learn, adapt, and 'change our minds.' Perhaps you are reading this book because a friend told you about it. Perhaps she read it because a family member told her about it. Perhaps as a result of reading this book you will make a deliberate, logical, decision, that is, *you will consciously choose,* to embrace the message of love which has so often been delivered, and adopt an attitude of loving kindness towards all things in the way you live your life. If this should happen it will be because your reality has been infiltrated by a certain packet of information, which was possible only because your friend told you about this book, which was possible only because a family member told her about it, which was possible only because the book was written and published. Thus a chain of

causes and effects will have led to your conscious choice, and the rule that all events are the inevitable results of their antecedents will have been satisfied.

Because of the way in which this process works, it is therefore possible for each human being, if they are exposed to and absorb the message of the logic of love, to consciously choose to adopt an attitude of loving kindness towards all things, in particular their fellow human beings, and to thereby love and revere God. It is only by this means that humanity's problems can be adequately addressed.

But there is a caveat. There are some humans who, due to faulty wiring in their brains or the accumulation of their life experiences, are unable to feel or express empathy towards others. Empathy is the basis for agape; without empathy one cannot achieve a state of universal love. These benighted individuals are classified in three ways: as psychopaths, sociopaths, and pathological narcissists. These seriously mentally ill people have always been and probably always will be with us. They are driven to acquire influence and control over others, and will often use any means necessary to achieve their ends. Humanity must take great care to ensure that such individuals do not acquire positions of power and influence in our societies. History clearly teaches us that disastrous calamities ensue when this happens.

The last two lines of the Song of Being state:

May our path be traced by wisdom.
Peace be upon us for all our days.
Amen.

These lines may strike you at first as a supplication, an asking of God for a boon, but they are not intended as such. We have seen that God does not, indeed cannot, intervene to alter the sequence of events that make up the Game of Being, and thus God cannot provide us with either wisdom or peace. These lines are meant to be a regular reminder to the reciter to carefully consider

the potential consequences of the options presented in any given situation, prior to embarking on any particular course of action; to take heed of, and learn from, the past; to take into account all available relevant information before choosing one's path into the future, and by so doing to pursue wisdom.

It is also a reminder to guard one's behaviour, to always act peaceably; and to at all times treat the other manifestations of the Mind of God with whom you interact with dignity and respect; and to not allow, in the heat of the moment, negative emotions such as anger to unduly affect your judgment and behaviour.

We cannot look to God to provide us with wisdom and peace. God has provided us with existence and awareness, but living with wisdom and in peace are our responsibility, and we must find them within ourselves.

This concludes the explication of the meaning of the phrases of the Song of Being. The intellectual structure of the Game of Being, of which the Song of Being is the metaphysical core, is intended to be a pragmatic metaphysics. Pragmatism, as defined by the American philosopher and psychologist William James, teaches that the truth of any given philosophical system should be judged upon the consequences of the application of its teachings. We believe that the widespread adoption of the teachings of the Song of Being would have a beneficial effect on the structures of human societies. Indeed, we deeply fear that if humanity does not make the kinds of changes to our modes of thinking to a mode resembling that which is suggested by the metaphysics of the Game of Being, the future of human civilization will be increasingly bleak.

Chapter Twenty-three

APPROACHING THE GODHEAD

PART TWO

* * * * * *

We turn our attention now to an examination and critique of the belief systems and myths which underpin the current structures of human societies. We begin by emphasizing that the metaphysics of the Game of Being belief system relies upon the use of the human intellect as the means whereby we may achieve a fuller and more satisfying understanding of the nature of God. The philosopher Ludwig Wittgenstein demonstrated

> ". . . that logic structures the world we live in and that logic is the structure of the intellect itself . . . Logic tells us nothing about the world. It is only the rules by which we can know the world - - - that is, the rules by which we must organize the observations brought to us by the senses." (114)

Therefore, if logic structures the universe, and if logic is the structure of the intellect itself, and since according to the metaphysics of the Game of Being the universe is the direct

manifestation of the Mind of God, then it follows that by using our intellect humans will be able to arrive at an understanding of the nature of God. This stands in sharp contrast to the teachings of various eastern schools of mysticism which believe that in order to experience direct contact with the Godhead, one must first silence the intellect.

Now, there is a difference between understanding and experiencing. One may possess an understanding of some process without ever directly experiencing the phenomenon in question; and one may experience some event without having a clear understanding of what has happened. When it comes to matters involving God, the question is: What is the most expedient method of achieving both an understanding of, and direct experience with, the presence of God? As the author Sam Harris has noted, "The roiling mystery of the world can be analyzed with concepts (this is science), or it can be experienced free of concepts (this is mysticism.)" (115)

It must be noted that for some schools of eastern thought there is no acknowledgement of a god or creator. The Buddha taught that any attempt to answer the question, "Does God exist?" was basically a waste of time, since it could not be answered one way or another with certainty. This has not, however, prevented some of his followers from proclaiming the Buddha to be a god. When the adherents of those eastern schools of mysticism that do not expressly believe in an Intelligent Creator speak of achieving a direct experience of the Godhead, they mean that they have experienced a transcendence from the earthly realm of objects that appear to be separate from one another, to a realm where they experience a sense of the Oneness of all that exists. This author is in no position to evaluate the truth of such claims, and wishes to in no way denigrate them. It is certainly possible that by learning to silence the intellect, it opens one to the possibility of accessing aspects of the universe which are blocked by the activity of our intellect. This makes a certain kind of sense: after all, our intellects are conditioned by experience to see objects as being

separate from one another. By silencing the intellect one theoretically removes the illusion-conditioned filter that perceives objects as being separate, allowing us to directly experience the connected wholeness of the universe.

But we do know this much: the journey to the attainment of such a state of mind is reputed to be long and arduous, requiring years of meditative practice under the guidance of a master who has already trod that difficult path. Such masters are hard to find, and the fact is that very few humans possess the necessary desire, dedication, and discipline, to say nothing of the time, to successfully complete such a journey. Therefore, as a means of helping the vast majority of humanity to attain an understanding of, and the experience of, the presence of God, this method must be deemed to be impractical.

In contrast, the use of the intellect, as prescribed by the metaphysics of the Game of Being, brings these goals much more easily within the reach of every human being. In this system the method involved is one of opening the mind, not shutting it off, and all that is required to attain an understanding of the nature of God is the acceptance of some baseline assumptions as being valid, a rudimentary knowledge of how the physical universe works, and a familiarity with the teachings of the Song of Being. As for the desire to experience direct contact with the Godhead, this wish is easily fulfilled: all that is necessary is for you to give someone a hug.

Having said that, and although this author cannot speak from personal experience, we believe that it is worthwhile to more closely examine the teachings of eastern mysticism. If we understand the reported experience correctly, we think it provides empirical evidence for the idea of the existence of a universally available mode of awareness which is based in space-time, and is thus evidence for the existence of space-time itself.

The stated purpose of meditation is to experience the phenomenon of selflessness. Harris, who claims many years of experience with the practice of meditation writes:

> "Inevitably, the primary obstacle to meditation is thinking. This leads many people to assume that the goal of meditation is to produce a thought-free state. It is true that some experiences entail the temporary cessation of thought, but meditation is less a matter of suppressing thoughts than of breaking our identification with them, so that we can recognize the condition in which thoughts themselves arise....
>
> "There is something to realize about the nature of [awareness,] and its realization does not entail thinking new thoughts. Like any skill that requires refinements in perception or cognition, the task of recognizing [awareness] prior to the subject/object dichotomy can be facilitated by an expert. But it is, at least in principle, an experience that is available to anyone." (116)

(In order to maintain consistency, we have inserted [awareness] where Harris used the word "consciousness" for reasons that we have examined earlier in our discussion.)

In his book, *The End of Faith*, Harris provides the following description of the meditation experience as described by an eighth-century mystic named Padmasambhava, who is generally credited with having brought the teachings of Buddhism from India to Tibet:

> "[I]n the present moment, when (your mind) remains in its own condition without constructing anything,
>
> Awareness at that moment in itself is quite ordinary.
>
> And when you look into yourself in this

way nakedly (without any discursive thoughts),

Since there is only this pure observing, there will be found a lucid clarity without anyone being there who is the observer;

Only a naked manifest awareness is present.

(This awareness) is empty and immaculately pure, not being created by anything whatsoever.

It is authentic and unadulterated, without any duality of clarity and emptiness." (117)

"Only a naked manifest awareness is present." We take the meditation experience as described by Padmasambhava, during which one experiences pure awareness, that is, awareness without content, as evidence for our hypothesis of the actual existence of the mode of awareness which is, like light and matter, a fundamental property of the universe, and which is manifest as space-time, the immaterial presence which envelopes and permeates all objects inhabiting the Field of Play. Apparently, in the meditative state, when one has become detached from one's thoughts, rather than using this mode of awareness to notice the external world, one directly experiences the presence of this state of being.

This fact about the mind's ability, when not intruded upon by information from the external world, or by thoughts generated by one's memory or one's imagination, to access directly this universal source of awareness is, as Harris notes, "an empirical claim, not a matter of philosophical speculation," substantiated by the reported experiences of untold numbers of individuals over many centuries. We believe this fact to be a powerful demonstration of the existence of an immaterial space-time which, as one of its several functions, makes possible awareness of their environment available to all animate manifestations.

Elsewhere in his book Harris makes the following

interesting observations:

> "The basic (and, I think, incontestable) fact is that almost every human being experiences the duality of subject and object in some measure, and most of us feel it powerfully nearly ever moment of our lives. It is scarcely an exaggeration to say that the feeling we call "I" is one of the most pervasive and salient features of human life: and its effects upon the world, as six billion "selves" pursue diverse and often incompatible ends, rival those that can be ascribed to almost any other phenomenon in nature. Clearly, there is nothing optimal - - - or even necessarily viable - - - about our present form of subjectivity. Almost every problem we have can be ascribed to the fact that human beings are utterly beguiled by their feelings of separateness. It would seem that a spirituality that undermined such dualism, through the mere contemplation of [the phenomenon of awareness,] could not help but improve our situation. Whether or not great numbers of human beings will ever be in a position to explore this terrain depends on how our discourse on religion proceeds. There is clearly no greater obstacle to a truly empirical approach to spiritual experience than our current beliefs about God." (118)

There is much to unpack here. Perhaps the first thing to note is that in 2004 when Harris' book was first published, he could write of six billion "selves." Now, some two decades later, we must speak of eight billion plus, a fact which is both astonishing and somewhat terrifying. Beyond this point, we must disagree with

Harris's diagnosis of the fundamental cause of the societal dysfunction so evident in our world today: "the fact that human beings are utterly beguiled by their feelings of separateness." This is true to the extent that our feelings of separateness currently blind us to the fact of our underlying connection to one another. But, within the illusory Game of Being generated by the Creator's virtual reality technology, we are indeed quite separate. In fact, from the point of view of the Creator, that is the purpose of the entire exercise.

Furthermore, we differ on what is, given the current state of human affairs, the most efficacious path to a cure for our dysfunction. The cure for this 'illness' is to provide humanity with the knowledge that, in the final analysis, our feelings of separateness are an illusion. Harris advocates for the path of meditation, the successful pursuit of which apparently makes the acquisition of such knowledge available to an individual through direct experience with the 'Oneness' of the universe. While in no way denying the possibility of acquiring the sought after knowledge by such means, we note only that this path requires an education involving sustained disciplined effort on the part of each individual, and is not easily achieved. As an alternative method of acquiring the necessary knowledge that our experience of separateness is an illusion, we propose that this knowledge, like any other knowledge, be gathered by the intellect, through an accumulation of verifiable facts about the nature of the universe. We should also note here that these two different paths are by no means mutually exclusive, and that we are quite willing to entertain the notion that the path of meditation is the superior of the two, but it is not the only path.

Humanity has learned that the familiar objects that make up our world are all made of the same three forms of energy-matter, which we have *labelled* protons, neutrons, and electrons. Your body, a tree, a fire hydrant, and a bus are just different, temporary, combinations of these three basic ingredients. The metaphysics of the Game of Being belief system maintains that those various

packets of energy-matter we have *named* protons, neutrons, and electrons are all direct manifestations of the Mind of God, and that therefore, at the most fundamental level, all objects are made of the same stuff: the Pure Consciousness of the Mind of God. (We have emphasized the words 'labelled' and 'named' to remind the reader of our earlier discussion in which we pointed out that words, as useful and necessary as they are, tend to distract us from the knowledge of what 'things' actually are. The words proton, neutron, and electron are simply symbolic signifiers for particular events that occur within the Field of Play.) In each case the Creator, through the manifestations known as protons, neutrons, and electrons, is having the separate experience of being your body, or a tree, or a fire hydrant, or a bus.

Our everyday experience of the subject/object duality for which Harris holds responsible our dysfunction, is an inevitable and necessary consequence of the Rules of the Game. As participants in the Game of Being we must live our lives in accordance with the rules that govern it, even though the Game itself is ultimately illusory; the Game is the physical manifestation of God's *virtual reality* technology. If, while directly experiencing the Oneness of the universe you were to step out in front of that moving bus, you would quickly become convinced that, within the Game of Being, you are indeed a 'self' which is separate from that bus.

So, while the practice of meditation can bring about the phenomenon of “selflessness” and offer a temporary respite from the subject/object duality inherent in the illusion in which we live out our lives, we cannot survive day-to-day while in such a state. Since the experience of the phenomenon of “selflessness” through the practice of meditation is only ever likely to be achieved by a small minority of human beings, we must find another method to overcome the dysfunction which arises from our sense of separation. To paraphrase Harris: there is no greater obstacle to overcoming this dysfunction than our current beliefs about God. To succeed in this quest, humanity must adopt a spiritual belief

system which is based upon our knowledge of the physical nature of the universe; knowledge that is truly readily available to most any interested person; knowledge which posits not merely that God is the source of all that exists - - - all religions say this - - - but that God *is* all that exists.

Thus our feeling of separateness is ultimately an illusion, and may well be the primary cause of many of our problems, but this in no way should be lamented. On the contrary, it is an experience which is to be celebrated and savoured, for it is for just this very purpose - - - to experience individuality - - - for which God created the Game of Being. However, while enjoying the experience of being your unique, individual self, at the same time it is important, to use Harris's phrase, to not be "utterly beguiled" by this experience, and to keep in mind that this is but an illusion, and that you are actually just one transient wave among many, many, many, gliding across the eternal and infinite ocean of the Mind of God, a wave which will one day dissipate back into the Oneness. Always remember that without this ocean there would be no waves.

Lest the reader think that we are endorsing an unbounded and excessive pursuit of self-fulfillment at the knowing expense of others, let us state clearly that this is not the case. The Buddha taught that in order to achieve the proper understanding of the nature of being, one must first extirpate the three poisons: delusion, craving, and hostility. We extirpate the delusion of separateness by acquiring, one way or the other, the knowledge that our day-to-day experience of separateness is actually an illusion. The Buddha also taught that desire is the cause of suffering, so we extirpate craving by living our lives in accordance with the dictum 'Moderation in all things.' We extirpate hostility through the realization that all that we experience, God experiences, and out of our desire to treat God with love and reverence, we therefore treat our fellow manifestations with love, acceptance, and compassion.

We will now conduct a brief examination of the most historically significant religious belief systems that have had the most adherents spread around the globe. These include Hinduism,

Buddhism, Confucianism, Taoism, Judaism, Christianity, and Islam. Each of these belief systems has something interesting to say about the nature of God, and contains valuable insights into how best to achieve a good life and a healthy society. There is something useful to be learned from each of these traditions.

However, the fact is that none of these belief systems are capable of meeting the spiritual needs of a global 21st Century human civilization. Over the past twenty-five hundred years tremendous advances have been made in every area of human endeavour. Human knowledge of how the universe works on every scale has grown by leaps and bounds. The advances made in the fields of mathematics, medicine, science and technology are truly breathtaking. Almost every important aspect of our civilization has evolved, and the pace of change is steadily increasing. Change is evident in every area of our lives. Every area but one. And that one is our understanding of the nature of God.

Our spiritual and religious belief systems have remained firmly mired in the past. All of them were birthed at a time when humans believed that the Earth was flat and that the Sun revolved around the Earth, and that the Earth was the centre of the universe. Islam, the most recent addition to the array of religions, came upon the scene in the sixth century C.E. The creation mythologies of all the major religions have been eclipsed by the advances in our understanding of the physical universe. All of the major religions have been used to justify the killing of those who do not share in their belief system. Alas, even the supposedly peace-loving Buddhists have demonstrated a lack of tolerance for those who have an understanding of God which differs from their own.

In the latter half of the 19th Century Friedrich Nietzsche famously declared that "God is dead," and many people around the world, particularly in the west, have come to the conclusion that the very concept of God no longer possesses any utilitarian value to humankind and have abandoned it completely, with dire consequences for the spiritual health of our societies. We do not share in this conclusion, and firmly believe that it is not the concept

of God in and of itself which is flawed, but rather that the traditional interpretations of the concept have become archaic and antiquated, and are in desperate need of an update. We shall examine each of the traditional belief systems across a number of modalities, including their understanding of the nature of God, their beliefs about what happens when we die, any claims of inerrancy, and their views on morality, in an effort to compare and contrast their beliefs with the belief system espoused by the Game of Being theology. (We will note before we begin that this author has relied heavily for his knowledge of the world's various religious traditions upon the superb and incisive writings of Huston Smith, in his book, *The Illustrated World's Religions, A Guide to Our Wisdom Traditions*.)

To begin with, we can ask: what are the roots of religion? From whence did the idea of a spiritual aspect to existence arise? In *The Story of Philosophy,* Will Durant lays out the English philosopher Herbert Spencer's answer to these questions:

> "Religion is at first the worship of a multitude of gods and spirits, more or less alike in every nation; and the development of religion comes through the notion of a central and omnipotent deity subordinating the others, and coordinating them into their hierarchy of special roles. The first gods were probably suggested by dreams and ghosts. The word spirit was, and is, applied equally to ghosts and gods . . . God was, at first, only "a permanently existing ghost." Persons who had been powerful during their earthly lives were believed to keep their power in their ghostly appearance . . . Such dangerous ghosts had to be propitiated: funeral rites grew into worship, and all the modes of currying favor with the earthly chief were applied to the ceremonial of prayer and the appeasement of the

gods. Ecclesiastical revenues originated in gifts to the gods, just as state revenues began as presents to the chief. Obeisances to kings became prostration and prayer at the altar of the god. The derivation of the god from the dead king shows clearly in the case of the Romans, who deified rulers before their death. In such ancestor-worship all religion seems to have its origin." (119)

Chapter Twenty-four

HINDUISM

* * * * * *

We turn our attention first to Hinduism, the oldest of the major historical religions which rely upon written sacred texts for the teaching and guidance of its followers. Hinduism is a very rational belief system. It incorporates a keen analysis of human psychology and of the human condition. Like all belief systems about the nature of being, the overall structure ultimately rests upon certain assumptions, and its teachings proceed logically from those assumptions. The importance of foundational assumptions cannot be overstated. As we have seen with the belief system known as Science, invalid assumptions lead inevitably to incorrect conclusions.

The Hindu belief system rests upon three basic assumptions. The first of these assumptions regards the nature of God, and contains a subtle but inherent contradiction. On the one hand, Hindus believe that God resides within all human beings. Of this belief Huston Smith writes:

> "For what is a human being? A body? Certainly, but anything else? A personality that includes mind, memories, and propensities? This, too, but anything more? Some say no, but

> Hinduism disagrees. Underlying the human self, and animating it, is a reservoir of being that never dies, is never exhausted, and is unrestricted in consciousness and bliss. This infinite centre of every life, this hidden self of Atman, is no less than Brahman, the Godhead. Body, personality, and Atman-Brahman - - - - a human self, is not completely accounted for until all three are entered.
>
> But if this is true and we really are infinite in our being, why is this not apparent?
>
> The answer, say the Hindus, lies in the depth at which the Eternal is buried within us, under an almost impenetrable mass of distractions, delusions, and self-serving instincts that comprise our surface selves. A chimney can be covered with dust, dirt, and mud to the point where no light pierces it at all. The human project is to clean one's "chimney" to allow the light within to radiate in full display." (120)

This is a lovely description of the human condition, but we believe that its message subtly leads its followers astray. It is a plain fact that we are not "infinite in our being." We are not everywhere, but at any given time are situated in one specific place. Furthermore, while the Mind of God is most assuredly Eternal, we are but temporary manifestations of the Mind of God, and our time, and God's time as us, as participants within the Field of Play, is limited. The Creator, who is infinite in space and time, deliberately designed the Game of Being so that God would be able to experience the finite, and to that end decreed, 'All beginnings must have an ending.'

And the metaphor, "The human project is to clean one's "chimney" to allow the light within to radiate in full display,"

similarly leads the individual down the path of error. Human beings contain no light within. Within are only muscle and sinew, bones, blood and guts. More importantly, this message implies that in order to find God the individual must 'look within.' This is a serious error. God's presence does not need to be 'uncovered,' it needs only to be recognized. God is all around us, in plain sight, dust, dirt, mud, and all.

On the other hand, Smith writes that Hindus insist that:

> "Because thoughts and things are finite and God is infinite, the only literal accurate description of the Unsearchable is neti . . . neti, "not this . . . not this." If you traverse the length and breadth of the universe saying of everything you see and conceive, "not this . . . not this," what remains will be God." (121)

This belief contradicts the earlier statement that Atman-Brahman resides as a light within each human. A resolution of this contradiction can be achieved with the acceptance of the teaching of the Game of Being that humans, and all other things, are direct manifestations of the Mind of God, and that God is therefore simultaneously finite and infinite in Being.

The second basic assumption upon which the Hindu belief system rests is that of the idea of reincarnation, or transmigration of souls. According to this belief, individual souls, or 'jivas,' enter into the world by the grace of God, and, beginning their odyssey of existence as souls partaking of the most simple forms of life, through the continual process of death and re-birth, work their way up through evermore complex lifeforms until they reach the status of entering a human form. There is no reliable evidence to support the idea of the existence of individual everlasting souls, and so the question arises: What purpose does this particular belief serve?

The answer to this question is tied up with the third basic assumption of the Hindu belief system, which is that we live in a

moral universe. In Hinduism this is expressed as the doctrine of karma, the moral law of cause and effect. Smith tells us that according to this doctrine:

> "The present condition of each interior life - - - how happy it is, how confused or serene, how much it sees - - - is an exact product of what it has wanted and done in the past. Equally, one's present thoughts and decisions determine one's future experiences. Each act that is directed upon the world reacts on oneself, delivering a chisel blow that sculpts one's destiny.
>
> This notion of a completely moral universe commits the Hindu to complete personal responsibility. It allows no toehold for psychological projection (blaming others for one's troubles) or appeals to bad luck. It is not, however, fatalistic. Karma decrees that every decision must have its inexorable consequences, but the decisions themselves are freely arrived at. The hand that a card player picks up he dealt in a former life; now he is free to play it as he chooses. The course that a soul follows is charted by its wants and deeds at each stage of its journey." (122)

The answer to our question of what is the purpose of the idea of individual everlasting souls is contained in the statement, "This notion of a completely moral universe commits the Hindu to complete personal responsibility." As it is in the monotheistic religions of the West, the invention of the notion of individual everlasting souls is designed to maintain social order: If you want to have a pleasant experience in the next life, you had better behave morally in this one. While Hindus do not assign the task of judgment to a particular deity as in the West, the doctrine of karma

necessarily presupposes the presence of some sort of mechanism extant in the universe which operates as a judge of the conduct of humans, and which rewards or punishes them accordingly.

For centuries, a significant portion of the population of the Indian sub-continent have lived lives of grinding poverty with little hope for improvement in living conditions. It is clear that the notion of 'karmic justice' has been imposed upon the populace as a means of convincing the impoverished to accept their lot in life, and to justify India's caste system. According to the logic of karma, if you are born into the lowest caste, that of the 'untouchables,' it is because of your behaviour in your previous life and you must accept your fate, for the universe has decreed that it be so, and so it must be. Thus your station within society in your current life was fixed before you were born, and there is nothing to be done about it. The success of this mode of thinking in allowing the privileged classes of India to maintain their position of privilege over centuries cannot be denied, but there are many in the world who would find this method of maintaining social order to be repugnant and indefensible.

As to the basic question of whether or not it is an accurate assessment of the workings of the universe to posit that there actually exists a moral component fundamental to said workings, or whether this notion is simply yet another invalid assumption which humans have made about the nature of being, that discussion we will set aside until after we have reviewed the rest of humanity's historical religious traditions.

So, to the ultimate question of what kind of world do we have, according to Smith Hinduism replies:

1. A multiple world that includes innumerable galaxies horizontally, innumerable tiers vertically, and innumerable cycles temporally.
2. A moral world in which the law of karma is inexorable.
3. A middling world that will never replace paradise as the spirit's destination.

4. A world that is maya, deceptively tricky in passing off its multiplicity, materiality and dualities as ultimate when they are actually provisional.
5. A gymnasium for developing spiritual capacities - - - what Keats called “a vale for soul-making.”
6. A world that is lila, the play of the divine in its cosmic dance - - - untiring, unending, resistless, yet ultimately beneficent with a grace born of infinite vitality. (123)

Dealing with each of these conclusions about the fundamental nature of the universe in turn:

1. The Game of Being teaching rejects the notion that any class of objects within the Game are “innumerable.” While the number of galaxies situated within the Field of Play may be beyond the ability of humans to count, there is, to be sure, a finite number of them. To counter the claim that there are “innumerable tiers vertically,” the Game of Being metaphysics posits that there are but three classifications of 'stuff': space-time, inanimate matter, and lifeforms. Matter, animate and inanimate, comes in the finite form of the 118 elements of the Periodic Table. While the number of known lifeforms number in the millions, their total number is not innumerable. However, there may be innumerable cycles temporally. The seemingly endless cycle of the seasons on the planet Earth will come to an end when the planet is swallowed by the star about which it orbits when that star becomes a 'red giant.' The Creator, weary of experiencing the infinite, deliberately designed the Game of Being so that its manifestations would be temporally finite. But, as we shall see, it is entirely possible that the Game of Being is episodic, and that while within each episode all beginnings must have an ending, the number of individual episodes of the Game that have been, and will be, could very well be innumerable.

2. As noted above, we will deal with the question of whether or not we live in a moral universe later in our discussion.

3. The third conclusion is based upon the assumptions that both jivas and paradise actually exist. There is a complete dearth of evidence to support the claim that either of these entities are to be found anywhere, within or without the universe. India's poverty-stricken masses have been fed the forlorn hope that their struggle to survive in this life will be rewarded by a more comfortable existence in some future set of circumstances. We believe that this message is intellectually dishonest. We may indeed live in a "middling world," but the Game of Being teaches that this is the only world we will ever know, and that it is in our hands, not God's, to construct a social order in which poverty is eliminated and suffering is minimized.

4. When Hindus characterize the world as maya, they mean "the world appears the way we see it, but that is not the way it really is." (124) This is a great Truth. When we sit in our chair in our living room we appear to be still when we are actually hurtling through space. Material objects appear to be solid matter even though their primary constituent is immaterial space-time. Things appear to be permanent when in fact all manifestations are temporary. Objects appear to be things when in fact they are events. Humans appear to possess free will when in fact the Game of Being is utterly deterministic, with the event that takes place at any given moment of time determined by the event(s) which preceded it. The entities of the world all appear to be different when they are actually all derived from and expressions of the same thing: the Pure Consciousness of the Mind of God. The world is indeed maya.

5. A gymnasium is a place of learning, where one acquires new knowledge and develops new skills; so to characterize the world as a gymnasium is not inaccurate. One area of knowledge that most humans encounter at some point in their lifetimes touches on their understanding of the nature of God. The Game of Being teaches that all things are direct manifestations of the Mind of God. However, we are leery of the use of the word "spiritual," lest it lead to the idea, as it evidently did for Keats, of "soul-making." The teaching of the Game of Being firmly rejects the notion that there exists anywhere within the Field of Play entities that are everlasting.

6. When Hindus say that the world is lila, they mean that the world is 'God's play.' In this respect, Hindu teaching and the teaching of the Game of Being are in complete accord. The Game of Being is indeed a game being played by the Creator, which God created in order to while away eternity. Writing of the Hindu notion of lila Smith says, "Like a child playing alone, God is the cosmic dancer whose routine is all creatures and all worlds." (125)

Chapter Twenty-five

BUDDHISM

* * * * * *

We turn now to a brief study of the teachings of Buddhism, the second of the great religions that India has bequeathed to humanity. There is no doubt that Siddhartha Gautama, the Buddha's name at birth, was one of the greatest teachers ever to walk the face of the earth. Born into royalty around 563 BC in what is now Nepal, his life as a child and young man was one of luxury and comfort. The story of his difficult journey from being a pampered prince to his attainment of enlightenment is the stuff of legend. It is said that despite the efforts of his father to protect Siddhartha from such knowledge, the young prince became aware of the suffering of the ordinary members of the populace, and that the knowledge that disease, decrepitude, and death are the inevitable outcomes of the human condition filled him with despair. Filled with the inner conviction that there must be more to existence than this, he renounced his royal life and set out on a path to discover what that 'more' must be. Over the next six years he devoted his time to studying with two Hindu masters who taught him the skill of meditation, and living his life as an ascetic, travelling about with a begging bowl. After his self-imposed privations almost killed him, he changed tack:

> "Having renounced mortification, Gautama devoted the final phase of his quest to a combination of rigorous thought and mystic concentration along the lines of Hinduism's raja yoga. Sensing at length that a breakthrough was near, he sat down one evening under what has come to be known as the Bo Tree (short for Bodhi or enlightenment), vowing not to arise until he had gained his goal." (126)

Legend has it that after persevering through a night of temptations similar to the story told of Jesus in the desert, Gautama deepened his concentration until, with the coming of the morning star, his mind achieved what the Zen school of Buddhism calls the state of satori: ". . . the experience [that] comes in a flash, exploding like a silent rocket in the unconscious mind to throw new light on everything." (127) The Buddha, whose name means 'I am awake,' was born through Gautama's direct experience of the ultimate Oneness of all that exists. In the terminology of the teaching of the Game of Being, we would say that the mind of the Buddha came into direct contact with the pure awareness that is space-time, the state of being which confers awareness upon lifeforms.

Having personally experienced what he came to call nirvana, the Buddha dedicated the rest of his life to teaching others how to achieve that state of mind. In his teaching the Buddha refused to describe this experience, insisting that it is "incomprehensible, indescribable, inconceivable, and unutterable." (128) The Buddha did allow that nirvana is "bliss, pure bliss." Similar to the comments of Sam Harris concerning the goal of the practice of meditation which we noted earlier, Huston Smith defines the experience of nirvana as the extinguishing of "the boundaries of the finite self." (129)

In the West there has arisen some confusion surrounding the

meaning of the word “nirvana,” with some believing it to be synonymous with the idea of heaven, while others associate it directly with the idea of God. But the Buddha taught that the notion that there exists a “. . .being who created the universe by deliberate design” (130) to be mere idle speculation and that therefore Buddhism, as originally conceived by the Buddha, was atheistic. In this view, nirvana is neither a being or a place; it is an experience. Yet the Buddha reportedly declared:

> “There is, O monks, an Unborn, neither become nor created nor formed. Were there not, there would be no deliverance from the formed, the made, the compounded.” (131)

While we can presume that the Buddha did not intend it as such, the first sentence of this paragraph is in perfect harmony with the conception of God as taught by the Game of Being theology in which God, the Creator, is said to be “formless, shapeless, featureless; a nebulous, non-corporeal field of Pure Consciousness, devoid of substance or foundation.”

There are two other similarities between Buddhism and the teachings of the Game of Being. To different degrees both deny the existence of an imperishable soul which survives death and carries on from life to life. The Game of Being's teaching in this regard is absolutist, stating plainly that nothing of us survives our deaths save the strands of our DNA passed on to our descendants, and the memories of us which are encapsulated within the realities of those who knew us, both of which become less distinct with the passage of time.

On the other hand, the Buddha's ideas regarding the existence of souls was less clear-cut and more complicated, for while he denied the existence of a spiritual substance which retains its separate identity forever, and although much of his teachings were a rebellion against the prevailing Hindu orthodoxy, he retained a belief in the Hindu idea of reincarnation. However,

when it came to describing what it is that is reincarnated, the Buddha's pronouncements were uncharacteristically vague, imprecise, verging on the contradictory. This is surprising because the Buddha's belief system is so firmly based upon a rational analysis of the human condition. As Smith notes, the Buddha's teachings were empirical, scientific, pragmatic, therapeutic, and psychological.

The Buddha's retention within his teachings of the idea of reincarnation is all the more puzzling when one considers the other area in which the teachings of the Buddha and the teachings of the Game of Being overlap. This area involves an emphasis on the impermanent and transitory nature of all things. Smith states that for the Buddha, ". . . everything is in process, everything is in change." (132) This belief aligns with an idea fundamental to the Game of Being: that, properly understood, manifestations are not objects, but events, constantly unfolding, all of which are destined to dissolve into the mists of time.

Even though his teachings were centred on the spiritual development of the individual human being, perhaps the Buddha believed, as did the Hindu culture into which he was born, that a belief in reincarnation was necessary to maintain the moral structure of society. For it is clear that the Buddha was a moralist. The individual steps of the Eightfold Path, his prescription for how to achieve true freedom, that is, "liberation from unconscious, mechanical existence," (133) are labelled as follows: Right knowledge, Right aspiration, Right speech, Right behaviour, Right livelihood, Right effort, Right mindfulness, and Right absorption. This emphasis on the 'Right' way to approach each of these steps presumes that there is a 'Wrong' approach in each case. This dichotomy, this way of categorizing behaviour or events, is presupposed by the underlying idea that there is a 'Right' and 'Wrong' embodied in the fundamental workings of the universe. The Game of Being belief system holds that this is a misguided and dangerous understanding of the fundamental nature of the universe. In our view a more accurate labelling of the steps of the Eightfold

Path would be Correct knowledge, Correct aspiration, Correct speech, etc.

Or perhaps the Buddha included the idea of reincarnation in his teachings because he felt it was necessary, for psychological reasons, to give hope to the millions of Indians who lived in desperate poverty, that the possibility of a better life awaited them in the future if they trod the path of righteousness in their current life.

As with the case of Jesus Christ, the Buddha did not commit any of his teachings to writing, and as with Christ, none of the Buddha's thoughts appeared in written form until a number of decades after his death. Buddhism and Christianity also share another common feature: over the centuries the followers of both of these two great teachers split into a number of competing sects. Although there are others as well, the two main sects within Buddhism are known as Theravada and Mahayana.

For Theravadins, Buddhism is a full-time job and requires the complete dedication of one's life to the pursuit of enlightenment as a monk. Although teachers and fellow-seekers are seen as aids along the path, Theravadins consider each individual to be alone in his struggle to attain enlightenment; for them there are no gods to help them along the way. Smith notes:

> "In Theravada Buddhism the prime attribute of enlightenment is wisdom (bodhi), meaning profound insight into the nature of reality, the causes of anxiety and suffering, and the absence of a separate, self-existent core of selfhood. From these realizations flow automatically the Four Noble Virtues: loving kindness, compassion, equanimity, and joy in the happiness and well-being of others." (134)

Furthermore, the Theravadins revere the Buddha not as a god, but ". . . as a supreme sage who through his own efforts

awakened to the truth and became an incomparable teacher." (135)

For Mayahanists, the content of the Buddha's message is as available to the ordinary person as it is to the dedicated seeker. For them the most important aspect of the Buddha's teaching is that of compassion for other beings, and they believe that Buddhas and bodhisattvas exist for the purpose of helping others along the path. A bodhisattva is ". . . a being who, having reached the brink of nirvana, voluntarily renounces that prize and returns to the world to make it available to others." (136) Further differences between the Theravadin and Mayahanist belief systems include the facts that the Mayahanists regard the Buddha to be a saviour of the world, and therefore to be a God, and that Mayahanism also ". . .spawned elaborate cosmologies replete with multi-leveled heavens and hells." (137) These are ideas which the Buddha himself denied during his lifetime. Thus a great irony contained within Buddhism is that it is a religion which ". . . began by repudiating ritual, speculation, grace, mystery, and a personal God, and ended by embracing them all. . ." (138)

It is worthwhile to take a moment to consider the social context from which Buddhism arose. Siddhartha Gautama's society was agrarian-based, and it would have been impossible for him to imagine a modern industrial society. He knew nothing of the scientific world-view and almost certainly would have believed that the Earth is flat and that the Sun revolves around the Earth. The Buddha's ideal social structure consisted of a monarchy, the monastic community, and the laity, with each component having responsibilities to, and being served by, the other two. What would the Buddha have made of an automobile, an airplane, a computer, or a cell phone? Are the Buddha's teachings still relevant in the modern world?

The answer is undoubtedly yes. As Sam Harris has argued, the Buddha's Eightfold Path, if diligently followed, can lead to the discovery and direct experience of the Oneness which underlies the manifest multiplicities that appear within the Field of Play. The example of the Tibetan Dalai Lama is an inspiration to millions

around the world. The achievement by each individual human being of the Buddha's teaching of wisdom and compassion will always and forever be goals which are essential to the structure of a peaceful human civilization. As to the Theravadin / Mayahanist debate over which value is primary, the teaching of the Game of Being seeks to resolve the issue by suggesting that it is surely part of wisdom to show compassion, and that to be compassionate is surely to demonstrate wisdom.

Chapter Twenty-six

CONFUCIANISM

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We turn now to an exploration of the teachings of Confucius. While the Buddha's chief concern was the spiritual development of the individual human being, the teachings of Confucius emphasized the social structure of society-at-large, based on the relationships between individuals and the responsibilities that each individual has to the others in his or her life.

Confucius was born around 551 B.C. and lived out his life during a span of Chinese history known as the Period of the Warring States. The authority of the Chou Dynasty had disintegrated and local warlords fought for control, plunging China into strife and chaos. Mass slaughters on the order of tens of thousands of persons including women, children and the aged were not unknown. Chinese society was coming apart at the seams.

From his study of the ancient classical texts Confucius became convinced that some 500 years earlier, during the formative stages of the Chou Dynasty, China had experienced a golden age which he called the Age of the Grand Harmony. He concluded that what had made the Age of the Grand Harmony possible were the societal traditions which were prevalent in China in that era, during

which the traditions which had made that society so successful were more or less automatically transmitted from one generation to the next. By Confucius' day that chain of transmission had broken down and those traditions had crumbled. Chaos was the result.

Having diagnosed the illness, Confucius' prescription was to shift ". . . tradition from unconscious to conscious status." (139) Confucius' basic assumption was that "Human beings are by nature good. For nearly two thousand years this was the first sentence that every Chinese child was taught to read.." (140) His goal was to have moral values taught in every possible venue, from temples and schools, to festivals and parades. His idea was that through the inculcation of the ideal moral values upon the members of society at every turn, the individual would naturally learn how to behave in ways that were beneficial to himself and to society-at-large.

According to Huston Smith, Confucius' program, his antidote to chaos, can be distilled down into five ideals. The first of these ideals is jen. Smith writes:

> "Jen defines the ideal relationship which should pertain between individuals . . . Variously translated as goodness, man-to-man-ness, benevolence, and love, it is perhaps best rendered as human-heartedness. Jen was the virtue of virtues in Confucius' eyes . . . In public life it prompts untiring diligence. In private life it induces courtesy, unselfishness, and empathy . . . It knows no national boundaries, for it understands that 'within the four seas all men are brothers.' " (141)

The second ideal is that of the chun tzu. This has been translated as "Humanity-at-its-best." Of the chun tzu Smith writes:

> "Endowed with a self-respect that generates respect for others, he approaches them with an

> eye, not to "What can I get from you?," but rather, "How can I accommodate you?" Only of such large-hearted people, Confucius thought, can civilization be built." (142)

The third ideal, li, has two meanings. The first of these is propriety, the "right" - - - the teaching of the Game of Being would say the "correct" or "proper"- - - way of doing things. For every social situation Confucius ". . . sought to chart an entire way of life, so that no one who was familiar with it need be in doubt as to how to behave." (143) The specifics for how the individual was to achieve proper conduct across a range of social roles were laid out in a number of doctrines.

One of these was what Confucius called the Rectification of Names. By this he meant that the responsibilities inherent in each social role should be built into the very definition of the word describing that social role. Thus "The word "father" should mean, not merely a man who has sired a child, but one that loves the child he has sired. Comparably with "ruler," "friend," "teacher," or whatever social role is in question." (144)

Another important theme of Confucius' teaching was the Doctrine of the Mean, which instructs individuals and society-at-large to chart "a middle course between unworkable extremes." Its motto was "nothing in excess" and entailed the belief that if this doctrine was put into practice it would result in social "harmony and balance, encouraging compromise and discouraging fanaticism." (145)

Confucius laid particular emphasis on what he called the Five Constant Relationships which are ". . . those between parent and child, husband and wife, elder sibling and junior sibling, elder friend and junior friend, and ruler and subject. It is vital to the health of society that these key relationships be rightly constituted." (146) Smith goes on to note:

> "That three of the Five Relationships pertain

> within the family is indicative of how important Confucius considered this institution to be. Within the family, it is the children's respect for their parents that holds the key; hence the concept of filial piety. 'The duty of children to their parents is the fountain from which all virtues spring.'" (147)

Another aspect of li is the Doctrine of Respect for Age. On this doctrine Smith comments:

> "Two points lock together here. On purely utilitarian grounds it would be good to have a society in which the young attend to the old, for soon the young will be old themselves and will themselves need tending. But Confucius also thought that age merits respect because of the wisdom experience confers. Years season wisdom and mellow the spirit." (148)

In the foregoing discussion we have explored the first meaning of li,

> ". . . which is propriety, or right conduct. The companion meaning of the word is ritual, which changes right - - - in the sense of what it is right to do - - - into rite. Or rather, it infuses the first meaning with the second, for when right behaviour is detailed to Confucian lengths, the individual's entire life becomes choreographed; it is transformed into a sacred dance. Its steps have been indicated. There is precedence for every act." (149)

The fourth ideal contained within Confucius' prescription for an orderly and peaceful society was the idea of te, which

translates as power, in particular the power by which a state is ruled. Confucius understood that

> "Rulers need the voluntary cooperation of their subjects, and this will emerge only when people believe that their leaders merit their cooperation. To merit it, leaders must be persons of character, sincerely devoted to the common good and possessed of the character that compels respect. Real te, therefore, is the power of moral example." (150)

The final plank in Confucius' program for the creation and maintenance of an orderly society was the notion of wen. Wen refers to the arts: poetry, painting, and music, in Confucius' day the primary cultural constituents of any successful society. Confucius valued the arts because he believed that they had the "power to ennoble the human spirit," and that states which were advanced in the field of the arts would be admired by other states, and therefore successful in their external relations.

From this discussion of the teachings of Confucius the question arises: is Confucianism a religion or simply a detailed program of ethical conduct? Is there a spiritual dimension at play here? During that era ancestor worship was widely practised in China, and most Chinese families regularly made sacrificial offerings to the dead. For the Chinese of that day the ancestral dead were the gods. The realm of the dead was known as ti (Heaven) and was presided over not by a creator god, but by the supreme ancestor, Shang Ti. It was widely believed that the dead knew what the future would bring, and professional fortunetellers were frequently employed to interpret the omens by which the dead were thought to communicate with the living. Confucius did not deny the idea of the continued existence of the dead in the spiritual realm, but his focus remained on the living family including, importantly, those ancestors who were still alive.

Confucianism lacks a highly developed cosmology which specifies how or why the world was created. But Confucius' teachings clearly have a moral component and Smith reports that:

> "Somewhere in the universe, he believed, there is a power that is on the side of right. It follows from this that the spread of righteousness is a cosmic demand. He taught that the Will of Heaven is the first thing a chun tzu will respect, and he believed that that Will backed his mission." (151)

On this point the teachings of Confucius and the teachings of the Game of Being diverge. But in another respect the teachings of the two schools of thought are not dissimilar. Confucius taught:

> ". . . that apart from human relationships there is no self. The self is a center of relationships. It is constructed through its interactions with others and is defined by the sum of its social roles . . . Confucius saw the human self as a node, not an entity; it is a meeting place where lives intersect." (152)

This line of thought is not all that different from the belief espoused by the Game of Being metaphysics that at the most fundamental level humans are not entities, but are events, and that the self is the sum of our interactions with other manifestations, both animate and inanimate, known collectively as our individual realities.

Another similarity between the teachings of Confucius and the teaching of the Game of Being is the emphasis on empathy, the power of projecting one's personality into (and so fully comprehending) the object of contemplation. Only through the development of this skill can the individual human being fully

experience the attitude of agape, or universal love. The ultimate goal of the Confucian program was to mould each individual into

> ". . . a chun tzu, a fully realized human being, through expanding one's empathy indefinitely. This expansion proceeds in concentric circles that begin with oneself and spread from there to include, successively, one's family, one's face-to-face community, one's nation, and finally all humanity. In shifting the center of one's concern from oneself to one's family one transcends selfishness. The move from family to community transcends nepotism. The move from community to nation overcomes parochialism, and the move to all humanity counters chauvinistic nationalism." (153)

A third area of resemblance between the teachings of Confucius and the teachings of the Game of Being is the idea that humans need to change their behaviours from being unconscious, automatic, and reactive, to being conscious and purposeful. Confucius' program was based upon changing the transmission of ". . . tradition from unconscious to conscious status." Similarly, the Game of Being teaching urges individuals to exercise their free will to make a conscious choice to love the other manifestations of the Mind of God with whom they interact.

Do the teachings of Confucius have any relevance to our modern societies? As Smith points out, Confucius' ideas were the foundational principles that structured the social relationships of a quarter of the world's human population for 2000 years. It would be unlikely that his ideas would have nothing of value to contribute to the modern age. Surely everyone could agree, at least in principle, on the importance of a secure family unit to the stability of society-at-large. There is no doubt that the breakdown of the family has contributed to the general malaise that is steadily

spreading throughout the western world.

And who can doubt the importance of having competent people at the helm, people who can inspire the citizens of their nation by the power of their own personal example. There are few countries now in the world whose leaders rule by the Mandate of Heaven, but it is increasingly clear that 'paper' democracies are no guarantee of wise and competent leadership. More and more we see supposedly democratic nations falling under the sway of men whose minds are diseased by avarice and the thirst for power. As I write these words the world is entering the third week of Russia's brutal invasion of Ukraine, on the orders of a man whose mind is clearly diseased. Closer to home, this past week has seen a committee of the United States Congress file evidence in court which suggests that the previous president of that country committed numerous felonies while in office. In this nuclear age it is more important than ever, for it is ultimately their responsibility, for the citizens of every nation to ensure that only individuals who have the necessary experience and who are of good character and sound judgment are permitted to occupy positions of power and leadership in their society. Confucius would surely have agreed with this idea.

Since he saw the self as defined by the sum of its social roles, Confucius would have been deeply troubled by the rampant individualism so much in evidence in modern western societies. He would have agreed with the philosopher Herbert Spencer that men are what the environment makes them. Thus a society organized on the basis of competition between individuals rather than on cooperation among them, inevitably leads to a society that suffers from internal divisions. A culture that regularly features 'celebrity roasts' as a form of popular entertainment teaches the young that it is acceptable to disrespect and mock one's peers for the sake of some cheap laughs, and so it is no surprise that bullying is a constant problem in the schoolyard. Confucius would have predicted that a society which is awash with images of violence in its entertainment will itself be violent.

All things considered, there is little doubt that the teachings of Confucius would have something of value to contribute to our modern western society. The social and economic success of the Chinese diaspora, who brought with them twenty centuries worth of Confucian traditions, suggests that there is something worthwhile in his teachings. A shift of emphasis, away from the entitlement of the individual towards the social responsibilities of the individual, as Confucius preached, would, we believe, have a positive effect on the behaviour of individuals and on the social structure of society-at-large.

Chapter Twenty-seven

TAOISM

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We turn now to a contemplation of the other great wisdom tradition which arose in China, the teachings of Taoism. Where Confucianism is primarily concerned with establishing a sound structure to the relationships between individual persons, Taoism (pronounced Dowism) is more concerned with bringing the individual into harmony with the 'life force' that Taoists say pervades the universe. The foundational text of Taoism, the Tao Te Ching, said to be, after the Bible, the most translated book in the world, is

> ". . . a guide to cultivating a life of peace, serenity, and compassion. . . As one of the world's great works of wisdom literature, it still has much to teach us today, offering a practical model based on modesty and self-restraint for living a balanced existence and for opening your mind, freeing your thoughts, and attaining greater self-awareness. With its emphasis on calm, simplicity, purity and non-action, it provides a time-tested refuge from the busyness of modern

life." (154)

Tao Te Ching has been translated as "The Way and Its Power." The literal translation of the word "Tao" is "path," but because of the mystical overtones attached to the word by the purported author of the Tao Te Ching, a figure of legend known as Lao Tzu, the exact meaning of Tao as intended by Lao Tzu has always been something of a puzzle. The opening verse of the Tao Te Ching begins:

> The Tao that can be told
> Is not the true Tao;
> Names that can be named
> Are not true names.
> The Origin of Heaven and Earth
> Has no Name.

Lao Tzu seems to have perceived the problem with the Veil of Names to which we have previously referred, and understood that the very act of naming something places a barrier between the namer and the direct experience by the namer of the object being named. Thus the purpose of the practice of meditation is to achieve a state of mind in which the habit of naming things disappears, and the direct experience of "perceiving that by which we perceive" (155) is attained. Still, being the manifestations humans have evolved to be, we are unable to proceed through everyday life without employing identifiers.

According to Huston Smith, Taoists have come to understand the word Tao in three different but related ways.

> "First, Tao is the way of ultimate reality. This Tao cannot be perceived or even clearly conceived, for it is too vast for reason to fathom. It is, all the same, the ground of everything that follows." (156)

The metaphysics of the Game of Being disagrees with this usage of the word "reality,' preferring to clearly and precisely define "reality" as the interaction of any given lifeform with the other manifestations within its environment; specifically, the acquisition, processing, and storage of information generated by those other manifestations by that particular lifeform. In this understanding, all realities are equally "ultimate." In our metaphysics, the Tao is the way of the ultimate "source." This interpretation is in line with Smith's claim that the Tao is "the ground of everything that follows." This usage of the word "Tao" corresponds with our naming of the ineffable as "God, the Creator." Indeed this Tao cannot "be perceived or even clearly conceived," for the Creator is infinite in space and time, and the human Awareness Connectivity System, having evolved to deal with the finite world, cannot truly comprehend the infinite. However, this inability to completely comprehend the nature of the Creator does not prevent us from assigning certain attributes to God, such as loneliness, boredom, and a desire for happiness. Assigning these attributes to the Creator provides us with an explanation for why God created the Game of Being, for why there is something rather than nothing. God created the Game to escape the ennui brought on by the first two of these attributes, and to fulfill the wish for the attainment of the third. God, the Creator, whose infinite realm is that of Pure Consciousness and who is therefore immaterial, wished to experience material being and the finite, and so created the Field of Play in order to achieve those goals.

Taoism's second understanding of the word "Tao" is:

> ". . . the way of the universe; the norm, the rhythm, and the driving power in all nature. Basically spirit rather than matter, it cannot be exhausted, for the more it is drawn upon, the more it flows. . . Giving life to all things, it may be called "the Mother of the World."" (157)

Since the metaphysics of the Game of Being is scientifically based, we do not accept the idea of "spirit" as an explanation for any phenomenon. This metaphysics associates this understanding of Tao, "the driving power in all nature," with the modern scientific concept of energy-matter. The Law of the Conservation of energy states that energy-matter can neither be created or destroyed; it can only be changed from one form into another. Therefore it cannot be exhausted.

And one particular form of energy, electromagnetic radiation, does indeed give "life to all things." When electromagnetic radiation within a certain range of frequencies (visible light) is absorbed by vegetative matter, it powers the growth of the plant through the process known as photosynthesis. The very existence of all plants and animals is dependent upon this phenomenon. The energy of light permits plants to grow. That energy is stored within the cells of the plant and is then transformed when the plant is eaten by an animal. The energy is transformed once again when the plant-eating animal is eaten by another animal. Thus all life on Earth is powered and made possible by the light from the star about which our planet revolves. Light is the "life force" that pervades the universe. Quite literally, light is indeed "the Mother of the World."

For Taoists the third understanding of "Tao refers to the way of human life when it meshes with the Tao of the universe." (158) Thus Taoism seeks to provide the individual with the tools necessary to guide him or her along a life path (the way) which will be in harmony with the other manifestations of the universe with which they come into contact.

The second important word in the title of Lao Tzu's classic is Te, or the "power" thought by Taoists to permeate the universe. Taoism's chief concern was to discover methods by which that power could be preserved, enhanced, or tapped into. These three different approaches gave rise to three different schools of Taoism in China, dissimilar in their teachings but in practice by no means

mutually exclusive.

The oldest of the three schools is known as Philosophical Taoism, and of the three is most closely associated with the teachings of Lao Tzu and the Tao Te Ching. Smith sums up the teachings of the Philosophical School of Taoism as follows:

> "Philosophical Taoists try to conserve their te by expending it efficiently. .. . We can establish [Philosophical Taoism's] link with power by remembering that philosophy seeks knowledge and that knowledge is power . . . The knowledge the Taoists sought was the kind that empowers life. We call it wisdom, and to live wisely (the Taoist philosophers argued) is to live in a way that conserves life's vitality by not expending it in useless, draining ways, the chief of which are friction and conflict . . . Their recommendations revolve around the concept of wu wei, a phrase that translates literally as inaction but in Taoism means pure effectiveness. Action in the mode of wu wei is action in which friction - - - in interpersonal relationships, in intrapsychic conflict, and in relation to nature - - - is reduced to the minimum." (159)

Later in his text Smith comments that wu wei flows through us ". . . when our egos and conscious efforts yield to a power not their own." Smith goes on to say that this power is ". . . a force that is infinitely subtle and intricate . . . The *Tao* flows in and flows out again, turning life into a dance that is neither feverish nor unbalanced." (160) On this point we must disagree with Taoist teaching, and with Smith's interpretation of that teaching, in two respects. Smith's statement implies that the Tao is some magical force resident in the universe that is available to flow through us, and if we only suspend our conscious efforts to control the choices

we make we will be able to achieve a life guided by wu wei, a ". . . life lived above excess and tension." This view is tragically incorrect.

We begin with the Taoist belief that the Tao is a force or power that exists in the universe. While this romantic notion may be psychologically comforting, there is simply no evidence to suggest that it is true. In this case it is the peculiarly Chinese expression of the more general and widespread idea held by many peoples throughout the history of human civilization that the universe is a battleground over which the forces of good and evil - - - right and wrong - - - contend. This belief is regularly reinforced in our present day popular culture. "May the force be with you" is the battle cry of those characters in the Star Wars saga who are on the side of 'good' in their never-ending struggle against the Empire, the entity representing the forces of 'evil,' the 'dark side.' (As we shall see, the human experience of the 'dark' has been entirely misunderstood and as a result the whole notion of darkness has been seriously maligned.)

There are no self-sustaining forces of 'good' and 'evil' operating in the universe. These words are descriptors - - - useful descriptors - - - of human behaviour. But they do not exist as independent entities. All that actually exists within the Field of Play are space-time and energy-matter. Everything else, including words and numbers, are either psychological projections or products of the human imagination. Nothing other than space-time and energy-matter actually exists. Thus the Tao is not, and cannot be, a force "that flows in and flows out." The Tao is an artifact of the belief system known as Taoism; a word invented to name the unnameable.

Our second point of disagreement with Smith's interpretation is his implication that a life lived in accordance with the concept of wu wei - - - pure effectiveness - - - can be achieved when our "conscious efforts yield to a power not their own." Not only is there no such power to yield to, the idea that a life of "pure effectiveness" can be achieved without a sustained conscious effort

is, we believe, completely erroneous. The sage whose life is one of pure effectiveness knows when - - - and when not - - - to act. This is the very definition of wisdom. To do this consistently throughout life one must consciously choose, over and over again, those paths of action which will be of greatest benefit to oneself and to those for whom one may bear some responsibility. The decision-making process of the sage who is profoundly in touch with the world around him may appear to others to be natural and spontaneous, but it is in fact the result of a deep examination and appreciation of the potential consequences of his actions. The sage who walks the path of wu wei does not do so unconsciously, allowing his fate to be determined willy-nilly by the universe, that is, by the whims of other persons (who are, after all, other individual manifestations of the universe). Quite the contrary. The true sage is one who is constantly weighing the possibilities before him and who carefully, and with the experience gained by practice seemingly instinctively, chooses the path that will reduce friction to a minimum. This process requires the subjugation of the emotions to the intellect, for the indulgence of our emotions frequently clouds our judgment. The true Taoist sage is more Spock, less Kirk.

This is not to say that emotions should play no role in our lives. Emotions are clearly important - - - and inescapable - - - components of the normal human psyche. The inability of an individual to experience emotion is considered to be a symptom indicative of pathology. Emotions are necessary to inspiration and creativity. They make our interactions with other manifestations of the universe more fulfilling. But when they rely overmuch on their emotions to guide their actions, humans frequently run into difficulties.

The well-known events of January 6, 2021, in Washington, D.C. are a case in point. In *The Book of Disquiet,* the Portuguese writer, Fernando Pessoa, comments ". . . that most people think with their feelings." This is an accurate description of what took place on that day. A crowd of several thousand people allowed

themselves to be whipped up into an emotional frenzy by a manipulative demagogue, and in an unhinged rage attacked the seat of the U.S. Government, in the process causing bodily harm to a large number of the police who were there to guard the building. The participants in that mob behaviour were not employing their intellect. They were not carefully weighing the consequences of their actions. Their choices could not possibly have been any further away from wisdom. They were 'thinking' with their feelings. As a consequence, many of them are now facing lifelong criminal records and significant jail time.

The ancient Taoists revered nature and sought to live in harmony with its rhythms. Huston Smith notes:

> "Of the natural elements, it was water that impressed the Taoists most. They admired the way it supports objects and carries them effortlessly on its tide . . . water is unobtrusive and adaptive; it assumes the shape of its containers and seeks out the lowest places. Yet despite its accommodations, it subdues what is hard and brittle. Its currents carve canyons from granite, and melt the hills we call eternal. Infinitely supple, yet incomparably strong - - - these virtues of water are precisely those of wu wei. (161)

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The lessons learned from water by the Taoists are highly relevant to events taking place on the world stage as we write these

words. The tragedy unfolding in Ukraine could have, and would have, been avoided, had the President of Ukraine followed the path of wu wei, the path of "pure effectiveness." The sage, the wise man, knows when, and equally important, when not, to act. This delicate sense of timing determines to a significant degree how to act.

The Ukraine military forces have fought courageously in the face of overwhelming odds. But the key word here is "overwhelming." They have virtually no chance of repelling the Russian invaders in the medium term. This much was apparent from the start, and although the Ukrainians have surprised everybody, not least the Russians and Putin, with the ferocity of their defence of their homeland, the eventual outcome is inevitable, and never in any real doubt.

Given this assumption, at the moment the Russian aggression actually began, the wise man, following the path of wu wei, would have immediately sued for peace. The terms of surrender would have been disagreeable for the Ukrainian leadership and for most of the Ukrainian people, but disagreeable and unacceptable are two different concepts. The Russian conditions for a halt to the invasion have been broadcast over the last forty-eight hours. Putin's demands are five: that Ukraine officially agrees to the Russian annexation of Crimea; that Ukraine recognize the independence of the eastern Ukrainian provinces in the Donbas region; that Ukraine give up on its efforts to join NATO and the European Union; and that Ukraine demilitarize. In other words, except for the additional demand that Ukraine demilitarize, to accept the facts on the ground as they actually were prior to the beginning of the invasion.

Would an early acceptance by the Ukraine government of Putin's demands have avoided all-out war? Or would Putin have insisted that the terms of surrender include the right to park Russian tanks in the centre of Kyiv? Perhaps. If Putin did make such a demand, the Ukrainians could have always refused to accept those terms at that point. But that appears to be the inevitable outcome in

any event, and this was, or should have been, clear to Ukraine's President Zelenskyy and his advisors from the outset.

Zelenskyy was outraged by the Russian attack, and who can blame him? He has received a great deal of praise in the international media for his courageous leadership under conditions of tremendous stress. But we believe that his leadership has been a disaster for the people of Ukraine. As president of his country it was his responsibility to look after the long-term well-being of Ukraine's citizens and their property. Nobody can fault him for his outrage, but he can be faulted for allowing it to determine the path that he has chosen. He has been 'thinking with his feelings,' not his intellect.

What would have been the outcome if Zelenskyy had sued for peace immediately after the invasion began? Ukraine would have had to agree to the permanent loss of Crimea and the Donbas region. The facts are that Ukraine lost control of most of these regions eight years ago, and in any case a significant portion of the populations of these areas, perhaps a majority, are Russian speakers who prefer to be citizens of the Russian state. The citizens of Ukraine would have had to live with the disappointment of being denied membership in NATO and the European Union, neither of which were at any rate guaranteed for a whole host of reasons. In the worst case scenario, Zelenskyy and the leading members of his government would have been forced to resign and go into exile, and a puppet government would have been installed by Putin. Corruption of the government would have continued much as it has in the past.

As disappointing as these outcomes would have been, for the ordinary Ukrainian life would have gone on pretty much as before. The water of the Ukrainian people would have adapted to the shape of its new container in which they could have resided comfortably, and they could have simply opted to wait Putin out in the hope that his eventual replacement will be someone who possesses a mind less diseased and ruthless. Putin is seventy years old; he will not be around forever. This would have been the wiser

choice, the path of pure effectiveness, the path of wu wei.

As it stands, the very best outcome that the Ukrainians can hope for is that after months, or more probably years, of grinding murderous strife they might drive the Russians out of their country, as did the Afghans in the 1980's. But this victory, if it ever arrives, will have come at the cost of thousands of dead, millions displaced, and the utter ruination of their cities and towns.

There are probably few Ukrainians who would be willing, right now under the present circumstances, to admit that the path down which Zelenskyy has led their country was a mistake. Right now patriotism, outrage, and an anger that is hardening into hatred rules the day. This is a human tragedy in and of itself, for hatred, no matter how righteous its causation, still poisons the mind of the hater. But it is clear that this, too, is an example of people 'thinking with their feelings.'

Imagine that we could return to the moment of the outbreak of hostilities and, like Dickens' ghost of Christmas future, show the Ukrainian people two movies of what might come to pass. In the one is the future in which Zelenskyy acceded to Putin's demands, with the results as outlined above. In the other is the future that has come to be. In the cold, hard, sober light of day, which path would they have chosen?

There are those who say that sometimes human sacrifice is required in order to defend the cause of freedom, and in the past this has been true. There were also societies in the past who believed that sometimes human sacrifices were necessary to appease the gods. How is such a belief today any different in its essence from those in that past? Life is precious and should not be sacrificed to futile efforts to avoid the inevitable. Among other definitions, freedom is defined as 'liberty of action;' in other words, the ability to choose from amongst a range of possibilities. At the end of which movie would the ordinary Ukrainian have the greater range of possible choices in their day-to-day lives?

There are those who say that it is a mistake to give in to a bully; it simply encourages them to continue bullying. There is

truth to this. It takes a wise man to know when and where to draw the line. As Shakespeare wrote, “Discretion is the better part of valour.” It may be that once he had made the decision to invade, no amount of appeasement would have satisfied Putin until his tanks were sitting in Kyiv's main square. However, although it is plain that Putin is willing to kill as many of them as is necessary to achieve his goals, it is reasonably clear that Putin seeks the subjugation of the Ukrainians, not their elimination as living beings from the face of the earth. In this respect Putin is not Hitler. Both Hungary (1956) and Czechoslovakia (1968) were victims of Russian bullying. In both cases resistance was minimal and the countries' major infrastructure was preserved. Although it took decades, the peoples of those two countries by and large chose the path of wu wei, waited out their occupiers, and eventually gained their freedom without appalling human sacrifices. It was Zelenskyy's duty and obligation to the people of Ukraine not to be their hero, but to be their protector. He has failed to fulfill that obligation. From this perspective, it is clear that, notwithstanding his own personal courage and his unexpected leadership skills, Ukraine's President Zelenskyy has made a tragic error.

It is revealing to compare the choices made by President Zelenskyy with the choices made by U.S. President Joe Biden. Biden's record over decades of public service has demonstrated that he is a man of compassion. There is no doubt that he feels truly aggrieved by Putin's aggression. But he has not allowed these feelings to determine the path he has taken. As the 'leader of the free world' Mr. Biden has understood that his obligation is to protect the lives and property of the peoples of that world. Although it must be as painful for Biden as it is for the rest of humanity to watch the Russian military commit repeated atrocities unchecked, he has recognized that his primary responsibility under the circumstances is to take no action which could escalate the war into a direct confrontation between Russian and American forces, which could result in a human civilization-wide catastrophe.

Biden has taken into account a careful consideration of

Putin's state of mind. Prior to the start of the invasion Putin's line of propaganda was that the Russian army was going to free the Ukrainians from the Nazi regime he said was governing the country, and that the Russians would be greeted as liberators. If Putin had come to believe his own propaganda, which cannot be discounted as a possibility, then he was, to some extent, in a delusional state of mind. Once a person enters into a delusional state they tend to interpret subsequent events in ways that serve to reinforce the foundations of the original delusion, no matter how illogical that interpretation may be. It must be understood that if Putin is delusional, that is his reality, and he will act accordingly.

One might think that the fierce resistance put up by the Ukrainians would have shocked Putin out of his delusional state, but that is not necessarily so. The deluded psyche is capable of amazing feats of twisted logic. Putin has long believed that the U.S. and NATO wish to destroy the Russian nation. This is paranoid delusional nonsense. While there are many who would welcome the end of the Putin regime, the West has no desire to cause harm to the people of Russia or seek that nation's dissolution. That Putin is paranoid - - - a psychological marker of the delusional - - - is obvious from the televised images of his meetings with his advisors, with him sitting alone at the end of a huge table and everyone else crowded around the far end at a considerable distance. Uneasy is the head which wears the crown. He is reported to be increasingly isolated - - - another common aspect of the delusional - - - and the few advisors that have access to him may be too afraid to provide him with information which would contradict his delusion.

We are certain that President Biden has been well advised as to Putin's possible state of mind. Putin has already hinted darkly about the use of nuclear weapons. Given his possible mental state such threats are of great concern. Biden must not take any overt actions which would have the effect of backing Putin into a corner. Does anyone seriously doubt that in the final months of World War 2 when Germany's defeat was clearly inevitable that Hitler, if he

had had access to atomic weapons and the means to deliver them, would not have used them to destroy London, Paris and Moscow? Instead, although it means permitting the Russian military to pound Ukrainian cities into piles of rubble, Biden is allowing Putin to dig himself ever-deeper into a hole from which in the end he may not be able to escape. The moment at which Putin's delusion melts away and he comes face-to-face with the truth, will be the moment of greatest danger. Until that moment Biden must continue to practise "pure effectiveness." He is walking the path of wu wei, the path of the sage. Zelenskyy, young and inexperienced, has not. It is true what Confucius said: wisdom comes with age and experience.

None of the foregoing should be interpreted as a suggestion that Putin's actions and his demands are in any way reasonable or legitimate. They are all breaches of international law which violate the established norms governing the relationships between nations. But it has been clear for some years that Putin cares not at all for the law, be it Russian or international, and to think that he can be persuaded or forced to behave otherwise is wishful thinking. Putin is possessed of a diseased mind. Lord Acton said, "Power corrupts. Absolute power corrupts absolutely." This is a deep psychological truth about the human mind that humanity desperately needs to understand, accept, and act upon. Like radiation poisoning, the longer the exposure to the temptations of absolute power, the greater the likelihood that the individual wielding that power will receive a deadly dose. Putin has held absolute power now for a number of years, and its poison has utterly corrupted his mind. Humanity must learn the lesson taught by Putin and other leaders currently on the world stage, and take steps to structure their governments in such a manner that minimizes the possibility that future leadership will be exposed to the toxic poison of prolonged power.

We apologize to our readers for this latest digression from the topic at hand, but current events have provided an opportunity to demonstrate the utility of the Taoist teaching of wu wei which

was so timely that we could not resist. This work is still more than a year away from being completed, and by the time it is published (assuming that it ever is) the situation in Ukraine may well have been resolved, one way or another. But if you are reading these words that means that we have not all been vaporized, and the lessons to be learned from walking the path of wu wei will be as valid as ever.

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It is now early March, 2024, and soon this manuscript will be ready to submit to a publisher. How swiftly the two years since we made the above comments concerning Russia's invasion of Ukraine have passed! It turned out that our assumption that the Russians would inevitably win the battle of Kyiv was invalid. We make no apologies for this. People with far more expertise in this area than we possess made the same mistake. Who would have thought that the much-vaunted Russian military would have been so ill-prepared and so poorly led? But that is the inherent problem with assumptions - - - they frequently turn out to be incorrect. We know that all too well.

Our critique of President Zelenskyy's decisions in response to the invasion was based upon that now invalidated assumption. Have subsequent events changed our position? The answer to this is no. We still believe that *the Ukrainian people* would have been better off had Zelenskyy sued for peace, on the terms demanded by Putin, as soon as the Russians had begun their invasion. Our prediction that, having made the decision to fight, the very best outcome that the Ukrainians could hope for was months, or more probably years, of grinding murderous strife has proved to be accurate. Zelenskyy recently announced that the Ukrainian

military forces have suffered 31,000 dead. Some western sources have estimated actual Ukrainian losses at more than three times that number. He also said that tens of thousands of civilians have been killed. Dozens of villages, towns and cities have been reduced to rubble, and the lives of millions have been irrevocably altered.

The eventual outcome of the conflict is increasingly uncertain and may depend on the outcome of the US presidential election more than any other single factor. What is certain is that Vladimir Putin, like every school-yard bully who has been denied what he wants, will do all he can to make the lives of Ukrainians as miserable as possible.

As for how the West should respond, the die has been cast and there is no going back. It is obviously in the strategic interests of the NATO countries to help Ukraine resist the Russians for as long as possible, and to maybe even, despite the odds, drive the invaders out. The Ukrainian people have decided that they would rather be dead than be Russian. While one might question the wisdom of this choice, one cannot question the courage it took to make it, nor the steel resolve required to sustain it. While the Ukrainians wrestle with the Russian bear in the mud on our behalf, the very least we can do is to hold their coat.

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Returning now to our exploration of the three different schools of Taoism, the second school is what Smith refers to as "vitalizing Taoism." Not content with the mere efficient

management of the energy of the Tao naturally made available to the individual, as taught by the Philosophical Taoists, the adherents of this school seek to increase their allotment of that vital energy by various specific means. These Taoists refer to this vital energy as 'ch'i,' the literal translation of which means 'breath.' Their goal is to maximize the presence and circulation of ch'i in their bodies by concentrating on three areas: matter, movement, and mind.

In terms of matter, they experimented with their diet, eating all sorts of different plants. This experimentation gave rise to the tradition of Chinese herbal medicine. Breathing exercises were developed to increase the flow of ch'i through the lungs and heart. The choreographed movements of the body called t'ai-chi, well-known in the west, were devised to facilitate the flow of ch'i through muscles and joints. These Taoists invented the practice of acupuncture to remove blockages to the flow of ch'i through the organs and circulatory system. Finally, influenced by the importation of Buddhism from India in the 3rd or 4th Centuries B.C., this school of Taoism developed their own particular form of yogic meditation. They came to believe that not only did this practice open the mind of the individual to the fundamental nature of the universe, but also that it was possible for the yogi who attained that wondrous state of mind to psychically channel the ch'i obtained "to the community to enhance its vitality and harmonize its affairs." (162) For this belief in psychic powers the Taoist yogis were much mocked by the Confucians, but they nevertheless developed a significant following.

The Philosophical and vitalizing schools of Taoism never developed into organizations with an inherent structure, but the third school of Taoism, Religious Taoism, was organized into an official institution in the 2nd Century C.E. This Taoist church deified Lao Tzu, and the goal of its priesthood was to make "cosmic life-power available for ordinary villagers [through specific rituals] by which higher, occult powers are tapped for use in the visible world." (163) Needless to say, this branch of Taoism has little in common with the teachings of the Game of Being.

The understanding of the nature of the universe and the nature of God, the Creator, espoused by the metaphysics of the Game of Being have been deeply influenced by the teachings of the Philosophical School of Taoism. Lao Tzu's description of the Tao quoted earlier in this work, which bears repeating, is a stunning 6th Century B.C. portrait of the nature of space-time:

> "Grand Power flows from the Tao.
> The Substance of the Tao
> Is Vague and Misty.
> Misty and Vague,
> But it contains Images!
> Its Substance Is Tenuous and Dark!
> But it contains an Essence,
> Supremely Real, Sure and Unfailing.
> From days of old it has been present,
> The Source of All Things."

The Game of Being's understanding of the nature of the Creator has been similarly influenced by Lao Tzu's ideas:

> "There is a being, wonderful, perfect;
> It existed before heaven and earth.
> It stands alone and it does not change.
> All life comes from it.
> It wraps everything with its love
> as in a garment,
> and yet it claims no honor,
> for it does not demand to be Lord.
> I do not know its name,
> and so I call it Tao, the Way,
> and I rejoice in its power." (164)

Chapter Twenty-eight

MONOTHEISM

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We move on now to an examination of the belief systems of the three monotheistic religions of the West: Judaism, Christianity, and Islam. All three of these religions have undergone centuries' worth of twists and turns in their doctrinal beliefs, and even a cursory examination of each of them is far beyond the scope of this work. For anyone who is interested in these matters we recommend Karen Armstrong's highly readable and thoroughly researched book, *A History of God.* For our part, we will limit our discussion to a study of those beliefs that are common to all three of these traditions, and in so doing compare and contrast their beliefs with the theological structure of the belief system proposed by the Game of Being.

Although the three monotheisms, which all arose in what is now known as the Middle East, had different names for the Creator (Yahweh, God, and Allah), they all shared in the assumption that there is but one god, as opposed to the beliefs in a multitude of traditional pagan gods which the monotheistic religions supplanted, and that the universe had been brought into being by this Creative Intelligence. All three of these monotheistic religions would have agreed with the argument made by Arius of Alexandria in the early 4th Century that God is ". . . the only unbegotten, the only eternal,

the only one without beginning . . . the only one who has immortality." (165) These beliefs all fit quite comfortably within the theology of the Game of Being.

It is known the world over that the central message of the teachings of Jesus Christ was that the solution to the human conundrum is that we should learn to love one another. Following the suppression of the Israeli rebellion and the destruction of the Temple in Jerusalem by the Roman army in 70 C.E., which resulted in the scattering of the Jewish people, the tradition of Rabbis (teachers) as leaders of the Jewish community became established, supplanting the role of the Temple priests who had been the leaders of the Jews in religious matters prior to that event. During this period Rabbi Akiva the mystic emphasized that the commandant contained in the Torah (the name by which the collection of Jewish laws and customs is known) "Thou shalt love thy neighbour as thyself" was "the great principle of the Torah." (166) The Rabbis taught that "Jews were not to think of God as a Big Brother, watching their every move from above; instead they were to cultivate a sense of God within each human being so that our dealings with others became sacred encounters." (167)

The Qur'an, the Islamic holy book of the Prophet Muhammad's teachings, states: "Wheresoever ye turn, there is the face of al-Lah."(Qur'an 2:109) The Sufis, the mystical branch of Islam which began to develop a century or two after the death of Muhammad and crystallized into organized orders in the 12th Century, took the Islamic assertion "There is no god but God" and restated it as "There is nothing but God." (168)

By the late 12th Century similar ideas could be found within the teachings of certain Jewish Rabbis, as the following makes clear:

> "Everything is in Thee and Thou art in everything. Thou fillest everything and dost encompass it; when everything was created, Thou was in everything; before everything was created,

Thou wast everything." (169)

All of these ideas are completely consistent with the teachings of the Song of Being which asserts that everything in the universe, all things, animate and inanimate alike, are direct manifestations of the Mind of God, and to that end states:

Wherever we look,
We see Thy face.
Whenever we listen,
We hear Thy voice.
In all that we touch, taste, or scent,
We find the essence of Thy being.

Thus the Game of Being belief system is not simply another mere monotheism, but is a proclamation of a pantheism, the doctrine that God is everything and everything is God. The 13th Century Christian philosopher Thomas Aquinas argued that:

> "What a thing is and the fact that it is at all are two distinct aspects of any created being. In God alone is there absolute simplicity, for what God is and the fact of his being are one and the same: God is "be-ing" itself - - - unlimited, absolute, beyond definition. Thus every creature is a compound of essence and existence, while God alone is not a compound, for his essence is existence per se. Creatures have existence; God is existence. Existence for creatures is not self-given, and therein lay Aquinas's fundamental philosophic tenet: the absolute contingency of
>
> the finite world on an infinite giver of being." (170)

The metaphysics of the Game of Being are in general agreement with this understanding of God, excepting only that we apply no gender to God, and that we extend this understanding to encompass not only “creatures” but to all things, animate and inanimate alike.

For the sake of simplicity, the Game of Being belief system has adopted the monotheistic idea that the Creative Intelligence that is responsible for the existence of the universe is an entity of singular character. However, it is entirely within the realm of possibility that the Field of Play is the product of the minds of an entire race of intelligent creative entities. Since we have no evidence to guide us one way or another on this question, we will continue to adhere to the monotheistic tradition that there is but one singular Creator, which we say in its 'primordial' state is composed of Pure Consciousness or thought, and who created the Game of Being in order to experience physical existence, with all its limitations. Existing forever in a state of immateriality, changeless and eternal, infinite in space and time, the Creator longed to experience change, and the material, and the finite, and so created the Game of Being in order to fulfill that longing.

So far we have examined those areas in which the teachings of the theology of the Game of Being and some of the traditions of the three historical monotheistic religions are consistent with one another. We turn now to those areas where the teachings diverge.

The first point of departure between the theology of the Game of Being and that of the historical monotheisms is that the latter all hold the belief that God is capable of intervening in the affairs of humans, and has in fact regularly done so in the past. Prior to their adoption of the idea of a single god, the ancient Hebrews and the assorted tribes of the Arabian desert were pagans who worshipped a panoply of gods and goddesses who were widely believed to have the power to interfere in human affairs. Indeed, al-Lah, which translates as 'the god,' was just one of several gods worshipped by the constantly warring Arab tribes prior to the

appearance of the Prophet Muhammad. This superstitious belief in the power of these pagan gods to intervene in the lives of human beings was carried over into the monotheistic belief systems espoused by Moses and Muhammad.

Claims of interventions in human history by God abound in the holy texts of all three monotheistic traditions. The entire Jewish religion is based upon the idea that Yahweh specifically chose the Hebrews to be his anointed people, and that he regularly intervened in their history throughout the biblical era. The parting of the waters of the Red Sea during the supposed exodus of the Hebrews from Egypt is just one example of a miraculous occurrence among many contained in the Old Testament. The teachings of the Christian tradition include the miracles of God impregnating the virgin Mary and the raising of Jesus from the dead, among others. In the Islamic tradition, God is believed to have revealed the entire work of the Qur'an to Muhammad via the angel Gabriel over a period of 23 years. Another example of Allah's intervention in Muhammad's life is the story of

> ". . .when [Muhammad] made his Night Journey from Arabia to the Temple Mount in Jerusalem. He had been transported in sleep by Gabriel on a celestial horse. On arrival, he was greeted by Abraham, Moses, Jesus, and a crowd of other prophets, who confirmed Muhammad in his own prophetic mission. Then Gabriel and Muhammad began their perilous ascent up a ladder (miraj) through the seven heavens, each of which was presided over by a prophet. Finally Muhammad reached the divine sphere." (171)

The theology of the Game of Being entirely disavows these kinds of magical thinking. At the beginning of this book, we demonstrated that it is a logical impossibility for a loving perfect God to have the power to intervene in the sequence of events of

which the Game of Being consists. There has only ever been one miracle which, by definition, is what an intervention by the Creator is, and that miracle was the creation of the Field of Play. God has not intervened in the Game of Being since that moment. God does not intervene in the Game. God is the Game.

Connected to the idea that God intervenes in human affairs is the belief contained within the traditional monotheisms that God is the ultimate cause of events, the implication being that God can determine what transpires in the world on a moment by moment basis. Again, this idea is a carry-over from the superstitious pagan belief systems, which preceded the development of the monotheisms, that the gods were active in the affairs of humans. That God is the ultimate cause of events is true in the sense that God is the agent which created the Field of Play, without which there would be no events. But it is a mistake to imply or believe that God determines what happens in the Game of Being moment to moment; that function is carried out not by God, but by the Rules of the Game.

A second point of departure between the belief system espoused by the Game of Being and that of the historical monotheisms is the notion of the 'afterlife,' and the idea that humans possess eternal souls. Especially prominent in early Christian thought was the belief that the human person is composed of spirit and soul and flesh. These associated ideas arose to provide solutions to three distinct problems which confront human existence. The first of these is our knowledge of our own eventual and inevitable demise. Voltaire asked, “Why do mankind flatter themselves that they alone are gifted with a spiritual and immortal principle?” (172) The 19th Century philosopher Arthur Schopenhauer answered Voltaire by saying:

> “The fear of death is the beginning of philosophy, and the final cause of religion. The average man cannot reconcile himself to death; therefore he makes innumerable philosophies and theologies;

> the prevalence of a belief in immortality is a token of the awful fear of death." (173)

Thus the idea of an eternal soul was created as a tool to help the individual deal with his or her fear of death.

The second problem which the idea of an afterlife was created to counter, or at least ameliorate, was the hard truth that for many humans who lived during the era when this idea evolved, life was difficult and a constant struggle for survival. The idea that an afterlife free of toil and suffering awaited humans at the end of their lives was very appealing to people who struggled daily with the vicissitudes of life.

The third problem which the ideas of an eternal soul and the afterlife were intended to solve was the issue of social control. The notion that the conditions that an individual could expect to encounter in the afterlife depended on the way they behaved in this life provided those in authority with a means of encouraging individuals to conduct themselves in a socially acceptable manner. An important tenet, particularly prominent in both Christianity and Islam, is that the eternal salvation of the believer's soul can only be achieved through their faith in God and their obedience to the laws proclaimed by God's messengers, the prophets, and enforced by their society's rulers, who claimed that their right to rule was divinely ordained.

The belief in the idea that humans possess eternal souls and that there is an afterlife is extremely problematic, and is contradicted by all that we observe about the universe. Everywhere we look in the universe we observe that events have a beginning, run their course for a period of time, and then come to an end. Here on the earth we know that mountain ranges are thrust upward when the tectonic plates that make up the earth's crust collide, and that these mountains, whose presence seems eternal by human standards, will eventually be worn down by the processes of erosion and washed away into the seas. When it comes to lifeforms, we know that species appear and disappear in

accordance with the climatic rhythms of the planet. In the wider universe we know that stars burst upon the scene when their nuclear fires ignite, burn brightly for millions or billions of earth-years, and then die off, sometimes in spectacular explosions that seed their galaxies with the elements necessary for life to appear. All around us we see in action what the novelist Hermann Hesse called the "unalterable law:" All beginnings must have an ending. To believe that homo sapiens, as individuals or as a species, are somehow exempt from this iron rule is, at best, astounding hubris, and at worst, blind fear-drenched heads-stuck-in-the-sand stupidity.

Time is running out. Humanity must give up its baseless belief in eternal salvation. Humans must bravely choose to accept the Game of Being on its own terms, rather than wasting their precious and limited time as players of the Game wishing it was other than it is. To that end, if we wish to deliver happiness to God, humans must structure their societies in such a manner as will ensure the genuine possibility of achieving happiness for each and every individual human manifestation of the Mind of God in this life, not in some imagined future impossibility.

Indispensable to the systematic belief in eternal souls and an afterlife is the idea of sin. According to The Oxford Companion to the Bible, sin is basically an offence against God; the implication being that God is offended when we sin. This too is a carry-over from the pagan era during which it was widely believed that the gods would become angry if they were not properly worshipped by humans.

Since the time of Moses an ever-enlarging portion of the human race has been taught to believe that if they behave in a manner which offends God, God will judge them harshly and punish them in the afterlife by casting their eternal souls into the fiery pits of Hell, where the soul will be forced to reside forever. Christians have taken this idea to the extreme, believing that infant humans, who have yet to commit any acts other than emerging from the birth canal, are born with the mark of sin upon their souls, which can only be expiated by being baptized with 'holy water.'

The Game of Being belief system utterly rejects these cruel, nonsensical, and superstitious ideas for which there is absolutely no evidence. The Game of Being belief system states plainly that God is never offended. Two of our core assumptions about the nature of God are that God loves the Game of Being and all that it contains, and that God seeks happiness. From the first of these assumptions it follows that God accepts and loves all the events that occur within the Field of Play. Therefore, when a human manifestation of the Mind of God behaves in a manner which is harmful to other manifestations of the Mind of God, resulting in God's desire to achieve happiness being temporarily unfulfilled, the Creator is saddened perhaps, but not offended. God never judges, condemns, or forgives. The act of forgiving requires that a judgment has been rendered prior to the act of forgiveness, and God does not judge. God simply loves and accepts. From God's point of view, forgiveness would get in the way of acceptance.

The Creator is well aware and accepts that the manifestations which appear within the Field of Play may in some ways be imperfect. These imperfections are why God loves the Game of Being so, even when they are a cause for sorrow, for they provide the Creator with experiences that are different from God's own perfect state of being.

The more complex a computer program is, the more likely it is to contain 'bugs' or errors. The Creator freely accepts that manifestations as complex as humans will inevitably contain flaws, and will sometimes behave in ways that run counter to God's goal of achieving happiness. Furthermore, and more to the point, the Creator knows that the Rules of the Game dictate that the Game of Being is fully deterministic, and that the state of play at any given moment in time is uniquely determined by the state of play in the moment(s) preceding it. The inevitable always happens: wherever and whenever something happens, whatever happens, happens inevitably. Because the Creator knows that the Game is structured in this way, the Creator also knows that it would be useless and self-defeating to take offence at any event which occurs during the

unfolding of the Game.

Furthermore, because the Creator ordained that a basic feature of the Game is that all beginnings must have an ending, God knows that any situation which contradicts or gets in the way of God's goal of seeking happiness will eventually pass. God is here for eternity. Time is on God's side.

For all of these reasons, the very concept of sin is completely fallacious. God never takes offence at any human behaviour, no matter how evil that behaviour may be from a human point of view. God does not view the events that occur within the Field of Play through the lens of good and evil. The categorization of behaviours as good and evil is peculiar to human manifestations, which is not to say that these categories do not perform a useful function. If humans are to live together in large groups peaceably, then certain behaviours must be deemed to be impermissible. The label of "evil" as a concept may be usefully applied to such behaviours in some situations. Certainly the current behaviour of the Russian military in the war on Ukraine qualifies as being evil, and there is no doubt that Vladimir Putin is an evil human being; or, perhaps, there is. More on this in a moment.

What is the role of God is such a situation? Since the manifestation known as Vladimir Putin is as much a direct manifestation of the Mind of God as was the manifestation known as Jesus Christ, does this mean that God condones, or worse still, commits evil acts? To answer this question we must remember that God exerts absolutely no control whatsoever over what takes place in the virtual reality technology known as the Game of Being. The sequence of events of which the Game of Being consists is ordered not by God, but by the Rules of the Game. So when evil acts occur, God does not commit them; God endures them, both as the evil-doer, and the evil-doer's victims.

All three of the historical monotheisms endorse the application of the concepts of good and evil to human behaviour. But the Christian and Islamic traditions have gone a step further and personified evil by associating it with the figure of Satan, the

fallen angel. Now, of course, there are no such things as angels; they are purely mythological beings, and therefore Satan does not actually exist. But, understood properly, Satan is a useful metaphor. Traditionally, Satan does not so much commit evil acts himself; rather, he tempts human beings to do evil. This understanding is perhaps a more accurate assessment of the role being played by Vladimir Putin. So far as is known, Putin has never personally killed another human being. But by ordering Russian troops to invade Ukraine, he has placed those soldiers in a situation where they are tempted to do evil, and they have succumbed to that temptation. Seen in this light, Putin is a classic example of Satan personified.

A further point of divergence between the historical monotheistic religions and the teachings of the Game of Being theology arises from the claim made by some followers of the former that the scriptures which form the foundations of their belief systems are literally the word of God as "dictated" by God (or in the case of the Qur'an by God's representative the angel Gabriel) to its human author, and therefore must be free of error because God is perfection itself and thus is incapable of making a mistake. These claims to scriptural inerrancy have a controversial history and have, in the modern era, tended to bring the very belief in God into disrepute among many. In an article on this subject in The Oxford Companion to the Bible, William H. Barnes writes:

> "Nonetheless, even if the term innerrant itself is of recent and controversial pedigree, the underlying concept of the complete truthfulness and dependability of all that scripture affirms has long been a part of both Jewish and Christian tradition. (Traditional Muslims would enthusiastically categorize the Qur'an with the same terms.)" (174)

This insistence on the literal truthfulness of all that scripture contains is common to certain followers of all three monotheistic

religions and is known as fundamentalism. Fundamentalist claims that every word of scripture is literally true are fraught with difficulties. For example, consider the story of the creation of the universe and the origination of humankind as recorded in the Book of Genesis, to which adherents of all three monotheisms subscribe. It is abundantly clear to any open-minded observer with even a smattering of knowledge about creation stories that the account in Genesis is just one more creation myth among many, its origins lost in the mists of time, its narrative developed over centuries, handed down from generation to generation by oral traditions, until it was written down in an era when men believed that the Earth is flat and that the Sun revolves around the Earth. Despite these sound reasons to doubt its factual accuracy; and despite the vast accumulation of scientific knowledge that demonstrates that the Earth and its inhabitants were not manufactured over a period of seven days; and despite the overwhelming evidence that homo sapiens did not originate from a lump of clay moulded by the hands of God but evolved over millions of years from prior lifeforms, fundamentalists of every monotheistic stripe stubbornly cling to the belief that the account of creation as recorded in Genesis is true and factually accurate. This stubbornness has two sources: One is the fear of the 'slippery-slope', and the other is due to a fundamental misunderstanding of the nature of God.

The fear of the slippery-slope arises because fundamentalists fear that if they admit the Genesis account of creation is inaccurate, then where does it stop? If Genesis is admitted to be inaccurate, does that not cast doubt on the veracity of many of the stories contained in the scriptures, so many of which appear to be based upon magical thinking? Perhaps the ancient Hebrews did not wander around the desert for forty years living on manna from Heaven. Perhaps God did not impregnate Mary. Perhaps Christ did not rise from the dead. Perhaps the Prophet Muhammad was not repeatedly visited by the angel Gabriel over a period of twenty-three years. Perhaps his ideas about which God to worship and how individuals should conduct their lives arose from

within his own human mind. So the fundamentalists' fear of the slippery-slope is well-founded. Once an inaccuracy in any portion of the 'holy' scriptures is admitted, then the accuracy of all of scripture is called into question, and the entire structure of the monotheistic belief systems begin to crumble towards collapse. This, fundamentalists fear, would lead directly to a God-less universe and the disintegration of moral standards of conduct which they believe derive from God.

It is at this point that what we believe to be a basic misunderstanding of the nature of God, which is shared by all three monotheistic religions, comes into play. Although the mystical traditions of all three of these belief systems have, as we noted previously, come to a different conclusion, the orthodox position which is dominate in all three is the belief that God is different than and separate from the material universe. The Game of Being theology holds that this belief is erroneous and is guilty of a misplaced emphasis. While the material universe is *different than* God's primordial state of being - - - after all, that is why God created the universe: to experience something *different* - - - it is not *separate from* God. The material universe is another aspect, an extension of, the Mind of God. The Game of Being theology claims that the entire material universe is the Mind of God made manifest, and that God experiences be-ing through all the myriad manifestations. Therefore, as the Song of Being says:

> Wherever we look,
> We see Thy face.
> Whenever we listen,
> We hear Thy voice.
> In all that we touch, taste, or scent,
> We find the essence of Thy Being.

This means that all the words contained within the scriptures are indeed the words of God, as *transposed* by the minds of God's human manifestations, because all the words ever spoken

or written, no matter how profound or how profane, have been the words of God, uttered by the imperfect human instances of God's omnipresence. Because human instances of God's omnipresence are imperfect, and because the knowledge of those humans who have transposed the words of God is limited, errors will occur in our written records. The prophets who appeared during the formative years of the three historical monotheisms and the authors of scripture who later set down their words did their best, based on their knowledge of how the universe functions that they possessed at that time, to understand and explain what they experienced and the visions of God that arose from those experiences. Because those authors lived in an age when it was widely believed that gods (which in the monotheistic religions morphed into *the* God) regularly intervened in human affairs, and because they lacked a scientific knowledge base which would have allowed them to explain natural phenomena, they were forced to explain historical events by means other than rational analysis. This resulted in stories being included in scripture which are, by today's standards, fantastical and superstitious. But for all that, the scriptures are no less (and no more) the words of God than, say, Einstein's General Theory of Relativity. Both are attempts by human manifestations of the Mind of God to explain to other human manifestations of the Mind of God certain aspects of the mystery of be-ing. It is our responsibility as individual manifestations of the Mind of God to interpret these words and to decide, in the light of our general knowledge of how the universe functions that we possess at the present time, which words constitute accurate representations of events, and an accurate understanding of the nature of God, and which do not.

Thus the understanding of the nature of God as espoused by the Game of Being theology allows us to admit that any and all attempts to explain the mystery of God may contain errors, without discarding in any way the notion that a Creative Intelligence is responsible for the existence of the universe. As for the question of whether or not we live in a moral universe, we shall come to that

topic presently.

There are other problems with the understanding of the nature of God as presented by the three historical monotheistic religions that we need to briefly touch upon. Based upon the descriptions of God's behaviour contained in scripture, God is a rather unpleasant character who is hardly deserving of our love and reverence. As the famous atheist Richard Dawkins states in *The God Delusion*:

> "The God of the Old Testament is arguably the most unpleasant character in all fiction: jealous and proud of it; a petty, unjust, unforgiving control-freak; a vindictive, bloodthirsty ethnic cleanser; a misogynistic, homophobic, racist, infanticidal, genocidal, filicidal, pestilential, megalomaniacal, sado-masochistic, capriciously malevolent bully." (175)

Dawkins' conclusions about the character of Yahweh, based as they are upon the stories actually written down in scripture, are undeniably accurate; they go some way to explaining why followers of the three monotheisms are taught to fear God, for such a god is indeed a fearsome individual. That such a being is deserving of our worship is an idea that should be rejected outright by anyone who desires to live in a more compassionate world.

According to the Game of Being theology, Christianity suffers from at least two fundamental flaws. Christians believe that Jesus was the appearance of the son of God on the Earth. The Game of Being teaches that Jesus was not the son of God, but, rather, was a direct manifestation of the Mind of God, and was in no way unique in this respect. All things, animate and inanimate, are a direct manifestation of the Mind of God: "Wherever we look, we see Thy face."

A second fundamental flaw in Christianity is the belief held by its followers that Jesus will someday return to bring salvation to

humanity. For two thousand years Christians have eagerly awaited Christ's imminent return. Think on it. 2000 years! And still he has not reappeared. Nor will he, not in another 2000 years, not in another 20,000 years, not ever. The Rules of the Game simply do not permit such an occurrence. All human manifestations of the Mind of God are one-offs, unique and unrepeatable. All beginnings must have an ending, and Christ's ending came on a hill called Calvary outside Jerusalem two thousand years ago. He will not, indeed cannot, reappear.

There is also a problem with Islam in that its holy book, the Qur'an, contains an overarching contradiction in its teachings. As we have previously noted, the Qur'an states that "Wheresoever ye turn, there is the face of al-Lah." (Qur'an 2:109) The only logical conclusion that one can draw from this teaching is that all things are manifestations of al-Lah. As a consequence of this insight, it follows that all things, including all persons, should be accorded reverence and love. This is an interpretation of the nature of God and the nature of the universe that the Game of Being theology most heartily endorses. However, the Qur'an repeatedly directs the believers in Islam to shun or attack those who do not share in their particular system of beliefs. According to Sam Harris,

> "On almost every page, the Koran instructs observant Muslims to despise non-believers. On almost every page, it prepares the ground for religious conflict . . . Islam, more than any other religion human beings have devised, has all the makings of a thoroughgoing cult of death." (176)

From a long list supplied by Harris we provide a few examples of the Prophet Muhammad's pronouncements:

> "God's curse be upon the infidels!"(Qur'an 2:89)
> "[We] shall let [the infidels] live awhile, and then shall drag them to the scourge of the Fire. Evil

> shall be their fate."(2:126) "Slay [the infidels] wherever you find them."(2:190) "Those that deny God's revelations shall be sternly punished; God is mighty and capable of revenge."(3:5) "God does not love the evil-doers; and that God may test the faithful and annihilate the infidels."(3:140) "Those that deny Our revelation We will burn in fire. No sooner will their skins be consumed than we shall give them other skins so that they may truly taste the scourge."(4:55-56) (177)

Seen within the historical context of the times during which Muhammad supposedly made these and other similar statements they become, if no less repugnant, then at least somewhat understandable. The Arab tribes of the 7th Century were constantly at war; blood-feuds, murder and mayhem were common. Mohammad and his initially small band of followers were persecuted for their beliefs and driven out of the city of Mecca. Muhammad's exhortations were designed to provide courage to his followers in the face of violence and adversity. The problem is that like the leaders of so many cults, Muhammad was regarded as a messenger from God, and his statements were interpreted as directives from the Almighty, which therefore must be followed. Although Islam is no longer a religious cult of a persecuted minority, these statements - - - because they are considered to be "the words of God" - - - have been retained in the Qur'an fourteen centuries later, and as recent history has demonstrated there are some Islamic fundamentalists who continue to interpret these statements quite literally.

Thus there is an unresolved contradiction at the heart of Islam between the idea that wherever we look we see the face of al-Lah, and the directives to shun, torture, or put to death those humans who do not accept the word of God as delivered by God's messenger, the Prophet Muhammad.

This exposes what we believe to be another problem with the Islamic belief system, and that is the idea that Muhammad was a messenger from God. Whether Muhammad made this claim himself or whether it was a claim made by his early followers is irrelevant. If God gave to Muhammad a message to proclaim to humanity, that would require that God possesses the ability to intervene in the stream of events of which the Game of Being is constituted. But we have demonstrated that it is a logical impossibility for a perfect loving God to have that ability, and therefore God could not 'give a message' for humanity to Muhammad or anyone else.

On the other hand, Muslims could avoid this logical conundrum by acknowledging that al-Lah is not a loving God, a conclusion which is supported by the evidence of the statements in the Qur'an previously quoted. Muslims could avoid *this* conclusion by claiming that al-Lah is indeed a loving God, but that al-Lah only loves those who follow the teachings of the Prophet Muhammad. However, this sets up a contradiction with the statement in the Qur'an that "Wheresoever ye turn, there is the face of al-Lah."(Qur'an 2:109) If a Muslim is in a crowd of non-Muslims, does this teaching from the Prophet not apply? If not, why not? If it is true that everywhere one looks one sees the face of al-Lah (and we believe it is,) then surely al-Lah knows this. Why would al-Lah discriminate between the faces of al-Lah which belong to individuals that accept the teachings of the Prophet Muhammad and the faces of al-Lah which belong to individuals who do not accept those teachings? Surely this would be illogical on al-Lah's part. How could al-Lah, who is perfection, contain such a contradiction? There simply is no escape from the fact that the Qur'an contains an internal logical inconsistency, and that therefore Islam is flawed in a very fundamental way.

Chapter Twenty-nine

UNDERSTANDING THE CONCEPT OF FAITH

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We turn now to the topic of faith. *The Oxford English Dictionary* defines the word 'faith' in several ways. It begins with faith being defined as "reliance, trust, in;" and "to believe implicitly." This is the kind of faith that humans regularly exercise in their day-to-day lives. For example, taking an airplane flight from one city to another involves the exercising of this kind of faith. When you get on the plane and settle into your seat, you do not *know*, as a fact from your own direct experience, that the pilot is fully qualified to fly the plane safely; you do not *know*, as a fact from your own direct experience, that the engines of the plane have been regularly and properly serviced; you do not *know*, as a fact from your own direct experience, that a sufficient amount of jet fuel has been placed aboard the plane to ensure that it has enough fuel to make it to its destination. But in each case you have *faith* that the training, the servicing, and the fuelling have all been properly carried out. If you did not have that faith, you would be understandably reluctant to get on board. Ultimately, you have that

faith because you know, from past experience and general knowledge, that all of those conditions are based on events which are possible. If you believed, based on your past experience and general knowledge, that the fulfillment of any of those three conditions required the occurrence of an event which is impossible, you would not get on the plane.

In the New Testament, the author of the letter to the Hebrews defines faith as "the assurance of things hoped for, the conviction of things not seen." As we have just demonstrated, this definition encompasses the reasons why humans willingly allow themselves to be flown through the air.

The Oxford English Dictionary also defines faith as "spiritual apprehension of divine truth apart from proof." From a more critical perspective, in *The End of Faith* Sam Harris defines faith in a similar manner: ". . . religious faith is the belief in historical and metaphysical propositions without sufficient evidence." (178) Thus both the OED and Harris concentrate their definitions of religious faith around the notion of evidence, or more precisely, the lack of it. While these approaches to the definition of religious faith are not incorrect, we believe that they miss the main point. All three monotheistic religions have taken the useful and necessary-to-the-functioning-of-society notion of faith, "the conviction of things not seen" in which we believe because of our conviction, based on our past experience and general knowledge, that those things not seen are events that are possible, and distorted that notion in an effort to persuade people to believe in events not only not seen, but events which, based on our past experience and general knowledge, we have reason to believe are impossible. Belief in the possible and belief in the impossible is the dividing line between *genuine* faith and superstition, which the OED defines as "credulity regarding the supernatural." Thus it is not faith that persuades people to believe that thousands of Hebrews were sustained by sustenance that fell from the sky while they traipsed around the desert for forty years. That is not faith; that is superstition. It is not faith which persuades people to believe that a

man walked on water and rose from the dead; that is superstition. It is not faith which persuades people to believe that in the 7th Century, long before the invention of conveyances to carry people through the air, a man flew from Mecca to Jerusalem; this too is superstition. Each of these stories, and many more contained in scripture, are events which, based on our past experience and general knowledge, we have reason to believe are impossible, and are therefore not sustained by faith, but by superstition.

The foregoing are all examples of what Harris calls "the belief in historical propositions without sufficient evidence." What about the belief in metaphysical propositions? Do our arguments rule out the possibility of a genuine faith in the existence of God? Our answer to this question is: not at all. This is because it is entirely within the realm of the possible that the universe was brought into existence by a Creative Intelligence. There is nothing in our past experience or general knowledge to suggest that this is not a possibility. Therefore a belief in the existence of God is not a superstition, it is a supposition, and as we shall see there exists evidence, not conclusive evidence to be sure but evidence nevertheless, to support the supposition that a Creative Intelligence, known variously as Brahman, Yahweh, God, Allah, or the Tao, is responsible for the existence of the universe, and that this Creative Intelligence must therefore perforce exist itself.

The Hebrew prophets of the biblical era and the authors of scripture who wrote down their words (in some cases hundreds of years later) and the Prophet Muhammad all made the same claim: that the words they uttered or wrote down were the result of divine revelation; that is, that God or God's representatives intervened in their lives to direct them in what to say. The theology of the Game of Being makes no such claim. The Age of Revelation is a distant memory; humans now live in the Age of Science. Science writ large is the coordinated effort by humankind to discern and understand the Rules of the Game. This effort is based upon the belief that the Rules of the Game are logically structured and amenable to rational analysis. Because the Game itself appears to

be structured in this manner, our theology contains the implicit belief that the mind of the Game's Creator is also amenable to such analysis. Thus our theology rests not on a claim of divine revelation for its authority; rather, it rests upon the same processes that guide Science, the defining paradigm of our Age.

Chapter Thirty

THE AMORAL UNIVERSE

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We turn our attention now to the question: Do we live in a moral universe? Is the idea that some events are “right” and some events are “wrong” a consequence of the fundamental operation of the Field of Play? Are these notions written into the Rules of the Game?

With the exception of Taoism, which did not concern itself with this question, the answer of each of the major historical religions to these questions is a firm “yes.” As we have seen, Hindus believe in the law of karma which, to use Huston Smith's word, is “inexorable,” and is a process that is built into the very fabric of the universe. In his teaching of the Eightfold Path, the Buddha emphasized that there are eight 'right steps,' or modes of behaviour which are necessary if an individual is to live a life which is in harmony with the fundamental workings of the universe, and to thereby have an opportunity to achieve enlightenment. If that is the case, it implies that there are at least an equal number of 'wrong' modes of behaviour that are in opposition to the harmonious functioning of the universe, and that therefore Buddhism argues that morality is an inherent aspect of the universe itself. As for Confucius, we have previously noted that he

believed that “Somewhere in the universe there is a power that is on the side of right.” As for the three monotheistic religions, they all maintain that the laws which codified our notions of morality were personally delivered to humanity by God (or, in the case of Muhammad, God's agent), and that God clearly intended that humans should understand that these laws are an indispensable part of the Rules of the Game.

These developments occurred in the pre-scientific era, when it was widely believed that the Earth was at the centre of all creation and that God had granted dominion over the planet to humanity. From these circumstances arose the belief that God was the source of the moral laws and that their application was fundamental to the righteous functioning of the entire universe. Religions developed the idea that if an individual violates the moral laws in this life, they will be punished in the next life or the after-life. From the idea of the 'righteous' conduct of the individual came the idea of conduct that is 'right,' and inevitably, its opposite, conduct that is 'wrong.' Over the intervening millennia these two concepts and the idea that they are of universal application have become tightly woven into the fabric of every human society.

In more recent times the philosopher Immanuel Kant and the civil rights leader the Reverend Dr. Martin Luther King, both moralists in the Christian tradition, have reinforced the idea that morality is embedded in the very fabric of the universe. Kant wrote: “Two things fill the mind with ever new and increasing admiration and awe, the oftener and more steadily we reflect on them: the starry heavens above and the moral law within.”(179) King stated, “The moral arc of the universe is long, but it bends towards justice.”

We believe that in both cases the sentiments expressed are incorrect. By comparing moral law with the starry heavens Kant is placing morality on an equal footing with the law of gravity which rules the motions of the stars; is a phenomenon which could not have evolved; which applies everywhere within the Field of Play; and which, although it can be temporarily sidestepped, must be

obeyed. Codified moral law (such as it is) applies to only one species out of millions on only - - - as far as we know - - - one planet out of billions, and this law is frequently disregarded. Not only is moral law frequently disregarded, unlike the law of gravity it differs in its application from one era to another and from one grouping of humans to another. At one time it was considered the 'moral' thing to do to burn lonely harmless old women at the stake. In one country today in the 21st Century it is considered the 'moral' thing to do to cut off the hands of thieves and the heads of adulterers. Clearly there is no one moral rule that applies equally to all events which occur within the Field of Play. As for King's claim, it is based entirely upon the assumption that the universe-at-large does indeed possess a "moral arc;" an assumption that the bulk of the available evidence appears to render invalid.

Fires, floods, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis, avalanches, and supernovas are all every bit as much a direct manifestation of the Mind of God as is any lifeform, and they are all deadly to life in all its manifestations. Clearly it would be unhelpful to apply the labels 'right' or 'wrong' to the occurrence of any of these events. As elements of the universe-at-large, they are obviously not subject to any moral arc.

Furthermore many animals, of which humans are but one example, kill other animals for sustenance. There is nothing in the Rules of the Game which prevents this from happening. Unlike the laws which mandate the strength of a gravitational field, the force which binds the nuclei of atoms, or the resonance of the carbon atom, all of which are fundamental unalterable requirements for the existence of the Field of Play as we experience it, no unavoidable law prohibits the killing of lifeforms by other lifeforms. In fact, the continued existence of many lifeforms is contingent upon their ability to do so.

We believe that the available evidence makes it clear that the notion of morality is not fundamental to the operation of the universe, that the Game of Being is not a moral but an amoral process, and that therefore the practice of categorizing events as

events that are 'right' and events that are 'wrong' arises from a misunderstanding of the fundamental nature of the Game. Thus to the question, Do we live in a moral universe?, we are convinced that the answer is No.

Not only does observation mitigate against the idea that the universe is moral, the conclusion that the universe is amoral also arises as a logical consequence of the basic understanding of what the universe is according to the metaphysics of the Game of Being. This metaphysics states that all material objects, which are ultimately most properly understood as concurrently unfolding events, are direct manifestations of the Mind of God. Since all manifestations arise from the same source, from the viewpoint of that source it is pointless to apply absolutist categories such as 'right' and 'wrong' to any events that occur within the Field of Play. This is so because the Creative Intelligence which is responsible for the existence of the Game knows that the Game is utterly and completely deterministic, and that the inevitable always happens. The circumstances prevailing in the entire Game at any given moment are determined by the circumstances prevailing in the entire Game at the moment immediately preceding the moment in question. For lifeforms that possess the capability to store information in what we call 'memory,' circumstances at a given moment can be influenced not only by the circumstances of the moment immediately preceding the moment under consideration, but also by circumstances further back in the chain of events. But this capability does not change the fact that the circumstances of any given moment are determined by the circumstances of the moment(s) which preceded it. Therefore, since whatever happens had to happen in the way it happened, it is pointless to apply the categories of right and wrong to anything that happens, for everything that happens happens inevitably.

We do not accept the idea that God created the Game of Being for the purpose of sitting in judgment over the behaviour of one of the Game's many manifestations. The Creator created the Game for the purpose of experiencing constant change. Thus the

Game is structured so as to consist of a series of events. Individual events are made manifest as constantly changing combinations of energy-matter which take on specific forms, persist as those forms for varying periods of time, and then dissolve to be re-manifest as subsequent forms. From the perspective of the Creator, there is no 'right' or 'wrong' to any of this process. The Game unfolds according to the dictates of the Rules of the Game including, fundamentally, the rules that everywhere within the boundary of the Game change shall be unceasing, and that in the Game all beginnings must have an ending, which themselves are not bound by any notions of morality.

And yet, despite our conclusion that the universe-at-large is an amoral process, the lifeforms known as human beings are clearly capable of possessing what we have labelled a 'moral sense,' which currently includes the habit, unfortunate in our view, of labelling behaviours (events) by the terms 'right' and 'wrong.' There is also evidence which suggests that certain other so-called social species possess a 'proto-moral' predisposition, an innate sense of whether certain events are 'fair' or 'unfair.' If the universe-at-large is amoral, the moral sense possessed by humans could not have been bestowed upon our species by some magical power at the moment of our inception, not least because the appearance of homo sapiens upon the Field of Play did not occur at one specific moment in time. In our present state morality has become a systematic set of agreed-upon rules for the regulation of conduct in human affairs. But it was not always so. From whence did this moral sense arise? Is it inherent in the human psyche, or is it a set of behaviours which has been learned to be advantageous and is taught and passed on from generation to generation? Or is it possible that both of these dynamics are involved?

In his book *The Blank Slate,* the psychologist Steven Pinker provides this answer:

> "The brain may be a physical system made of ordinary matter, but that matter is organized in

> such a way as to give rise to a sentient organism with a capacity to feel pleasure and pain. And that in turn sets the stage for the emergence of morality." (180)

As an explanation for why morality has arisen as a system for regulating human relationships this cannot be the whole answer. There are many species who possess the capacity to feel pleasure and pain whose behaviour evinces no characteristics of a moral sense. Pinker goes on to flesh out his argument as follows:

> ". . . there are reasons to believe that . . . a moral sense evolved in our species . . . Children as young as a year and a half spontaneously give toys, proffer help, and try to comfort adults or other children who are visibly distressed. People in all cultures distinguish right from wrong, have a sense of fairness, help one another, impose rights and obligations, believe that wrongs should be redressed, and proscribe rape, murder, and some kinds of violence. These normal sentiments are conspicuous by their absence in the aberrant individuals we call psychopaths. The alternative, then, to the religious theory of the source of values is that evolution endowed us with a moral sense, and we have expanded its circle of application over the course of history through reason (grasping the logical interchangeability of our interests and others'), knowledge (learning of the advantages of cooperation over the long term), and sympathy (having experiences that allow us to feel other people's pain)." (181)

In this quotation Pinker employs the phrase "distinguish right from wrong." This is not surprising since this is the standard

phraseology used by humanity the world over to describe moral and immoral behaviours. However, for the reasons previously presented (the universe-at-large is amoral and therefore absolutist concepts of right and wrong cannot accurately be said to apply to the events which take place within the Field of Play), and for other reasons which we will come to presently, we believe that the use of such phraseology to distinguish moral from immoral behaviour is a mistake which too often results in confusion and distrust.

For a detailed explanation of how a moral sense could have evolved to become a dynamic inherent in the human psyche, we turn once again to the writings of Professor Richard Dawkins. In *The Selfish Gene,* Dawkins describes human bodies as "survival machines," created by the replicators called genes to protect the genes and ensure their continued survival over evolutionary time:

> "Now [genes] swarm in huge colonies, safe inside gigantic lumbering robots, sealed off from the outside world, communicating with it by tortuous indirect routes, manipulating it by remote control. They are in you and in me; they created us, body and mind; and their preservation is the ultimate rationale for our existence. They have come long way, those replicators. Now they go by the name of genes, and we are their survival machines." (182)

This is a powerful and useful insight, but in concluding that genes' "preservation is the ultimate rationale for our existence" Dawkins commits what is in our view an error which is common in atheistic Science. He is confusing a 'how' question with a 'why' question. The fact that entities we call genes have joined together to build survival machines we call the human body answers the question of 'how do we exist?' It does not answer the question of 'why do we exist?' The ultimate rationale for our existence is: humans exist so that God can have the experience of being human.

The idea that the moral sense which humans possess has a genetic basis rests upon two related dynamics observed in human behaviour: kin altruism and reciprocal altruism. Both of these behaviours can be understood as the outcomes of the action of 'selfish' genes, which seems like a contradiction in terms but isn't. In *The God Delusion* Professor Dawkins provides a detailed explanation:

> "The logic of Darwinism concludes that the unit in the hierarchy of life which survives and passes through the filter of natural selection will tend to be selfish. The units that survive in the world will be the ones that succeed in surviving at the expense of their rivals at their own level in the hierarchy. That, precisely, is what selfish means in this context. The question is, what is the level of the action? The whole idea of the selfish gene, with the stress properly applied to the last word, is that the unit of natural selection (i.e. the unit of self-interest) is not the selfish organism, nor the selfish group or selfish species or selfish ecosystem, but the selfish gene. It is the gene that, in the form of information, either survives for many generations or does not. Unlike the gene (and arguably the meme), the organism, the group and the species are not the right kind of entity to serve as a unit in this sense, because they do not make exact copies of themselves, and do not compete in a pool of such self-replicating entities. That is precisely what genes do, and that is the - - - essentially logical - - - justification for singling the gene out as the unit of 'selfishness' in the special Darwinian sense of selfish.
>
> "The most obvious way in which genes ensure their own 'selfish' survival relative to

other genes is by programming individual organisms to be selfish. There are indeed many circumstances in which survival of the individual organism will favour the survival of the genes that ride inside it. But different circumstances favour different tactics. There are circumstances - - - not particularly rare - - - in which genes ensure their own selfish survival by influencing organisms to behave altruistically. These circumstances are now fairly well understood and they fall into two main categories. A gene that programs individual organisms to favour their genetic kin is statistically likely to benefit copies of itself. Such a gene's frequency can increase in the gene pool to the point where kin altruism becomes the norm. Being good to one's own children is the obvious example, but it is not the only one. Bees, wasps, ants, termites and, to a lesser extent, certain vertebrates such as naked mole rats, meerkats and acorn woodpeckers, have evolved societies in which elder siblings care for younger siblings (with whom they are likely to share the genes for doing the caring). In general, as my late colleague W. D. Hamilton showed, animals tend to care for, defend, share resources with, warn of danger, or otherwise show altruism towards close kin because of the statistical likelihood that kin will share copies of the same genes.

"The other main type of altruism for which we have a well-worked-out Darwinian rationale is reciprocal altruism ('You scratch my back and I'll scratch yours'). This theory, first introduced to evolutionary biology by Robert Trivers . . . does not depend on shared genes.

> Indeed, it works just as well, probably even better, between members of widely different species, when it is often called symbiosis. The principle is the basis of all trade and barter in humans too. The hunter needs a spear and the smith wants meat. The asymmetry brokers a deal. The bee needs nectar and the flower needs pollinating. Flowers can't fly so they pay bees, in the currency of nectar, for the hire of their wings . . . Reciprocal altruism works because of asymmetries in needs and in capacities to meet them. That is why it works especially well between different species: the asymmetries are greater . . . Natural selection favours genes that predispose individuals, in relationships of asymmetric need and opportunity, to give when they can, and to solicit giving when they can't. It also favours tendencies to remember obligations, bear grudges, police exchange relationships and punish cheats who take, but don't give when their turn comes." (183)

Thus over the course of the evolutionary history that predated the appearance of homo sapiens - - - a period of probably several million years - - - genes that selected for kin altruism and reciprocal altruism would have become steadily more influential in the genome because the offspring of our forbears who possessed those genes would have had a better chance at survival. At some point a conscious understanding that such behaviours were advantageous occurred in the brains of our ancestors. Steven Pinker comments:

> "Morality, after all, did not enter the universe with the Big Bang and then pervade it like background radiation. It was discovered by our

> ancestors after billions of years of the morally indifferent process known as natural selection." (184)

That discovery, which was more likely to have been a slowly dawning realization rather than a 'Eureka!' moment, was the early beginning of the moral codes by which humans organize their societies today. Our ancestors would have begun to engage in the process of deliberately teaching their offspring, first by example and eventually via language, that it was advantageous to behave towards others in what we now call a moral manner. What was originally instinctual has been consciously developed into prescribed codes of conduct.

So is a moral sense inherent in the human psyche? The answer certainly appears to be "yes." Evolution has genetically endowed us with the capacity to care about how our actions affect the lives of others. Pinker notes:

> "[Morality can be seen] as something more than a social convention or religious dogma. Whatever its ontological status may be, a moral sense is part of the standard equipment of the human mind. It's the only mind we've got, and we have no choice but to take its intuitions seriously. If we are so constituted that we cannot help but think in moral terms (at least some of the time and toward some people), then morality is as real for us as if it were decreed by the Almighty or written into the cosmos." (185)

So morality can, perhaps must, be considered to be an inescapable element of the experience of being a normal healthy human manifestation. Decree by the Almighty is ruled out as a source of morality by the metaphysics of the Game of Being due to the logical conclusion that a loving Creator is incapable of

intervening in or altering the course of events of which the Game is constituted. But the idea that morality is written into the cosmos is not so easily dismissed. That morality evolved in humans (and perhaps other species) via the process of natural selection appears to be well established. The process of evolution itself seems to be an element of the Game which is fundamental to the playing of the Game and its outcomes: given the right set of circumstances lifeforms will appear and the process of evolution will ensue. Since decree by the Creator has been ruled out, evolution is the only solution we have to the puzzle of how lifeforms have come to be present in the universe. If evolution is fundamental to the playing of the Game, and if evolution is the source of morality in humans, then the argument can be made that morality is indeed written into the cosmos. Yet due to its intermittent and uneven application it cannot be a Rule of the Game in the manner suggested by Kant. We propose, instead, that morality be considered to be *an emergent property of the universe;* a property that is not fundamental to the playing of the Game in the sense that the Game could not proceed without its presence, but rather is a dynamic which has inevitably emerged (whatever has happened has happened inevitably) to play a limited role affecting some of the ongoing unfolding events which constitute the Game. The events known as human beings are profoundly affected by this emergent property of the universe. This suggests that humans are morally capable beings living in a deterministic amoral universe, and that the collision of these two facts lies at the root of the human dilemma. Is there any way out of or around this dilemma? We do not think so, but we believe that there may be a way to mitigate its effects through a more careful use of language.

Words matter. Language is a tool invented by humans so as to permit the efficient transference of information. Arguably, language is the most powerful tool humans have ever invented, for without it the invention of most of our other tools would not have been possible. The more powerful a tool, the greater the damage it may cause if used carelessly. We submit that the use of the words

'right' and 'wrong' as analogues for 'moral' and 'immoral' behaviour constitute a serious instance of the careless use of the tool called language, which has resulted in confusion and conflict.

The Oxford English Dictionary has twenty-four different definitions for the word 'right' including, crucially: just, morally good, proper, correct, true, the preferable or most suitable, the less wrong or not wrong, sound, sane, satisfactory, well-advised, and not mistaken, among others. Having so many possible meanings for one word is a recipe for confusion and misunderstanding. Similarly, the word wrong can mean either mistaken, incorrect, or immoral.

In *The Blank Slate* Steven Pinker writes:

> "Some debates are so entwined with people's moral identity that one might despair that they can ever be resolved by reason and evidence. Social psychologists have found that with divisive moral issues, especially those on which liberals and conservatives disagree, all combatants are intuitively certain they are correct and that their opponents have ugly ulterior motives. They argue out of respect for the social convention that one should always provide reasons for one's opinions, but when an argument is refuted, they don't change their minds but work harder to find a replacement argument. Moral debates, far from resolving hostilities, can escalate them, because when people on the other side don't immediately capitulate, it only proves they are impervious to reason." (186)

We believe that at least part of the explanation for the dynamic which Pinker succinctly describes lies in the multiple meanings we have for the words 'right' and 'wrong.' Everyone wants their point of view to be considered to be 'right' not only

because they think their point of view is 'correct,' but also because they want their point of view to be considered to be 'moral.' Conversely, no one wants to admit that their opinion could be 'wrong' or 'incorrect' because of the implication that 'wrong' may also mean that their opinion is 'immoral.' This confusion need not be apparent at the conscious level of discourse. It lurks subconsciously, causing people to dig in to their positions, and makes them "impervious to reason." The Harvard biologist Marc Hauser specifically connected the dynamics of language and morality when he wrote, "As with language, the principles that make up our moral grammar fly beneath the radar of our awareness." (187) Combined with the widespread confusion over the source of morality - - - i.e. the erroneous belief that the moral code has been decreed by God - - - and we are faced with a situation in which good will and the possibility of compromise can quickly evaporate.

A potential path out of this morass would be to do away with the usage of the words 'right' and 'wrong' as synonyms for 'moral' and 'immoral.' This idea may sound simplistic - - - not to say unlikely - - - but it could provide at least a partial solution, and languages do in fact change over time. It's not as if there are no alternatives available. All that would be required is for humans to refrain from using the 'catch-all' words of 'right' and 'wrong' and to be more precise in their communications. Instead of describing human behaviour as right or wrong, behaviour would be classified as 'permissible' or 'impermissible,' 'legal' or 'illegal,' 'wise' or 'foolish.' Taking this idea further, descriptions of events would no longer be right or wrong, but would be 'accurate' or 'inaccurate.' Statements concerning supposed facts would become either 'correct' or 'incorrect,' or 'mistaken.' Through the use of the tool of language in this more careful manner, confusing overlap with the notions of morality could be avoided. Such a linguistic development would eliminate the habit of thinking of right and wrong as concepts in opposition to one another altogether, and the connection between right/wrong and moral/immoral would

subsequently disappear, along with the mistaken notion that the universe-at-large is moral.

This is not some dry academic argument over semantics. This problem has real-world consequences. Because people do not want to admit to being wrong, due to the word's association with immorality, they are unable to learn from their mistakes. Despite the obvious fact that Donald Trump is unfit to hold the office of the presidency of the United States, his most ardent followers continue to voice their political support for him. Why is this, when he has made it perfectly clear that he is not to be trusted with such power? We believe that the primary reason for this is that his supporters are afraid to admit that they made a mistake in giving him their support in the first place. They are afraid to admit, to themselves and to others, that they were wrong.

A similar situation has arisen around the issue of gun violence in America. Within the past two weeks two horrific mass slaughters have occurred in America. These were not isolated events, but are merely the latest in a long string of such massacres stretching back over many years. The action required to prevent these tragedies from reoccurring in the future is painfully obvious. Laws must be passed to prevent military-grade weapons from falling into the hands of confused and angry young men. Everybody knows this. But the politicians who have the power - - - and the responsibility - - - to pass the necessary laws refuse to act. Why, in the face of so much death and suffering, why? It is not because the politicians are stupid. The solution to the problem is obvious, and they see it as clearly as everyone else. Part of the reason is that many politicians are financially beholden to the gun lobby. This is a separate problem and requires a separate solution. But we believe that the primary reason these politicians do not take the steps necessary to bring an end to this violence is because they are afraid that if they change their position on the issue now, it will be seen as an admittance that they were wrong, and therefore perhaps immoral, in the past.

People make mistakes. As a regular occurrence people

make mistakes. This applies to everyone and everyone acknowledges that this is in fact the case. Trial and error is a fundamental aspect of the human experience. It is the process by which we learn and progress. But if mistakes are considered to be wrong, the associated connotation with immorality disrupts the learning process. Most people are willing to admit when they have made a mistake and thus can learn from it; in general, people are much more reluctant to admit that they are wrong.

The solution to this predicament is to do away with the very concepts of right and wrong, and to achieve this we must banish the words which represent those concepts from everyday usage. This is not easy; these concepts and their verbal representations are deeply ingrained in the human psyche, but with concentrated effort it can be done. It requires that we pay conscious attention to our speech, and that we weed out the words 'right' and 'wrong' from the garden of our vocabulary whenever we find ourselves about to deploy them. With conscientious practice however, the old habitual way of speaking, and eventually of thinking, in terms of right/wrong will fall away, and the problems that have arisen as a result of thinking in those terms will be more amenable to solutions. There is no 'right' or 'wrong' to the functioning of the universe, and if humans discard this mode of labelling events human civilization will be the better for it.

The alert reader may have noticed that there is an inconsistency between the suggestion argued for in the preceding paragraphs and our own usage of the word 'wrong' on at least one occasion within these pages. At the very beginning of this book we used as an epigram a lyric written by Ian Anderson of the band Jethro Tull (we are definitely dating ourselves here):

> “I don't believe you.
> You have the whole damn thing all wrong.”

Anderson was stating his belief that the Church of England's conception of God is mistaken. We appropriated the

lyric because of our conclusions that humanity does indeed have the whole damn thing all wrong, that is, not only our understanding of the nature of God, but also our understanding of some of the fundamental phenomenological aspects of the universe are incorrect. We apologize for the inconsistency, but the phrase “You are completely mistaken about the whole damn thing” just doesn't scan.

Chapter Thirty-one

HUMAN RIGHTS:

A MODERN MYTH

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The careless use of the tool of language which has given rise to the confusion over matters moral and immoral has also infected the related field of 'human rights.' People everywhere, and particularly in the West, have become convinced that they possess, and are entitled to, by virtue of their being human, this abstract thing they call 'rights.' People firmly believe that it is 'right,' (by which they mean 'proper,') that they possess these 'rights.' People demand that their 'rights' be respected by the other members of society. People become very angry when they perceive that their 'rights' are being abused or denied. There is a constant clash over the ongoing question of whose rights in any given situation should have priority. In the midst of all this turmoil there is little understanding of what 'rights' actually are. According to the Oxford English Dictionary, one of the many definitions of the word 'right' is “being entitled to privilege.”

The modern roots of this misunderstanding can be traced back to Thomas Jefferson and the Founding Fathers of the

American republic when they signed the Declaration of Independence which states "that [all men] are endowed by their Creator with certain inalienable rights, that among these are life, liberty and the pursuit of happiness." By wording their declaration in this manner, these men were seeking to lend authority and justification for this claim by relying on a tactic that had been around for thousands of years: "God said so."

When Moses came down from the mountain with the tablets on which the Ten Commandments were written, he didn't tell the gathered tribes of Israel, "Well, I've spent some time thinking about it, and I think that these would be a useful set of rules on which to base the structure of our society." Rather he said, "God told me to tell you that these are the laws by which we should live and that you should obey them, because God said so." The Prophet Mohammad said to his fellow Arabs, "The words that I am speaking to you were put into my mouth by a messenger from Allah, so if you want Allah's blessing you must live your lives according to their dictates, because Allah said so." Throughout history, monarchs have claimed that they had been placed on their thrones by God, and that they ruled by divine right. Therefore their rules were God's rules and their subjects were obligated to submit to them because God said so. It is ironic, to say the least, that the Founding Fathers relied on the same source of authority for their Declaration of Independence as that claimed by the monarch against whom they were rebelling.

And of course, the Founding Fathers did not really mean what they were saying. For reasons apparently known only to God, only white men of a certain age and who owned property were endowed with these "inalienable rights" of life, liberty and the pursuit of happiness. Several of the men who signed that document actually owned other human beings. Considered without the benefit of rose-tinted historical glasses, it is clear what Jefferson and his confreres were up to. True to the OED definition, they were bestowing upon themselves certain privileges. But it would have been unseemly to admit to that, so they renamed these

privileges “rights” and said that this was acceptable because God said so. Thus was laid the foundation of the now widespread and mistaken mythological belief that humans possess 'rights' that have been endowed by God. But the truth is, and the history of the development of these so-called 'rights' bears this out, what humans actually possess are a number of privileges, which their society-at-large, or their ruling elites, have decided to bestow upon the individuals who are members of that society.

According to the metaphysics of the Game of Being, the claim that men have been endowed with certain inalienable rights by their Creator is errant nonsense, because this would require that the Creator possessed the capability to intervene in the stream of events of which the Game consists when humans appeared on the scene in order to do the 'endowing,' and this capability is something which we have demonstrated logically that the Creator does not possess.

A further problem with the myth of 'inalienable rights' is that they are not in fact inalienable. Society-at-large, in the form of the state, retains the power to deprive the individual of his liberty, happiness, and in some jurisdictions, his very life. If human rights were an endowment from God in the same manner that God endowed the Field of Play with the law of gravity, this would not be possible. The ability of the state to alienate the individual from his or her 'rights' makes clear what these 'rights' actually are: privileges sanctioned by society-at-large.

The current uproar in the United States over abortion 'rights' is a clear illustration of this fact. For fifty years their society-at-large has extended to American women the privilege of ending unwanted pregnancies. It now appears that a tiny number of that society's elite - - - five persons dressed in black robes - - - will allow the power of the state to do away with that particular privilege. Whether or not this action reflects the will of the majority of the American public is another matter. The point is that so-called inherent individual 'rights' are actually privileges, which may be permitted or may be denied by the society in which that

individual lives. Inalienable rights are a myth. They do not now, nor have they ever, existed.

A clear-eyed understanding of these situations encourages a shift in our perspective. Most parents understand that when they grant a privilege to their child, it is important that it be accompanied by an increase in the responsibilities borne by the child, so that the child will learn to value and appreciate the privilege. In much of the world today, and especially in America, the mythology of 'rights' to which the individual is supposedly entitled has been emphasized to such an extent that it has clouded people's understanding that the privileges which society has granted them come with a set of responsibilities. When Mohandas Gandhi received a letter urging world leaders to draw up a charter of human rights, Gandhi wrote back, “In my experience, it is far more important to have a charter of human duties.” (188) By placing the emphasis on human responsibilities rather than on a sense of entitlement, Gandhi knew whereof he spoke.

The reasoning behind the granting of privileges to individuals by society-at-large is that such privileges enhance the freedom available to each individual member of that society, in the belief that the greater the amount of freedom available to its members to do as they please with their lives, the happier individuals will be and that a happier citizenry will be beneficial to society-at-large. Thus the granting of privileges is in keeping with one of the goals for which God created the Game of Being: the Creator's desire to experience happiness, which is one of our fundamental assumptions concerning the nature of God. Therefore, as a general principle, it is beneficial to society-at-large to grant privileges to its individual members, but always with the proviso that the exercising of those privileges by each individual be done in a responsible manner. Since privileges are privileges and not endowed entitlements, if an individual abuses their privileges then society can act to withdraw some of that individual's privileges as deemed necessary for the benefit and/or protection of society-at-large.

However, while the general principle is sound, because humans are imperfect beings who make mistakes, as a practical matter it will be necessary for society-at-large to place reasonable limits on the privileges made available to its individual members. Anarchy has never been a successful strategy on which to base the operation of a stable society. Therefore a society whose goals are stability and the maximum happiness of its members will hew to the teachings of Confucius, Aristotle, and many other philosophers: nothing in excess, moderation in all things.

The problem then becomes: which privileges should be granted? We believe that there are four general guidelines which can usefully be employed in the answering of this question:

1. Any privilege, the exercising of which interferes with the reasonable exercising of a privilege of another member of society, shall not be granted.
2. Any privilege, the exercising of which results in chaos and/or mayhem, shall not be granted.
3. Any privilege, the exercising of which is deemed to be contrary to the beneficial well-being of society-at-large, shall not be granted.
4. Any privilege, the exercising of which does not contravene any of the foregoing three stipulations, shall be granted.

The implementation of these four general guidelines, as reasonable as they are, will not in and of themselves bring an end to moral disagreements and legal disputes. People will still disagree over what constitutes the "reasonable exercising of a privilege" or which privileges are or are not "deemed to be contrary to the beneficial well-being of society-at-large." A detailed set of laws based on custom and precedent will still be required, and a legal system composed of police and prosecutors to enforce the laws, lawyers to represent individuals in the courts, and judges to decide what is reasonable and what is deemed to be contrary will still be necessary.

However, the basic privileges to which the citizens of countries with democratic traditions have become accustomed would be preserved. Take, for example, a citizen's privilege to have access to the ballot. If, in a country made up of diverse ethnic groups, the majority tried to deny a minority group access to the ballot, the majority would have to demonstrate to the satisfaction of a judge that the individual members of the minority's privilege to vote somehow interfered with the reasonable exercising of the privilege to vote of the individual members of the majority; or that the minority's exercising of the privilege to vote would result in chaos or mayhem; or that the exercising of the minority's privilege to vote would be contrary to the beneficial well-being of society-at-large. In any country with a history of democratic traditions, these would constitute significant legal hurdles for a majority wishing to deny the privilege to vote by a minority.

But at the same time the privilege of casting a ballot would remain a privilege, not an entitlement, and could be revoked if the privilege was abused, such as the case of an individual casting two ballots in one election. A person who was found guilty of such an act could be denied the privilege of voting in future elections. Such a penalty would make it clear to all the individuals in a given society that the various privileges they enjoy are just that, privileges, granted to them by their fellow citizens, not mythological God-endowed 'rights' - - - which is an impossibility - - - and that the continuation of the enjoyment of those privileges is contingent upon the agreement of the individual to exercise his or her privileges in a responsible manner.

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We now wish to apply the framework of our ideas regarding rights, privileges, and the logic of love to the latest global crisis:

the war in Gaza.

On the morning of October 7, 2023, the terrorist group known as Hamas launched a surprise attack on the state of Israel, during which they committed atrocities against innocent, defenceless, terrorized Israeli citizens. More than 1,200 Israelis were massacred and some 250 were taken hostage and carried off to Gaza. Civilized nations around the globe have, quite properly, condemned the attack as an act of barbarism.

In response, the Israeli military has unleashed thousands of bombs and missiles which have rained down destruction on innocent, defenceless, terrorized Palestinian citizens. As of this writing more than 31,000 Palestinians, two-thirds of them women and children, have been killed, and practically all of the cities of Gaza have been reduced to rubble. Civilized nations around the globe have, however regretfully, condoned this response as an act of self-defence.

Both actions have resulted in the indiscriminate slaughter of innocent, defenceless, terrorized human beings. Why has there been such a gaping disparity in the global response to these events? Apparently it is because so-called civilized nations consider the Israelis to be exercising their *right to self-defence.* But this belief is completely fallacious. There are two fallacies involved here. The first of these is the idea that Israel has a 'right' to behave as it has done. This is false. Just as individual citizens do not possess 'rights' granted by the Creator - - - they are granted *privileges* by their fellow citizens - - - neither do nation-states possess 'rights' of any kind. 'Rights' are a myth, and, as the war in Gaza makes abundantly clear, a dangerous one at that. What nation-states possess are *obligations*; the most important of which is the obligation to protect the lives and property of its citizens. On October 7, 2023, the state of Israel failed utterly to fulfill that vital obligation. Who, if anyone, will be held responsible for that failure remains to be seen.

The second fallacy which is apparent in this situation is the claim that the actions of the Israeli military in Gaza are a form of

self-defence. This claim is pure sophistry. The Oxford English Dictionary defines the verb 'defend' as "ward off attack from, keep safe, protect." To *defend* its citizens is precisely what the state of Israel failed to do on October 7th. The actions of the Israeli military in response to the attack by Hamas, by air and by land, are not, by any stretch of the imagination, *defensive* in nature. It is clear and obvious that it is now the Israeli military which is doing the attacking. The Israelis are attempting to rationalize their behaviour by claiming that they are engaging in a *preemptive* attack, necessary to prevent Hamas from carrying out future attacks on Israel, which, to be clear, Hamas has sworn to do. This does not change the bare facts of the matter: what Israel is engaging in is *not self-defence*; it is *aggression.* And given the large number of civilian casualties and the wide-spread destruction of Gaza's infrastructure, it does not seem to be merely preemptive in nature. It smacks of retaliation, reprisal, and revenge.

In a statement published on October 27, 2023, on the web site of the Johns Hopkins Bloomberg School of Public Health (publichealth.jhu.edu) entitled *The Rules of War and Human Rights in the Israel - Hamas War,* the legal and human rights expert Len Rubenstein, JD, a Distinguished Professor of the Practice and interim director of the Centre for Public Health and Human Rights at the Johns Hopkins Bloomberg School of Public Health, made the following comments:

> "The rules, [of war] known as international humanitarian law, are designed to limit harm to non-combatants in war; they are distinct from the law regarding the legitimacy of going to war. The rules aim to protect civilians, wounded and sick soldiers, health and humanitarian workers, and prisoners of war.
>
> "Civilians may not be attacked or taken hostage. In their targeting, combatants must distinguish between civilian and military objects

and take precautions to avoid hitting hospitals and other civilian structures. Even when the target is a military one, combatants must take precautions to avoid or at least limit harm to civilians. The rules also prohibit attacks on objects indispensable to the survival of the civilian population. Conflicts in densely populated areas do not obviate these duties.

"The rules apply to both state military forces and non-state armed groups, such as Hamas. The fact that one side violates the rules does not permit the other side to deviate from them.

"Intentional attacks on civilians and collective punishment are each war crimes. Grave violations of the rules, such as targeting civilians or civilian infrastructure, taking hostages, or starving the population, are war crimes. . .

"Occupying powers have additional obligations to ensure that populations living in occupied territory have adequate access to health services and public health measures. International authorities as well as the State Department consider Gaza to be occupied because of Israel's control of airspace, territorial waters, entry and exit of people, and water and electricity.

"Hamas' atrocities, including its horrific massacres of civilians, taking of hostages, and indiscriminate rocket attacks throughout Israel, are war crimes. The latest reports state that Hamas killed 1,400 Israelis, the vast majority of them civilians, and has taken more than 200 hostages. Hamas fighters also attacked a hospital and its staff in Israel, killing a paramedic and

injuring others.

"The Israeli military conducted more than 7,000 strikes in Gaza in the first 19 days of the war. According to Gaza Ministry of Health, more than 6,500 Palestinians, including civilians and fighters, were killed (including more than 2,000 children), in that period. As of October 23,there were 25 incidents of extensive damage to health facilities, some of them more than once.

"A full investigation is required to learn facts that can reveal whether Israel distinguished between civilian and military objects and took the precautions required by law for each attack to minimize harm to civilians and civilian structures and to ensure that its attacks are proportionate. The sheer number of airstrikes in such a short period in a dense area and the high death toll, however, cast serious doubt whether Israel complied with its obligations.

"Gaza's health infrastructure and its capacity to treat traumatic injuries were weak before the war because of Israel's blockade and the impact of past conflicts in this century. Israel's cut-off of electricity and fuel, and only partial restoration of water to Gaza, along with damage from airstrikes, has forced closure of multiple hospitals at a time of enormous need. In my view, the denial of key utilities to the population amounts to collective punishment."

Based on Professor Rubenstein's remarks, it seems clear that the organization known as Hamas has committed war crimes. For this the leaders of Hamas should be held to account. There is also the distinct possibility that the Israel Defence Force (IDF) has also committed war crimes. International arrest warrants for both

Israeli and Hamas leaders have already been served by the International Criminal Court. Further allegations may arise if and when the cessation of hostilities permits the proper investigation of events.

It is important for humanity to grasp that neither Hamas nor Israel have engaged in actions that are *wrong*. From the perspective of the Creator, no *wrong events* can ever occur in the Game of Being. Because the inevitable *always* happens, whatever has happened has happened inevitably; thus whatever has occurred could not have occurred in any way other than the way in which it did occur, regardless of the particular circumstances of the occurrence, and to label events that have already occurred as 'wrong' or 'unacceptable' is simply unhelpful. Humans must learn to accept that any and all events, no matter how distressing a particular event may be, having once occurred, cannot be undone. Our task is to learn from them and move on, in the hope that such events can be prevented from reoccurring in the future.

There are three lenses through which the actions of human manifestations can usefully be judged. The first of these is the ethical-moral lens by which we judge what is permissible and what is impermissible. The lessons of history make clear that if we are to live together in peace and security we must refrain from causing harm to one another, and thus the widely acknowledged rule is that it is impermissible to kill our fellow humans. Obviously, both sides in the Israel-Hamas conflict have chosen to disregard this rule, with disastrous consequences.

The second lens is the legal lens, by which we judge what is criminal and what is not. It is possible that at some future point certain of the events which have occurred during the Israel-Hamas conflict will be judged by a duly authorized tribunal, such as the International Court of Justice or the International Criminal Court, to be war crimes. Whether this ever happens and whether or not the parties involved would submit to the authority of such a tribunal remains to be seen.

The third lens through which the actions of humans can

usefully be judged is the behavioural lens, by which we deem the behaviour of humans to have been either wise or foolish. There is no doubt that the behaviour of Hamas has been very foolish indeed. Not only have their actions resulted in the deaths of tens of thousands of the Palestinians in whose name they claimed to have carried out their atrocities, their actions have brought about the utter ruination of their society. If there was any doubt in the minds of decent people around the globe concerning the character of Hamas prior to the October 7th attack on Israel, all such doubt has now been removed and the reputation of Hamas has been forever tarnished. Furthermore, Hamas' behaviour has not moved them one micron closer to their stated goal of driving the Jewish people out of the Holy Land. Quite the opposite. All of the deaths, all of the suffering which the Palestinian people have experienced as a result of Hamas' actions have been for nought. What Hamas did was unwise in the extreme.

How about the state of Israel? Has its behaviour been wise or foolish? We have previously defined wisdom as possessing the ability to know when, and when not, to act. In choosing to act or not to act, the sage has a specific goal in mind, and above all else must weigh whether or not that goal is achievable via the various paths the sage is contemplating. Israel's Prime Minister Bibi Netanyahu has stated repeatedly that his government's goals are the release of the Israeli hostages, and the complete elimination of Hamas. These are the immediate short-term goals. The long-term goal surely remains the protection and long-term security of the Israeli people. Netanyahu has chosen the path of all-out war. Will this path lead to the achievement of Netanyahu's stated goals? The available evidence to date suggests the answer to this question is no.

The only significant release of the hostages came about as a result of a temporary cessation of hostilities. Whether or not military action will result in the freeing of those hostages who remain captive is very much an open question.

As for Netanyahu's second goal - - - the complete

elimination of Hamas - - - the available evidence, which Netanyahu must have been aware of, suggests that this goal is not achievable through brute force. This is because Hamas comprises not merely a group of blood-thirsty war-crime-committing terrorists; it has evolved into a symbol of freedom and redemption for the Palestinian people. It has become an idea, and ideas are much harder to kill than human beings.

In an article published in The New Yorker on January 22, 2024, David Remnick quotes "Hussein Agha, a Lebanese academic who has worked as a negotiator for the Palestinians since before the Oslo Accords" who stated:

> "The Palestinians have been on the receiving end of brutality for a hundred years, and now was their chance to show they could do this. And it is important to note that almost no Palestinians stood against it, except some N.G.O.s, which get Western money. Even Abu Mazen" - - - Mahmoud Abbas, the President of the Palestinian Authority - - - "cannot come out clearly against it. This runs deep inside the Palestinian psyche, this very act. It borders on the Biblical. It has nothing to do with politics or the interaction of the two peoples. It's revenge. It comes out of a feud festering over decades, even centuries."

Remnick comments that "[E]ven in the ruins of Gaza - - - amid all the suffering, death, destruction, and dislocation - - - many will revere Yahya Sinwar [the leader of Hamas in Gaza] as an icon of armed resistance in the Palestinian national cause. 'His picture from now on will be next to Arafat's everywhere,' Agha told me. 'His picture will be in the pocket of every Palestinian teen-ager. Even if the Israelis kill him, he is a hero. The important result of this war was over the night of October 7th. The rest is revenge.

The I.D.F. cannot kill Hamas. It's everywhere.'"

If what Hussein Agha said is true - - - and his long experience dealing with the Palestinians strongly suggests he knows whereof he speaks - - - then, if the path of total war is chosen, there are only two possible ways by which Netanyahu's stated goal of the complete elimination of Hamas from Gaza can be achieved. One way would be to drive the entire population of 2.1 million Palestinians out of the Gaza strip. This would be a monstrous war crime. The other possibility would be to kill 2.1 million Palestinians. This would be a much more monstrous war crime, on par with the Holocaust. Clearly, neither of these two possibilities are tenable. Yet if the goal of the complete elimination of Hamas from Gaza is to be achieved, this is where the path of total war - - - the path chosen by Bibi Netanyahu - - - ineluctably leads.

The Game of Being is relentlessly, unforgiveingly, logical. In light of this fact, the only logical conclusion which can be reached in this situation is that Netanyahu's stated goal of the complete elimination of Hamas from Gaza was not, and is not, achievable, which calls into question the wisdom of his choice of going down the path of total war. The question then becomes: what other paths, if any, were available to him?

We will explore just one of the potential alternatives. What if, instead of committing the nation of Israel to total war, Bibi Netanyahu had chosen to commit the Israelis to the application of the logic of love? Imagine how events might have unfolded if the Prime Minister of Israel, instead of ordering his air force to drop thousands of pounds of high-explosive on defenceless human beings, and mobilizing his army to prepare for an invasion of Gaza, had issued the following public statement on October 8:

> My fellow Israelis, I speak to you tonight at a terrible moment in our nation's history. Not for the first time, our people have been confronted with true evil. We are all in shock,

and I know that every Israeli citizen is consumed with sorrow and rage, and many of you are thirsting for revenge. Under these terrible circumstances, it is inevitable that the citizens of Israel will be 'thinking with their feelings.' While I share those feelings, as your elected leader I do not have the luxury of indulging them by letting them determine how we, as a nation, respond to the evil which has been visited upon us. As your leader, it is my responsibility to think with my mind, not my emotions. How we respond to this confrontation with evil will affect the lives of each and every one of us. Therefore I must swallow my own outrage, and seek the path of wisdom. So, after hours of deliberate and careful contemplation, I have reached the following conclusions:

For generations Israelis and Palestinians have engaged in ongoing and seemingly endless strife. Each side has shed the blood of the other. If this conflict is ever to come to an end, then one side or the other must act to break the chain of violence and retaliation. Yesterday's terrible events make it clear that Hamas is not ready to so act. Logic dictates that this means that, as the other party to this conflict, it is up to us, the nation of Israel, to break the chain.

The second most famous Jew in history, Albert Einstein, defined insanity as “doing the same thing over and over again and expecting different results.” The history of our two peoples makes clear the lesson that responding to an act of barbarism with another act of barbarism only leads to yet another act of barbarism. If we are to cure ourselves of the insanity into which both our

peoples have sunk, the chain of violence must be broken and replaced with something else: a lifeline which can serve to lift both peoples out of this quagmire. To this end, I have concluded that we - - - by which I mean Israelis and Palestinians together - - - must infect the minds of our enemies with the logic of love.

The application of the logic of love requires that we recognize each Israeli and each Palestinian as a human being, a being that has been created in the image of God, and that therefore each Israeli and each Palestinian is a holy being, and is thus deserving of love and compassion.

Therefore I say to you, that, as a first step along this new path, on *this* occasion, the nation of Israel will adhere to the teaching of the most famous Jew in history, Jesus Christ, and in the face of this monstrous deed, *we will turn the other cheek*. I will order no retaliation to be visited upon the Palestinian people for the grievous injury they have inflicted upon us. The people of Israel will do its part to break the chain of violence here and now.

To the Palestinian people in general and to Hamas in particular, I say do not interpret this gesture as a sign of weakness. The state of Israel possesses the means to flatten virtually every building in Gaza, and there are those who counsel this course of action. But in the name of the logic of love I am choosing to do otherwise. If you launch rockets at us, we will rely upon our Iron Dome anti-missile defence system to protect us. We will fortify the Israel-Gaza border and if you attempt to attack our citizens across it, we will do

> whatever is necessary to defend ourselves. But, for now, we will not retaliate against the people of Gaza. Do not make the mistake of believing that our forbearance is infinite or that our tolerance for abuse will be endless. Israel reaches out to you with the open hand of peace. I urge you to reciprocate and join us in this task of changing the course of history. Shalom.

The foregoing statement is, of course, pure fantasy. The probability that a man like Bibi Netanyahu, who has been a lifelong supporter of Israel's annexation of Palestinian land, and who now may well be considered by some as the man ultimately responsible for the commission of war crimes, would ever make such an enlightened statement, should it ever even occur to him, is precisely zero. His actual statement included the phrase that the Israeli military response to the October 7th atrocities would "resound down through the generations." And indeed it probably will, but only as yet another instance of mankind's willingness to engage in barbarism..

Imagine, for a moment, the global impact that our fantasy statement could have had. Imagine if 'God's chosen people,' participants in an age-old blood-feud, had deliberately withheld their vengeance. That, too, would have resounded down through the generations, but, we believe, with a much different historical effect.

One of the most impressive things about lifeforms is that they are capable of learning from past experience and adapting their behaviour accordingly. As we have seen, even the lowly *Mimosa pudica* is capable of learning and changing its behaviour. Will *Homo sapiens sapiens*, the self-titled 'wise men,' ever learn the lesson that barbarism only ever begets more barbarism? For the sake of humankind's future generations, we must strive to make it so. It will not happen on its own. Someone, somewhere, must find the courage, and the compassion, to break the chain. Like the

United States following 9/11, Israel was given the opportunity to do this, but has thrown it away. Will humanity be given another chance? Only time will tell.

Chapter Thirty-two

A UNIVERSE BY DESIGN

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Having made our argument concerning the amorality of the universe-at-large, and examined how morality came to be an aspect of the human condition, and having (we hope) established the truth of the matter when it comes to the mythological notion of so-called human 'rights,' we turn our attention now to another matter. We have previously made the claim that evidence exists which is suggestive of the idea that the universe has been purposely designed to function in the way in which it does. If it is true that the universe has been designed, it follows logically that there must be a designer.

What do we know with certainty? We know that the universe exists and we know that the universe is structured in such a manner that makes possible the appearance of lifeforms, because we are here to observe it. Through our observations we have assembled a body of knowledge made up of facts which describe various aspects or characteristics of the universe. We now know that the appearance of lifeforms in the universe is crucially contingent upon the specific values held by some of these facts, and that the coming together of these contingencies is so remarkable that they render the argument that their manifestation is

coincidental unsatisfactory to our inquisitive human minds. In physics this puzzle is known as 'the fine-tuning problem.'

How the universe came to exist is a matter of conjecture. At the present time there are two main schools of thought that attempt to provide an answer to that question of how. The older of these two schools, which we may call the Traditionalists, claims that the universe was brought into being as a result of the efforts of a Creative Intelligence. In broad terms, the Game of Being theology belongs to this school of thought. The Traditionalists begin by making certain assumptions about the nature of this Creative Intelligence, and then, through faith, interpret historical events in the light of these assumptions. We have questioned the validity of some of these assumptions, and have pointed out the confusion that grips many traditionalists concerning the notion of what constitutes genuine faith.

Over the course of the recent past the Traditionalists' argument has increasingly fallen out of favour with many people, particularly in the West. This has been due in no small part to the stubborn refusal by members of the fundamentalist wing of the Traditionalist school to embrace Darwinism, or natural selection, as the explanation for how life has evolved on this planet. This refusal is based primarily on the fundamentalist fear of the "slippery slope" which we have previously discussed. The fundamentalist refusal to accept natural selection, in the face of the mountains of evidence which support it, has severely damaged their credibility and has unfortunately tarnished the entire Traditionalist view of how and why the universe came into being. This book is, in some ways, an effort to remove that tarnish.

The newer of the two schools which attempt to provide an explanation for the existence of the universe is that of Science. Science begins with certain assumptions about the physical nature of the universe, the validity of some of which we also question herein, and then, by the process of gathering empirical evidence, attempts to interpret and explain events through the lens of those assumptions. This approach to understanding the universe can

boast of many successes, and Science has discovered and explained aspects of the nature of being that were completely beyond the reach of the Traditionalist approach. As a result, many of those who believe in the methods of Science deny the idea that a Creative Intelligence is responsible for the existence of the universe because there is no direct conclusive empirical evidence that such an entity exists.

Our argument for the idea that the universe has indeed been purposely designed rests upon certain facts about how the universe functions which have been discovered by the school of Science, not the Traditionalists. These facts reveal aspects of the universe which are fundamental to the functioning of the universe; which had to be part of the structure of the universe right from the beginning; which could not have evolved over time; and which therefore had to be 'set' or determined by some sort of rule or mechanism prior to the creation of the Field of Play.

To explain why we have reached the conclusion that the universe shows evidence of having been designed, we begin with stars. Stars are 'element-making machines' where the constituents that make up planets and lifeforms are manufactured. Of crucial importance to the existence of lifeforms are the manufacture of the elements carbon, oxygen, and nitrogen. Ninety-six percent of the atoms in your body are made of these three elements plus hydrogen, put together in various combinations.

Starting with the simple one proton nuclei of hydrogen, in a process known as nucleosynthesis, stars fuse atoms together in a step-wise fashion to create heavier and more complex atomic nuclei. The first step involves the addition of a neutron to a hydrogen nuclei which creates an atom of deuterium, also known as 'heavy hydrogen'. The fusion of two deuterium nuclei (after an intermediate step which we will discuss in more detail presently) results in the formation of helium-4 (a nucleus with two protons and two neutrons) which are also known as 'alpha' particles. Helium-4 nuclei are very stable and are the basic building blocks of the rest of the elements manufactured in the cores of stars right up

to iron-56. In this process of manufacturing heavier and ever more complex nuclei, two amazing circumstances prevail; circumstances which could not have evolved as the universe aged, and which speak eloquently to the idea of the universe being designed to fulfill a purpose.

When two alpha particles fuse together they form a beryllium-8 nucleus. The addition of another alpha particle results in the manufacture of a carbon-12 nucleus, atoms of which are crucial to the existence of lifeforms. But physicists discovered that there is a problem involved in this seemingly straight-forward manufacturing process. It turns out that beryllium-8 nuclei are very unstable and last only for an extremely short period of time: 10^-19 of a second. This means that the creation of a carbon-12 nucleus could only take place if a third alpha particle collided with the beryllium-8 nucleus in that brief window of time, and a greater mystery was why the kinetic energy of the third alpha particle did not simply blow the unstable beryllium-8 nuclei apart.

In 1954 it was the physicist Fred Hoyle (he of the "Steady State" theory of the universe) who solved the riddle. His solution was based on a property of atomic nuclei known as 'resonance' which refers to the ability of atomic nuclei to exist at more than one energy level. Hoyle proposed that carbon-12 possesses a particular resonance in which its energy level would be equal to the combined energy of an unstable beryllium-8 nuclei and an incoming alpha particle, the collision of which would then permit the manufacture of carbon-12.

In his book *In the Beginning*, the astrophysicist and science writer Dr. John Gribbin writes of this discovery. In a chapter aptly titled *The Goldilocks Effect,* in which he describes how the conditions prevailing in the universe must be "just right" for lifeforms to appear, Gribbin states:

> "In 1954, the idea seemed outrageous. In order to make carbon (and all the heavier elements), the laws of physics would have to be

> *precisely fine-tuned* (emphasis added) for this resonance to occur. . . . The coincidence is so remarkable that it is worth putting some numbers in. The energies involved are measured in mega-electronvolts (MeV), but that doesn't matter - - - just look at the numbers themselves.
>
> "The energy of a beryllium-8 nucleus plus a helium-4 nucleus is 7.3667 MeV; the energy of an excited carbon-12 nucleus is 7.6549 MeV. The difference between the two is just under 4 per cent, and the extra 0.3 MeV or so required to make the match perfect is just the sort of energy of motion that will be carried into the collision by the alpha particle. Instead of blasting the beryllium-8 apart, the energy carried by the alpha particle is just enough to carry the combination over the top and make excited carbon-12: 'just right' to make the carbon nuclei that go into the atoms in Baby Bear's porridge.
>
> "The power of the coincidence is brought home when you consider what would have happened if the balance had just tilted the other way, with the beryllium-8/alpha particle combination having an energy even just 1 per cent more than the excited state of carbon-12. Then there would be no resonance. The incoming alpha particle would indeed blast the beryllium-8 apart, and there would be no carbon (or any heavier elements) in the Universe." (189)

And there is more, much more. Other nuclei can also have excited states. Oxygen-16 nuclei are manufactured from the combining of a stable carbon-12 nuclei with an alpha particle, which possess a combined energy level of 7.1616 MeV. To this must be added the kinetic energy of the incoming alpha particle.

This total exceeds the energy level of oxygen-16 which is 7.1187 MeV. Despite this difference in energy levels, because carbon-12 is stable and therefore stays around once it has been created, a certain proportion of the collisions between carbon-12 nuclei and alpha particles do result in the manufacture of oxygen-16 nuclei, without the requirement of the resonance factor which is necessary to the manufacture of carbon-12. This means that a significant proportion of the carbon-12 nuclei never undergo transmutation into oxygen-16, and remain available to be blasted out into space when the star goes supernova at the end of its life. Such manufactured carbon then is used to form the next generation of stars, planets and moons, and, potentially, lifeforms. But this outcome could easily have been otherwise. Dr. Gribbin notes:

> "If, however, the oxygen-16 energy level lay just above the combined carbon-12/alpha particle level (which would happen if the excited oxygen energy level were just one percent higher), then it would resonate, and all the carbon-12 inside a star would quickly be converted into oxygen-16. There would be no carbon available to take part in all those interesting reactions that are the basis of life as we know it on Earth.
>
> "So there are two remarkable coincidences which allow lifeforms like us to exist - - - a double Goldilocks effect - - - at work inside stars. The first makes it possible for carbon to form at all; the second prevents all the carbon turning into oxygen, but allows enough oxygen to be made to carry the process of nucleosynthesis on up the chain to iron-56. . . . Could such coincidences arise by accident? Were they 'built in' to the structure of the Universe by a designer? Or have they evolved through natural selection?" (190)

We know of no credible theory that could explain the production of carbon and oxygen within stars as being the consequence of an evolutionary process of natural selection, and we do not accept the notion that this situation is the result of mere coincidence. Fred Hoyle himself had his doubts. “In his book *Galaxies, Nuclei and Quasars* (published in 1965), Hoyle says that it looks as if 'the laws of physics have been deliberately designed with regard to the consequences they produce inside stars'.” (191) And there is further evidence which supports the proposition that the structure and operation of the universe have been designed to be as they are.

Science has concluded that there are four fundamental forces which operate in the universe. Our readers will by now be aware of our argument that the first of these 'forces', gravity, is not a 'force' at all but is, in accord with Einstein's General Theory of Relativity, a warping of space-time by matter. But for the purposes of our present discussion we will ignore this important distinction. The second force is electromagnetism, which is really a combination of two directly related forces, electricity and magnetism. Electromagnetism is the force that propels light and radio waves through space-time, and humanity has exploited this force to generate electricity and run electric motors. The third force is known as the 'strong' force. “The strong force is the powerful (though short-range) force of attraction which holds the nucleus [of atoms] together against the tendency of the positive charge on all the protons to blow the nucleus apart.” (192) The fourth force is the 'weak' force, and is thought to be responsible for the radioactive decay of unstable atoms. As part of their continuing effort to describe all the fundamental forces of nature by one set of mathematical equations, physicists have mathematically unified the electromagnetic and weak forces into one hybrid known as the 'electroweak' force.

Considering these four forces and other fundamental aspects of the universe, Dr. Gribbin states:

> "The behaviour of everything in the visible Universe, and the Universe itself, depends on the balance between these four forces, together with the exact values of the basic unit of electric charge (the charge on an electron) and the exact masses of the proton, neutron and electron. The standard idea of the Big Bang as a unique event offers no explanation of why these fundamental entities should have the properties they do. It is either just luck (coincidence) or the work of a designer, depending on your personal preference. But there is no doubt that the exact values of these fundamental entities are crucially important to the nature of the Universe, and to the existence of life-forms like us." (193)

Missing from Dr. Gribbin's portrait of the universe is the existence of the bubble of space-time in which all of these components operate, but his point is well-taken. The universe is either the result of an intelligent designer, or the result of an amazing set of fortuitous coincidences.

In his book *Just Six Numbers,* Britain's Astronomer Royal Lord Martin Rees discusses six numbers, representing six aspects of the universe which he claims are fundamental to its functioning; in other words, if the value of any one of these six numbers was different from what it is, the universe as we know it could not exist. According to Rees:

> ". . . the nature of our universe is remarkably sensitive to these numbers. If you imagine setting up a universe by adjusting six dials, then the tuning must be precise in order to yield a universe that could harbour life." (194)

The first number Rees discusses has a value of

1,000,000,000,000,000,000,000,000,000,000,000,000 (1.0x 10^36). Explaining its significance, Rees states:

> "This number measures the strength of the electrical forces that hold atoms together, divided by the force of gravity between them. If [this number] had a few less zeros, [i.e. if gravity was a little bit stronger] only a short-lived miniature universe could exist: no creatures could grow larger than insects, and there would be no time for biological evolution." (195)

Rees goes on to explain that in a universe in which gravity was stronger stars would be smaller and much shorter-lived, galaxies would be more compact and stable planetary systems could not exist, which in turn would mean that biological life could never appear. On the other hand, if gravity was much weaker than it is, stars could not form and the universe would consist of a diffuse cloud of hydrogen and helium. There would be no galaxies and no planets, and hence no life. This number's value is not derived from any theory. It is the value of a ratio between two other numbers. "All we know is that nothing as complex as humankind could have emerged if this number were much less than" (196) its value of 1.0 x 10^36.

(We digress here for a moment to note that this number does not describe a particular phenomenon in the universe. As the value of a ratio it is a pure number, created by scientists to relate the numerical value of one aspect of the universe to the numerical value of another aspect. According to Rees, the denominator of this ratio represents "the force of gravity" between atoms. This is consistent with the Newtonian understanding of the phenomenon of gravitation, but as we have previously discussed we believe this understanding to be flawed. In our view the correct description of the denominator in this ratio is that it represents the capacity of an atom to curve the space-time in its vicinity.)

Rees' second number has the value of 0.007. This number

> ". . . defines how firmly atomic nuclei bind together, and how all the atoms on earth were made. Its value controls the power from the Sun and, more sensitively, how stars transmute hydrogen into all the atoms of the periodic table. Carbon and oxygen are common, whereas gold and uranium are rare, because of what happens in the stars. If this number were 0.006 or 0.008 we could not exist." (197)

Rees' next two numbers, designated by the Greek letters omega and lambda, are significant only in the context of the idea that the universe is expanding. Since through our analysis of the cause of the red-shifting of light from distant galaxies we have demonstrated that the universe is in fact not expanding, we can ignore the details of what these numbers supposedly represent.

The fifth number which Rees claims is of fundamental importance to the functioning of the universe has a value of about 1/100,000 and is also a ratio, a pure number devised by physicists which is not in itself representative of an actual phenomenological aspect of the universe. This ratio is derived by dividing the amount of energy required to break apart the largest structures in the universe - - - clusters and superclusters of galaxies - - - by their total 'rest-mass energy'. Rees writes, "[This number] is crucial for determining the 'texture' of structure in our universe, which would be very different if its value were either much larger or much smaller." (198) However, we believe there are three errors that lie deep in the reasoning which has given rise to this number. The three errors comprise one invalid assumption and two incorrect conclusions.

The invalid assumption is that the 'force of gravity' is infinite in range, and that it is this 'force' that binds together clusters and superclusters of galaxies. We have demonstrated that

gravity is neither a 'force' nor is it infinite in range, and we have argued that what keeps galaxies within the filaments of the cosmic web is the preferential behaviour of the massive neutron stars at the centre of galaxies to move through 'stressed' space-time.

The first incorrect conclusion is that galaxies grew out of small irregularities in the overall smooth distribution of matter in the early universe, and that the evidence for this is the small differences in temperature measured in the cosmic microwave background. Rees' fifth number "measures the amplitude of these [supposed] irregularities." (199) However, we have argued that these temperature differences are not evidence of the presence of the primordial seeds of galaxies from the early moments of the universe's existence, but, rather, are merely tiny differences in the temperature of the bubble of space-time as it exists today. Further, we say that matter was not smoothly distributed in the early universe. We have argued that the overall structure observed in the universe today is due to the fact that in the very early universe the filaments in which we now find clusters of galaxies were of a higher temperature than the rest of the bubble of space-time, which resulted in an imbalance in the creation of matter and antimatter within those filaments. After the matter/antimatter annihilation event was completed, the surplus matter remaining within those filaments, in the form of hydrogen and helium gas, were drawn together by gravity to form the first generation of stars, culminating over time in the formation of galaxies.

Rees writes that why his fifth number has the value it does ". . . is still a mystery. But its value is crucial: were it much smaller, or much bigger, the 'texture' of the universe would be quite different, and less conducive to the emergence of lifeforms." (200) But it is a 'crucial number' with only imaginary significance. The second incorrect conclusion is that so-called 'dark energy' exists. There is in fact no force in the universe working to break apart clusters and superclusters of galaxies, so that a number representing the amount of energy required to do so (the numerator in the ratio that gives Rees' fifth number its value) is a meaningless

number with no application to the actual universe. Thus Rees' fifth number is a number which does not represent a fundamental aspect of the actual universe and is associated with three conceptual misunderstandings about how the universe functions. It is a number that has significance only in the confused minds of cosmologists.

Rees' sixth crucial number is equal to 3, the number of spatial dimensions in the universe. The universe as we know it could not exist if there were fewer or more dimensions than three. If there were four spatial dimensions planetary orbits would be highly unstable, as would be the orbits of electrons around atomic nuclei, meaning that atoms could not persist. If there were only two dimensions no complex structures could arise.

Another important fact about the nature of the universe arises from the context of neutron decay. Unlike most sub-atomic particles (apart from protons, electrons, and neutrinos) which decay in less than a second, a free neutron takes 10 – 15 minutes to decay into a proton, electron and a neutrino. Neutrons which are bound up in an atomic nucleus are stable and do not decay because - - - so current theory states - - - their mass is so close to the mass of a proton. Theoretical physicist Lawrence Krauss has written:

> "The entire stability of the nuclei that make up everything we see, including most of the atoms in our body, is an accidental consequence of the fact that the neutron and proton differ in mass by only 0.1 percent, so that a small shift in the mass of the former, when embedded in nuclei, means it can no longer decay into the latter. . . . It still amazes me when I think about it. The existence of complex matter, the periodic table, everything we see, from distant stars to the keyboard I am typing this on - - - hinges on such a remarkable coincidence. Why? Is it an accident, or do the laws of physics require it for some unknown

reason?" (201)

We believe that this "remarkable coincidence" is not an accident, and that the laws of physics do indeed require it because those laws have been designed - - - by a designer - - - in such a manner that it be so.

A further 'coincidence' without which the universe as we experience it could not exist is the aspect of the universe which physicists refer to as the "Higgs field." You may recall from 2012 the excited announcement made by the scientists doing particle smashing experiments at the Large Hadron Collider in Switzerland that they had found evidence for the existence of the Higgs boson, the manifestation of the Higgs field in particle form. In her lively and entertaining book, *The End of Everything (Astrophysically Speaking),* astrophysicist Katie Mack comments on the significance of the Higgs field having the value that it does:

> "The Higgs field not only gives particles the ability to have mass, it also determines several of the fundamental constants of nature, like the charge of the electron, or the masses of particles. The particular physical state we live in, with the Higgs field nicely situated where it is, is referred to as our "Higgs vacuum" or "vacuum state." If the Higgs field had some other value . . . we might not be able to exist at all. We enjoy a universe in which *the masses and charges of particles are perfectly set* (emphasis added) to allow them to come together in molecules, form structures, and carry out the chemical processes of life. If the field took some other value, this delicate balance might be off, potentially making these bonds impossible. We owe our entire corporeal existence to the fact that the Higgs has settled on the value it has." (202)

We submit that these established facts, taken in their totality, are evidence which strongly suggests that the universe has been deliberately designed to fulfill a particular purpose, and that if there is design, then *ipso facto*, there must be a Designer. We believe that this assemblage of facts cannot be satisfactorily explained away as the product of mere coincidence, and that this evidence, when considered objectively, supports the claim of the Traditionalist school that the existence of the universe is the result of the efforts of a Creative Intelligence.

There is an assumption embedded in this claim of the Traditionalists that the creation of lifeforms is the ultimate goal of the Creative Intelligence which is responsible for the existence of the universe. The theology of the Game of Being accepts this assumption. Lifeforms provide the Creator with the greatest range of potential experiences, which is the purpose for which the Game of Being was created. On planet Earth human beings provide the Creator with the greatest range of experiences of all of the lifeforms present, and for that reason, in spite of all our imperfections (and maybe because of them), the experience of being human is highly valued by God. When humans disappear from the Field of Play, as inevitably we must, God will lament our passing, even while accepting it must be so.

The universe seems to have been designed in such a manner so as to be primed for the appearance of lifeforms. Certain complex molecules, thought to be the precursors of life, have been discovered in the clouds of gas that inhabit the vast spaces between the stars in our galaxy. The telltale signatures of some of these same molecules have also been discovered in the light from distant galaxies. It is thought that these molecules may have been brought to Earth by comets and/or asteroids, and jump-started the complex chemical reactions that were necessary for life to establish itself. If this is true, it means that planets throughout the galaxy, and we now suspect that there are billions of them, may have been similarly seeded with these complex molecules, and that life may

have taken hold wherever suitable conditions were to be found. Thus the universe appears to have been designed to prioritize life.

Let us now examine the belief system of the school of Science in regard to the existence of the universe. How does this school of thought account for the facts about the universe which we have just examined? Does Science have an explanation for the multifarious 'coincidences' upon which the existence of the universe and the appearance of lifeforms within it depends?

To begin, we must consider why a majority of the scientific community have rejected the idea of an Intelligent Creator and embraced atheism. This is a relatively recent development, and was not always the case. Isaac Newton, for example, was a very devout Christian. We believe that there are two primary factors which have contributed to this historical development. The first of these is connected to the refusal of some members of the Traditionalist school to accept the empirically based findings of Science, where those findings contradict the written accounts of the history of the universe contained in the so-called 'sacred' texts which the Traditionalists rely upon to understand the nature of being. Science has demonstrated that many of those accounts cannot possibly be factually accurate, and so members of the scientific community, who pride themselves on their rationality, simply cannot associate themselves with people who insist on indulging in what are clearly irrational sets of beliefs. Since the idea of an Intelligent Creator being responsible for the existence of the universe has historically been intricately bound up with those irrational beliefs, Science has, by and large, rejected the entire package as being irrational and lacking in evidence.

The second factor contributing to Science's rejection of the idea of an Intelligent Creator is the terrible role that religion has played in the history of humanity. Unspeakable atrocities have been carried out in the name of God, not just occasionally, but throughout history. As Steven Pinker notes:

"The history of religion shows that God has

> commanded people to do all manner of selfish and cruel acts: massacre Midianites and abduct their women, stone prostitutes, execute homosexuals, burn witches, slay heretics and infidels, throw Protestants out of windows, withhold medicine from dying children, shoot up abortion clinics, hunt down Salman Rushdie, blow themselves up in marketplaces, and crash airplanes into skyscrapers. Recall that even Hitler thought he was carrying out the will of God. The recurrence of evil acts committed in the name of God shows that they are not random perversions. An omnipotent authority that no one can see is a useful backer for malevolent leaders hoping to enlist holy warriors. And since unverifiable beliefs have to be passed along from parents and peers rather than discovered in the world, they differ from group to group and become divisive identity badges." (203)

Science looks at the record of wreckage that the various beliefs in the idea of an Intelligent Creator have left behind in their wake, and has concluded that this idea has been a profoundly destructive force in the history of human civilization, and should be abandoned. It is a good argument. However, we submit that it is not the concept of God itself that is the problem; rather, it is the historical interpretation of that concept to date that has been flawed. We believe that Science has thrown out the baby with the bathwater.

So how does Science explain all those 'coincidences' upon which the existence of the universe as we know it depends, which Science itself has discovered? Science's explanation for those coincidences is the notion of the 'multiverse', which is just now, through the medium of comic books and movies, becoming widespread in the zeitgeist.

According to Lord Martin Rees the basic idea of the multiverse "is that our Big Bang may not have been the only one. [In this scenario many] separate universes [have been created and] may have cooled down differently, ending up governed by different laws and defined by different numbers." (204) Some cosmologists have suggested that there might be an infinite number of such alternate universes in the multiverse, in which case it is inevitable that at least one universe governed by the laws and defined by the numbers which apply to our universe would appear. Rees himself admits that the invocation of multiple universes as an explanation for the coincidences which are fundamental to the operation of our universe is "extravagant", and is contrary to the rule suggested by the application of Occam's Razor which states: "Entities should not be multiplied beyond necessity;" in other words, out of an array of possibilities the most simple solution to a problem will most often be the one which is correct.

Furthermore, it is based on what is a purely human notion: the idea of the infinite. Infinity only applies to human-derived ideas, such as the number line. No matter how large (or small) a number a person can imagine, there is always a number which is greater (or lesser) than the original number imagined. It has also been demonstrated that there are an infinite number of possible ways to arrange the notes of a musical melody. These things are inventions of the human mind. But there is no phenomenological aspect of our physical universe which is truly infinite. According to Newton, the 'force' of gravity is infinite in range, but we have demonstrated that that assumption is invalid. There are an estimated two trillion galaxies, trillions of stars, probably many more trillions of planets and moons; there are an estimated 10^80 particles in the observable universe. These are all very large numbers, larger than our minds can ever possibly encompass, but in each case the number of items in each category is finite and in theory, measurable. The invention of an infinite multiverse to explain the fundamental characteristics of our universe runs counter to what we observe in our universe, and thus stands on

shaky metaphysical ground.

At the same time however, we must admit that the Game of Being theology and metaphysics both rely to a certain extent on an invocation of the infinite. We hold that the Mind of God is infinite in extent, and that the Big Bang singularity was infinitely dense. In neither case do we claim to be able to imagine what those terms mean. But neither of these two propositions is a phenomenological aspect of our universe; as with the number line, they are both pure products of the human mind. As with the idea of a multiverse, in both cases we are imagining something which is 'outside' our universe: the realm of the Mind of God is outside the space-time of our universe, and the Big Bang singularity is outside of our universe in time, having been a state of being which occurred prior to the creation of the Field of Play.

The metaphysics of the Game of Being and the idea of the multiverse also share a similar flaw: neither supplies a truly satisfactory answer to the question of what was the cause of which they are the effect. In other words, what came before God, and where did the original universe that gave rise to the multiverse come from? The Traditionalist school answers this question by saying that God is eternal, and has always been. Science answers the question with the equally mysterious idea that each universe of the multiverse is birthed via a so-called 'quantum fluctuation'.

The Game of Being metaphysics does however have three advantages over the idea of the multiverse. First, the other universes in the multiverse can never, by definition, be observed, anymore than the realm of the infinite Mind of God can be observed, since they are outside of our universe. But according to the metaphysics of the Game of Being, the Mind of God can be observed since, by definition, all the objects within our universe are the Mind of God made manifest in some finite form.

Second, in the metaphysics of the Game of Being the general picture of how the universe came to be can be explained in terms to which humans can relate. Bearing in mind the assumption that the ultimate goal of the Game of Being is to produce lifeforms,

the creation and operation of the universe can be understood as the erection and operation of a manufacturing facility, a factory.

To begin with, one draws up a set of blueprints for the factory. This is analogous to the Creator establishing the Rules of the Game. Then the builder brings together the raw materials from which the factory is to be constructed. The Creator's raw material was the immaterial Mind of God. Then the foundations of the factory are poured. God created the foundation of the Field of Play by forming the raw material (a portion of the immaterial Mind of God) into the necessary condition (the state of being modern cosmology calls the Big Bang). Then the walls and roof of the factory are constructed. The factory which we call the 'bubble of space-time,' aka the Field of Play, was constructed through the Cosmic Inflation event. After the construction of the factory has been completed, the machines required for the manufacturing process are placed inside. Over a long period of time, the element-making machines we call stars were built up and put in place within the Field of Play, that is, within the 'factory' walls. These star machines, once assembled, went into production mode and over a period of billions of earth-years produced the elements which in turn gave rise to lifeforms in at least one location within the Field of Play. It may not be a very efficient process. The creation of lifeforms is contingent on many factors and is not easily achieved, not even for an architect possessing the powers of God. But although humans have not yet found evidence that lifeforms do indeed exist elsewhere within the Field of Play, and may never do so, it seems to us to be unreasonable to assume, given that the universe appears to have been designed so as to prioritize the creation of lifeforms, that over the vast spans of time in which the universe has existed that lifeforms have made an appearance in only one single location within the Field of Play, and we may assume that God feels these scattered appearances of life, spread across the cosmos in space and time, to be worth the effort that was required to set the Game in motion.

Thus the Game of Being metaphysics provides humans with

a clear logical picture of how the universe came into being to which they can relate. Viewed objectively 'from the outside,' the structure and the functioning of the universe bear all the hallmarks of a planned and deliberately thought-out process which proceeded in a step-by-step manner, over mind-blowingly long periods of time, towards the manufacture of a specific product - - - lifeforms. On the other hand, the school of Science's explanation for the birth of the universe: that it is the result of a 'quantum fluctuation' is, in comparison, a barren term of art which even the physicists who employ it do not pretend to fully understand.

The third advantage which the Game of Being metaphysics has over the multiverse idea is that it provides a built-in sense of purpose to human existence. It provides a simple answer to the question of why are we here. Humans are here so that God may have the experience of being human. Some members of the atheistic School of Science may have trouble accepting this conclusion. Several generations of them have been taught that the universe is nothing more than mere particles in motion, a purposeless mechanism, and that there is no answer to the question of why it exists.

> " 'The more the universe seems comprehensible,' writes Steven Weinberg, 'the more it seems pointless.' 'Man,' says Jacques Monod, 'lives on the boundary of an alien world. A world that is deaf to his music, just as indifferent to his sufferings or his crimes.' 'Life,' comments Gerald Feinberg, appears simply as a 'disease of matter.' The sense that modern physics has presented us with a view of nature that is bereft of human meaning or purpose seems remarkably pervasive in the community of physicists." (205)

In his book, *The Greatest Story Ever Told - - - So Far,* the eminent theoretical physicist and noted atheist Lawrence M. Krauss

writes ". . . the universe doesn't give a damn what we would like or whether we survive." (206) On this point we are quite certain that Dr. Krauss is confused. Like most of us, we expect that Dr. Krauss has family, friends, and colleagues. We assume that these individuals care very much about what Dr. Krauss would like or whether or not he survives. Those persons are manifestations of the universe in every way, every bit as much as a star or the Higgs field (the topic Krauss was discussing when he made those remarks). The farmers that grow his food, the cashier who serves him at the grocery store, the mechanic who repairs his car; all of these people and others are how the universe works to meet his needs. The people in Dr. Krauss' life are the universe's way of caring about him. The universe cares about you, Lawrence. It truly does. You can count on it. And so, my dear readers. can each of you.

In his book, *In the Beginning,* John Gribbin argues that the multiverse as a whole should be considered to be a living entity, and that the appearance of our universe is a result of the evolution of the multiverse. In Gribbin's view the 'purpose' of the multiverse is to produce baby universes, and the appearance of lifeforms is a mere incidental by-product of this greater process. Unfortunately for this theory, it rests entirely on a flawed understanding of the phenomenon of so-called black holes. Gribbin notes that the theoretical physicist Lee Smolin has suggested:

> " . . . that every time a black hole collapses into a singularity and a new baby universe is formed, the basic laws of physics are altered slightly as spacetime itself is crushed out of existence and reshaped. The process is analogous (perhaps more than analogous) to the way mutations provide the variability among organic lifeforms on which natural selection can operate. Each baby universe is . . . not a perfect replica of its parent, but a slightly mutated form." (207)

Gribbin then goes on to expand on this idea:

> "Each universe starts from its own big bang, but all the universes are interconnected in complex ways by black hole 'umbilical cords', and closely related universes share the 'genetic' influence of a similar set of physical laws." (208)

But we have suggested that there is a much simpler and much more likely explanation for the black hole phenomenon; an explanation that does not rely on the notion of 'singularities' and which cannot give birth to baby universes. As we have previously discussed, in our view a 'black hole' appears when a star of sufficient mass collapses to form a neutron star so massive that its presence stresses the space-time in its immediate vicinity to such a degree that that region of space-time loses its flexibility, and due to its rigidity will not allow electromagnetic waves to travel through it, and so, in the complete absence of light, the neutron star appears to be black. So there are no singularities, no black hole umbilical cords, no baby universes, and thus there is not even any viable theoretical underpinnings for the idea of an evolving multiverse, let alone any actual empirical evidence.

Given the fact that there can never be, in principle, any empirical evidence for the existence of the multiverse - - - since any other universes would exist outside our universe and hence would be beyond the limits of observation - - - the idea of the multiverse must be taken to be for what it actually is: a metaphysical attempt by atheistic Science to explain away the 'coincidences' evident in the universe without which lifeforms could not exist, and so to provide an alternative to the idea that our universe is the handiwork of a creative intelligent purposeful Designer. In its unstinting bias against the notion of a Creator, atheistic Science clings to the idea of the multiverse in much the

same manner in which fundamentalists of the Traditionalist School cling to their opposition to the idea of natural selection. Atheistic Science does not accept the Traditionalist School's beliefs concerning *why* the universe exists, and the Traditionalists do not accept Science's explanation for *how* the universe exists. In this sense the two groups are talking past one another. A major goal of this book is to resolve this impasse.

The jaundiced view of lifeforms held by some members of the School of Science, as noted earlier, have had a deleterious effect on the human psyche and on human societies. Although the total number of the supporters of the Traditionalist School world-wide are yet greater than the total number of the adherents of the School of Science, what Science claims is still hugely influential. Statements made by adherents of Science which claim that the universe is pointless, or that life is a disease of matter or an incidental by-product of the universe, cause real damage to individuals and to society-at-large. Such statements rob humans of their purpose and the sense that we are all part of something greater than ourselves. Bereft of a unifying sense of purpose, societies splinter into ever more fractious identity-politic groups, and individuals engage in destructive and self-destructive behaviour because 'nothing matters.'

These caustic views are based in no small part on the history of human civilization over the past 100-plus years. The self-portrait painted by humans over this period has not produced a pretty picture. With the enhanced power of technological advances, the human proclivity for violence and savagery continues to bedevil us right up to this very moment. But the solution to our collective predicament - - - and there are solutions - - - is not to write humans off as a disease or an accident. Such attitudes only contribute to the problem.

Science is humanity's last, best hope. It is incumbent upon the leaders of the School of Science to celebrate humans for what we are and for what we have the potential to be. Humans are, as far as we know, the most amazing, most creative manifestations in

the known universe, possessors of an Awareness Connectivity System which is unrivalled by that of any other known lifeform. Because of that, humans are precious to, and highly valued by, the Creator. It is the responsibility of Science, as the rising paradigm in human civilization, to teach humanity this lesson. Science can, and must, do better. If the impasse between the School of Science and the School of the Traditionalists is to be overcome, it will be necessary for the belief system of Science regarding the creation of the universe to evolve, and to embrace the notion of intelligent design.

At the same time it will be necessary for the adherents of the various branches of the Traditionalist School to free themselves from the grip of the religious dogma of the past, and to embrace the evidence-based explanations which Science has provided regarding how the universe came to be and how lifeforms have evolved. It might seem difficult for the followers of the traditional religious belief systems to let go of those beliefs and to embrace the teaching of the Game of Being, which seeks to forge a union between the schools of Science and the Traditionalists. But humans have made such spiritual transitions before. Each of the religious belief systems which collectively dominate human civilization today was at some point in the past 'the new kid on the block,' supplanting the belief system that was then current in their region, gradually spreading further afield. In every case the new belief system took hold because it provided a more satisfying understanding of the nature of God and a more profound explanation for the nature of being. For those people who are reluctant to move on from the old ways, perhaps these words from Hermann Hesse will be of some comfort:

> “Beauty, even surpassing beauty, is perishable like all other things, as soon as it has become a historical phenomenon upon this earth. We know that and can grieve that it is so, but cannot seriously try to change it, for it is unalterable

law." (209)

The rule that all beginnings must have an ending applies to all things, including systems of religious belief. It is time for humanity to move beyond the archaic and antiquated notions of the nature of God of the past; these notions no longer meet the needs of our species. Now, more than ever, humanity needs an understanding of the nature of God which will not continue to divide us, but will draw us together, united in the belief that we are all connected to one another by virtue of each of us being a direct manifestation of the Mind of God, the one source of all being in the universe. The lessons of history make it abundantly clear that the existing traditional belief systems, and the traditional monotheistic theologies in particular, cannot accomplish this task. One is based on a largely fictional history composed of fables and legends, folk tales and tall tales, and on the claim that only its followers can have an exclusive relationship with God. The appeal of the second relies upon what is clearly and obviously magical thinking. The founding doctrine of the third repeatedly directs it adherents to shun and even to murder those humans who do not accept its teachings. These belief systems need to be discarded, and placed into the dust bin of history.

Now, more than ever, humanity needs a theological belief system which does not mindlessly reject fact-based knowledge because it is contrary to the writings of men from twenty-five hundred years ago, who were utterly ignorant of even the concept of Science. The teachings of the Game of Being theology and metaphysics can meet this need. These teachings meet this need in four main ways:

1. The Game of Being teachings provide an answer to the question of why the universe exists. Why is there something, rather than nothing? The Game of Being teaches that the material universe exists because God, who is Pure Consciousness and is therefore immaterial,

unchanging, eternal and infinite, wished to experience material being, and to thereby experience change, beginnings and endings, and the finite.

2. The Game of Being teachings provide an answer to the question of why we humans are here. It teaches that all material objects in the universe are direct manifestations of the Mind of God. Therefore we are here so that God may have the experience of being human.
3. The Game of Being teachings assume that in the creation of the Game God did so in the pursuit of happiness, and that God loves all the manifestations of the Game. Since humans are direct manifestations of the Mind of God, these assumptions provide humans with a logical rationale for why we should love one another, and why we should devote our lives to seeking happiness for ourselves and for others.
4. The creation myth of the Game of Being reflects current human understanding of how the universe came to be.

When the Creator created the Field of Play, it was, by definition - - - since it was an act of God - - - a miraculous event. Because God lacks the capability to intervene in the unfolding events of which the Game consists, there have been no fresh miracles since then. However, that original miracle of creation has yet to be completed; it is ongoing and will not be completed until the inevitable ending of this episode of the Game of Being. This means that each and every one of all the events which have occurred in the Game since the creation of the Field of Play are part and parcel of that original miracle. This means, my friends, that your individual appearance within the Field of Play, and the appearance of all the other events - - - all the people, places, and things - - - that contribute to the totality of your existence, are miraculous events.

The writer of folktales and fables, Aesop, commented in the story, *The Fox and the Lion,* that "familiarity breeds contempt." While it is not true that humans are always contemptuous of those

with whom they are familiar, this saying hints at a deeper problem that is an unfortunate characteristic of the experience of being human. Very early in life young humans begin to take the miracle of being for granted. All too soon we lose our sense of wonder of the world. This insidious process begins when we learn our first words. As we have previously noted, the naming of a thing places a filter, a barrier, between ourselves and our direct experience of that thing. Little by little, as our vocabulary grows, we come to take more and more of the world and the things that inhabit it for granted. As we age the world loses its 'awesomeness' and becomes ordinary. Soon our experience of the extraordinary nature of being becomes so rare that when it does occur we have a particular word to describe the experience: in those moments we are said to be 'awe-struck.' At such times we are often unable to put into words the precise nature of the experience we are having. There is a reason for this: in that moment, words simply get in the way; in that moment we return to our child-like wonder at the miracle of the existence of the world, we briefly return to the time before language came to dominate our interactions with the other miraculous manifestations of the universe which surround us.

When people think about 'the universe' they often think in terms of stars, other planets, space, things that are not part of their normal everyday experience. Because we quickly become habituated to the presence of buildings, vehicles, trees, birds, humans, and all the other objects that daily surround us, we tend to forget that each of these things is, like stars and planets, a part of the universe, and is therefore a wondrous manifestation. The reason we say the Song of Being three times each day is to provide us with regular reminders of this fact, so that for a brief moment we stop taking the world for granted and gaze upon it once again, child-like, in wonder and astonishment.

Chapter Thirty-three

END TIMES: THE UNCREATION

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At the end of the previous chapter we made a statement regarding "the inevitable ending of this episode of the Game of Being," and over the course of this book we have mentioned repeatedly what we believe to be a fundamental rule of the Game, ordained by the Creator: "All beginnings must have an ending." If this rule applies to all the manifestations that make an appearance within the Field of Play, to be absolute, it must eventually apply to the Field of Play itself. This is hardly a new idea. The idea of the 'End Times' has been around for many centuries and its study is known as 'eschatology.'

The eschatological notions of the three traditional monotheistic religions all revolve around some variation on the theme that at some point God will bring about the end of the world, and will sit in judgment on the living and the dead, rewarding the just and punishing the wicked. This idea rests ultimately on the all-too-human desire for revenge; to see evil people who escaped punishment in this life eventually punished for their sinful ways.

The Game of Being teachings completely reject these ideas. We have demonstrated logically that a loving God lacks the capacity to intervene in the ongoing events which comprise the

Game, and therefore cannot act to bring about the end of the Game. Furthermore, God accepts all the events which take place in the Game, no matter how wicked they may be by human standards, because God knows that within the Game the inevitable always happens; and therefore God does not judge human behaviour as just or unjust because each instance of human behaviour, whether it be for good or for evil, is inevitable. God does not judge. God simply accepts, and loves.

The Hindu religion, in keeping with their belief in reincarnation, posits that the world will never come to an end but will forever be reborn in endless cycles of being. As we shall see, these ideas are not altogether dissimilar to the metaphysics of the Game of Being. As for the Buddhists, the original teachings of the Buddha did not deal with matters eschatological. The Buddha's emphasis was on the acquisition of the skills necessary to enter into Nirvana within one's current life.

As for the School of Science, some of its members have developed a keen interest in the topic of eschatology. Since arriving at the conclusion that the universe had a beginning in time (the Big Bang theory), cosmologists have, quite correctly in our view, delved into the question of whether or not the universe will eventually come to an end. Since the universe had a birth, will it not inevitably have a death?

Cosmologists have developed a number of theories as to how the universe might come to an end. In her book, from which we have previously quoted, astrophysicist Katie Mack describes the latest theories in some detail. According to Mack, there are currently five possibilities under consideration. They are known by the colourful names of the Big Crunch, Heat Death, the Big Rip, Bounce, and Vacuum Decay.

The Big Crunch theory is based upon the idea that the gravitational force exerted by all material bodies upon all other material bodies in the universe will eventually halt the expansion of the universe and bring about a contraction. In this scenario all the galaxies will move ever-closer together, and eventually all the stars,

planets, and moons will crash together into a single (infinitely?) dense point in a Big Crunch. This idea, which was once thought to be a real possibility, has recently fallen out of favour. For it to be possible, it was expected that the rate of expansion of the universe would show evidence of slowing down. However, cosmologists are currently labouring under the misconception that the rate of expansion of the universe is actually increasing, so the idea of a Big Crunch ending to the universe has been discounted. But we say that the Big Crunch was never a real possibility, not because the rate of expansion of the universe is increasing (the universe is not expanding,) but because the 'force' of gravity (it isn't a force) is not infinite but is localized and quite finite, and that therefore all the material bodies in the universe are not 'pulling' on all the other material bodies in the universe in the first place.

The next two theoretical descriptions of how the universe might come to an end, Heat Death and the Big Rip, are variations upon a single theme. They both rely on cosmology's current most favourite fantasy, our old friend 'dark energy.' You will recall that dark energy is cosmology's explanation for the apparent expansion of the universe. In the Heat Death scenario dark energy, which for some mysterious and unexplained reason operates only in the voids between galaxies but not in the space within galaxies, will drive galaxies ever-further apart ever-more rapidly, until each galaxy is completely isolated in space, unable to view or be viewed by any other galaxy. Then, according to Mack, after all the stars have died out - - - that's the cause of the Heat Death - - - and after the passage of many billions of years, proton decay will commence leading to the disintegration of all matter, and eventually all the black holes in the universe will 'evaporate,' leaving a completely empty so-called 'de Sitter space' which will continue to expand forever.

While this theory is correct in one respect, we believe that its other details are mistaken. The 'galaxy isolation' part of the Heat Death theory is erroneous, based as it is on the misconception that the universe is expanding. However, the 'Heat Death'

component of the theory, which is based upon a process completely different from any supposed expansion, will, as we shall see, play a significant role in bringing this episode of the Game of Being to a close. Other problems with this theory arise from its invocation of proton decay and black hole evaporation. The decay of a proton has never been observed, and there is no reliable evidence to support the notion that protons will, all on their own, as a matter of course, begin to spontaneously decay. As for the idea that black holes will eventually evaporate, we may trace this notion to the fertile mathematical imagination of Stephen Hawking, whose basic understanding of the phenomenon of black holes was simply mistaken. Black holes are actually massive neutron stars, and they will not 'evaporate' away on their own. Another problem with the Heat Death theory as laid out in Mack's book is that at the end we are left with so-called de Sitter space. According to the metaphysics of the Game of Being, all beginnings must have an ending. In order to comply with this rule not only must all matter be erased, but the existence of space-time itself must at some point also come to an end.

The Big Rip theory of the end of the universe is the Heat Death theory on steroids. This theory also rests fundamentally on the mistaken conclusion that the universe is currently expanding, but in this case the dark energy responsible for the expansion, called in this theory 'phantom' dark energy, instead of being constant over time as in the Heat Death theory, will increase in strength over billions of years, not only destroying galaxies but eventually becoming so powerful that it will tear atoms asunder, and "at the final instant, the fabric of space itself is ripped apart." (210) So by destroying everything, including space itself, the Big Rip theory would at least comply with the requirement that all beginnings must have an ending. But its reliance on the concept of dark energy means that it is fundamentally flawed. Because the universe is not in fact expanding, the entire concept of dark energy, phantom or otherwise, is completely extraneous.

We turn now, briefly, to a set of how-the-universe-will-end

theories known collectively as Bounce. Metaphysically, these theories resemble the Hindu belief in a cyclical universe of constant death and rebirth over immense periods of time. The basis of these theories has evolved over time. Originally, the prod for these theories was cosmologists' conviction that there must be a flaw somewhere in Einstein's theory of gravity. This conviction arose from their inability to mathematically combine the General Theory of Relativity with the theory of Quantum Mechanics, and their inability to explain why the force of gravity is so weak compared to the other three basic forces of nature. News Flash to cosmologists: Einstein's General Theory of Relativity contains no flaws, and gravity is not a 'force.' Cosmology's search for a solution to these two problems, which are 'problems' which do not actually exist, led to the idea of the existence of extra dimensions of space into which gravity might be leaking, thus explaining its weakness. This notion led to the proposal that our universe is actually a membrane called a '3D brane,' which exists in a higher dimensional space which we humans cannot perceive called the 'bulk.' According to this theory other 3D branes exist in the bulk, and occasional collisions between those branes and our brane result in the death and rebirth of our own universe. Variations on this theme go on from there but our exploration of them will not. There is absolutely zero empirical evidence to support any of these ideas. None of them provide an explanation for why our universe, the one we know actually does exist, contains the 'coincidences' it does which are necessary to the emergence of lifeforms. And yet modern cosmology continues to deride the idea of intelligent design as fanciful superstition and an appeal to the "supernatural." If invisible extra dimensions are not "supernatural," then what is?

We turn now, finally, to the how-the-universe-will-end theory known to cosmologists as 'vacuum decay.' According to astrophysicist Katie Mack, "The whole idea of vacuum decay rests on the hypothesis that our universe has *a kind of fatal instability built into it* (emphasis added)." (211) We believe that in this respect, the vacuum decay idea provides the mechanism required to

fulfill the Creator's dictate that all beginnings must have an ending, and it means that the means to that end have been contained within the universe from its very beginning, as is only logical, awaiting the moment when the conditions within the Field of Play are such that this mechanism will be activated. However, as we shall see, the vacuum decay theory as currently conceived does not, in the end, satisfy the requirements of this dictate.

The theory of vacuum decay involves the notion of the Higgs field. We have encountered the Higgs field earlier, where we noted that the particular value it is said to possess is one of the coincidences critical to the structure and functioning of the universe as we know it. According to the Standard Model of particle physics there are a range of values which the Higgs field might possess. This range of values is referred to as the 'potential' of the Higgs field. The value of the Higgs field potential at any given point in time is determined by the so-called vacuum state of the universe. Mack writes:

> "Wherever the Higgs field is now in its potential, it's given us a perfectly livable, comfortable universe. We have constants of nature that are nicely compatible with bound particles and solid, life-compatible structures. If another state is possible, lower down the potential, all that is at risk. . . .
>
> "Unfortunately, the best data we have, consistent with every measurement of the Standard Model of particle physics, suggests that our Higgs field is currently clinging onto [a vacuum state] known as a "false vacuum," as opposed to the "true" vacuum. . . .
>
> "What's wrong with being in a false vacuum? Quite possibly, everything. A false vacuum is at best a temporary reprieve from ultimate destruction. In a false vacuum, the laws

> of physics, including the ability of particles to exist at all, are contingent on a precarious balancing act that could be upset at any moment.
>
> "When this happens, it's called vacuum decay. It's quick, clean, painless, and capable of destroying absolutely everything." (212)

Mack goes on to note that some kind of trigger will be necessary to induce vacuum decay, and it is at this point that our theory of how the universe will end departs from the cosmological model of vacuum decay described by Mack. She suggests an ultra-high-energy explosion, or a catastrophic final evaporation of a black hole, or a quantum tunnelling event as potential triggers. According to the theory, any one of these events could conceivably result in the formation of a tiny bubble of "true" vacuum. "This bubble contains within it a drastically different kind of space - - - one in which the processes of physics follow different laws, and the particles of nature are rearranged." (213) This bubble, once created, would then expand at the speed of light, engulfing and destroying everything with which it comes into contact.

We have several objections to this model. First and foremost, it fails to satisfy the rule that all beginnings must have an ending. Admittedly, our current universe is destroyed in this process, but it is less of an ending and more of an evolutionary process. Space-time as we know it disappears, but is replaced by a "different kind of space" with different laws of physics and a rearrangement of particles. Perhaps the "Higgs field" in this new space would settle into a new potential, a new false vacuum, remain stable for a period of time during which this new universe could develop as ours has, only to eventually be dislodged once again, renewing the entire process. Perhaps there is no "true" vacuum state, just an endless series of "false" vacuums. If that is the case, this vacuum decay model belongs with the evolutionary multiverse or the Bounce theories of the end-of-the-universe theories which describe a cyclical process of birth and death of

universes, in which each new universe arises as a direct result of the destruction of the universe which preceded it.

But this model's failure to strictly and completely obey the rule that all beginnings must have an ending is not the only reason we reject its formulations. We believe that its reliance on extraordinary events to act as potential triggers also makes it suspect.

To the best of our current knowledge the most powerful explosions which can happen in the universe are the result of a star going supernova. There is no known mechanism, real or currently imagined, which could produce an ultra-high-energy explosion more powerful than the violent deaths of massive stars. A supernova occurs somewhere in the universe on an almost daily basis; if a powerful explosion were capable of dislodging the Higgs field potential from its present value and thus creating a tiny bubble of “true” vacuum, it should have happened long ago. Since it hasn't, (if it had we obviously would not be here to talk about it) we can safely discount this possibility.

Mack's second suggestion for a vacuum decay trigger event is the evaporation of a black hole. This possibility can also be ruled out. As we have previously explained, black holes are not some magical region of space-time where the laws of physics do not apply. Black holes are massive neutron stars surrounded by regions of space which have been stretched so tight by the gravitational field of the neutron star that it can no longer vibrate and hence cannot permit the passage of light, and they do not evaporate.

Mack's third possible trigger for vacuum decay is the idea of quantum tunnelling. This is where things get interesting. Quantum tunnelling is the phenomenon where a quantum particle, say, an electron, passes from one side of an impenetrable barrier to the other side, seemingly tunnelling through a solid object. This astounding behaviour is, apparently, well-documented. Let's assume, for the sake of argument, that this understanding of this phenomenon is accurate. Mack describes the consequences of this

idea as follows:

> "Letting electrons sneak across short gaps or squeeze through insulating barriers is a nice party trick, but it gets significantly more ominous when you realize that quantum tunnelling can be performed not only by particles, but also by fields. Fields like the Higgs, separated from that big true-vacuum valley by a potential barrier it can tunnel right through." (214)

Wait a minute. Okay, so physicists have made observations which reveal that electrons can tunnel unimpeded through solid objects. And 'fields' are also capable of performing this stunt. Okay. Now, the Higgs field is an energy (?) field which permeates the entire universe, endowing particles with mass. Okay. What, exactly, is the "barrier" that the Higgs field might someday tunnel through? What is it made of? Where can it be found? The barrier through which an electron supposedly tunnels is a real, solid object of some sort. What is the barrier which is currently containing the Higgs field? In Mack's book there is a diagram showing the Higgs field tunnelling through a line on a graph that has a hump in it, demonstrating the Higgs field potential falling from its current "false" vacuum value to a lower "true" vacuum value. Vacuum decay. But of course the diagram is just a mathematical representation. Oh. But what is it that the mathematics supposedly represents? Does such a barrier have an actual physical existence? If it does, where is it? If it doesn't, how can it prevent the Higgs field, which presumably is physically manifest at all points in the universe, from taking on any particular value it pleases? This line of questioning leads ineluctably to this question: does the Higgs field itself actually physically exist in the universe? Or is it merely a mathematical mirage, like the mathematical manipulations of the equations of Einstein's General Theory of Relativity which supposedly describe and provide the explanation for black holes?

Katie Mack's own comments are instructive here:

> ". . . we already have a puzzle on the table: the nature of the Higgs field, and its (and our) fate. The data we've already obtained, and are working to analyze, could *begin* (emphasis added) to trace out the nature of the Higgs in more detail . . . the Higgs potential is *the mathematical structure* (emphasis added) that determines how the Higgs field evolves . . . But with current theories we have very little handle on what it looks like. Based on our current understanding, its shape depends sensitively on the competing influences of several different hard-to-calculate aspects of the Standard Model . . ." (215)

Okay, back to basics. The universe comprises objects which are physically manifest as space-time or energy-matter. Their interactions and behaviour are not determined by the shape of a mathematical structure on some graph. Their interactions and behaviour are determined by the influences they exert on one another. To exert those influences, the objects must have a manifest presence within the Field of Play. Therefore, if the Higgs field is to perform the trick of quantum tunnelling, then there must exist some manifestation of energy-matter for the Higgs field to tunnel through. If no such manifestation exists, then no Higgs field quantum tunnelling can occur. As far as your author is aware, there is no observational evidence or even any theoretical musings to suggest that some manifestation which could function as a barrier for the Higgs field to tunnel through actually exists.

And as for the idea of the Higgs field itself, what is the evidence for its existence? Is it real? Or is it merely another phantom of the physics opera like black holes, dark energy, and dark matter, all of which disappear with a correct understanding of the nature of space-time. Space-time, eh? Hmmm. It turns out

that the evidence for the existence of a particular specialized entity in the universe which has been named the Higgs field is remarkably thin. It rests upon the mathematical formulations of theoretical physicist Peter Higgs from the 1960's; the Standard Model of particle physics; and the apparent discovery of a quantum particle possessing the predicted (by the mathematics of Peter Higgs and the Standard Model) appropriate theoretical mass by the team of physicists operating the Large Hadron Collider in 2012.

We have learned, repeatedly, that just because a statement is made in a tidy set of mathematical equations does not mean that its conclusions can be trusted to be correct. The Standard Model of particle physics is the theoretical mathematical structure created by physicists over the past few decades to explain the existence of quantum particles and how the forces between them function. It is, by all accounts, an amazing edifice and a staggering accomplishment. According to theoretical physicist Lawrence Krauss, "The mathematical architecture [of the Standard Model] that has resulted is so ornate that it almost seems arbitrary." (216) But in fact some of the elements of the Standard Model are indeed arbitrary. In order for the equations to all fit together properly and make mathematical sense, some of the numbers used in the Standard Model have to be 'put in by hand,' that is, placed into the equations without any experimental or empirical basis for the values stated. Writing about the Standard Model Katie Mack states:

> "We know that it . . . has to be missing some very important pieces. In addition . . . it has some major "tuning problems" - - - places in the model where a parameter has to be set juuuuust right or else everything falls apart." (217)

This does not in itself render the Standard Model meaningless, but it does mean that we should accept conclusions based upon it with, if not a healthy skepticism, then at least a sense

of caution.

What about the 2012 discovery of the Higgs boson at the LHC? It's time for a thought experiment, one which you can easily carry out if you are so inclined.

Imagine that you are standing on a concrete sidewalk facing a ten foot high concrete wall. You have with you a box of six empty glass beer bottles, a broom, a shovel, a garbage can, and a pair of safety goggles. You put on the safety goggles. Taking one of the beer bottles and from a safe distance you throw it gently, underhand, at the concrete wall, You observe that it breaks into a number of pieces, some of them larger than others. With the broom and the shovel you then clean up the glass fragments and dump them in the garbage can. You do this not only because you are a responsible citizen, but also because you want a 'clean slate' for the next part of the experiment. Taking a second bottle in hand, you throw it at the wall, this time with a little more force, and then observe the results. You then shovel up the broken glass and dump it. You repeat this cycle, each time throwing the bottle with a little more force than the time before. By the time you get to the sixth bottle you are throwing it overhand, as hard as you can. As the experiment has progressed you will have noticed, to no great surprise, that the harder you throw the bottles, the more pieces and the smaller are the pieces of glass that end up on the sidewalk. Congratulations! You have just replicated the experimental work done at the Large Hadron Collider. Don't forget to haul away the garbage can of broken beer bottles.

There are, of course, some key differences between our thought experiment and the experiments carried out at the LHC. For one thing, the experiments at the LHC are somewhat more hi-tech. The LHC is the most complex machine humanity has ever assembled. Instead of beer bottles impacting a concrete wall, this machine makes it possible for streams of protons travelling in opposite directions around its 27 kilometre circular tunnel at near light-speed to be brought together in high energy collisions. Amazing technologies have been developed to record the effects of

these collisions, which result in the creation of an array of sub-atomic particles. A second major difference between our thought experiment and the experiments at the LHC is that at the LHC many of the 'pieces of glass' do not hang around for very long after the impact, but quickly decay, in some cases in millionths or billionths of a second. But the essence of our thought experiment and the LHC experiments is the same: smash things together and see what happens.

Now that we understand the basic process, we can ask what is the basis of the evidence for the existence of the Higgs field? The evidence rests upon the discovery of a new elementary particle called the Higgs boson which was announced in 2012. The Higgs boson is thought to be the manifestation of the Higgs field in particle form, with a mass of about 125 times the mass of a proton. At this point the reader may legitimately wonder, how is it possible to smash protons into protons and to create particles that are 125 times as massive as the original protons? After all, if you threw a billion beer bottles at the concrete wall of our thought experiment, it is highly unlikely that you would ever observe the appearance of a piece of glass which is larger and heavier than the original beer bottle as a result of the impact.

The solution to this puzzle is Einstein's famous equation $E = mc^2$, which states that mass and energy are two sides of the same coin. (We shall see that there is another way to interpret this equation, but the standard interpretation will suit our present needs.) Mass can become energy (this is what happens inside the core of a star,) and energy can become mass. Because the protons racing around the 27 kilometre track of the LHC are travelling at close to the speed of light they carry with them an enormous amount of kinetic energy, the energy of motion. When the protons collide some of this kinetic energy is transformed into mass, that is, into sub-atomic particles, most of which quickly decay. Because there is so much energy available at the point of collision, some of the newly-formed particles can possess a mass greater than the mass of the original protons. While most of these newly-formed

particles quickly decay, some of them are present long enough for the detectors in the LHC to record their existence, or in the case of the Higgs boson, for its existence to be *inferred.*

For the thing is, the Higgs boson was not, in itself, directly observed. Lawrence Krauss writes:

> ". . . the particle was discovered by looking precisely at the decay channels that had been predicted for a Standard Model Higgs particle. The relative decays into photons (via intermediate top quarks or W's) versus particles such as electrons (via intermediate Z bosons) *agreed more or less with what was predicted,* (emphasis added) as did the production rate of the new particle in the proton-proton collisions. Of the billions and billions of collisions analyzed by the two detector collaborations up to that point, about fifty potential Higgs candidates had been discovered. Many tests needed to be performed to get a more definitive identification, but if it walked like a Higgs and quacked like a Higgs, it probably was a Higgs." (218)

So what do we have here? We have an unobserved particle whose existence is inferred by the mathematical predictions of "decay channels." Out of billions and billions of collisions we have just 50 examples in which 'the glass' shattered in just the necessary way to suggest that some of the 'pieces of glass' actually observed, came from a very particular sized piece of glass which existed for so short a period of time it could not be directly observed. And as for Krauss's riff on the saying that if something walks like a duck and quacks like a duck it's probably a duck, that saying is useful only if one already has previous knowledge of actual ducks.

Krauss goes on to state:

> "In September 2015 . . . the two large [LHC] detectors ATLAS and CMS combined their data from 2011 and 2012 and presented for the first time a unified comparison of theory and experiment. The result - - - involving a mammoth computational effort to take into account separate systematic effects in each experiment, involving a total of forty-two hundred parameters - - - showed with a residual uncertainty of about 10 percent that the new particle had all the properties for the Standard Model Higgs." (219)

Forty-two hundred mathematical parameters. Some of which, according to Katie Mack, have "to be set juuuuust right or else everything [in the Standard Model] falls apart." *Mathematically* predicted decay channels. No direct observation of an actual Higgs boson. No evidence for the existence of some sort of manifestation for the Higgs field to quantum tunnel through. We submit, to the jury of our readers, that the existence of the Higgs field has not been established beyond a reasonable doubt. And if there is no Higgs field the whole theory of vacuum decay as a potential ending of the universe is left without any basis whatsoever. This possibility poses another question: if a specialized entity (named the Higgs field) does not exist, what is it that confers mass upon quantum particles?

Throughout our discussion we have returned again and again to the concept of immaterial space-time for an explanation of various phenomenological aspects of the universe. We have come to the conclusion that the Creator is a very elegant and economical architect, who has designed, created, and made manifest one single 'state of being' - - - immaterial space-time - - - in such a manner that this single 'state of being' can fulfill a number of different functions in the Game of Being.

Function #1: Immaterial space-time is the Field of Play, the

background medium through which the manifestations of the Mind of God move about, and which permeates and surrounds all the material objects which appear in the Game. Material objects move about the Field of Play by pulling themselves through immaterial space-time as a swimmer pulls themselves through water, thus fulfilling the Creator's mandate that everywhere within the boundary of the Game change shall be unceasing.

Function #2: Immaterial space-time is the parent of matter and antimatter. It is constantly giving birth to tiny perturbations made of itself, what physicists call 'virtual' particles. Generally, these perturbations immediately dissipate back into the body of immaterial space-time, but in those regions of space-time where the necessary conditions exist, that is, where the temperature of the space-time is sufficiently high, such as shortly after the initial creation and expansion of the bubble of space-time, or in the high-energy collisions of particles in the LHC, these perturbations can obtain fleeting or semi-permanent status as material manifestations within the Field of Play.

Function #3: The presence of immaterial space-time provides particles of matter and antimatter with the property known as 'mass' (this is its 'Higgs field' function.)

Function #4: The curvature of immaterial space-time in the presence of matter is responsible for the phenomenon known as 'gravity.'

Function #5: The presence of immaterial space-time makes possible the propagation of electromagnetic radiation (light waves).

Function #6: Under certain conditions immaterial space-time can be formed into a (relatively) impermeable barrier known as 'magnetic fields,' which prevent charged particles emitted by stars from impacting the surfaces of the planets orbiting those stars,

allowing for the possibility for lifeforms to evolve.

Function #7: The shock waves propagating through immaterial space-time created by the fusion of atomic nuclei in the cores of stars produce the pressure which prevent stars from undergoing gravitational collapse.

Function #8: Because immaterial space-time permeates and surrounds all material manifestations in the Game of Being (with the exception of neutron stars which it cannot penetrate), it is able to function as the Creator's 'sensory system,' allowing the Creator to directly experience all that occurs within the Field of Play. Immaterial space-time thus possesses the property of awareness.

Function #9: Because immaterial space-time possesses the property of awareness, it is able to bestow awareness of their environment upon all material manifestations which are equipped with an Awareness Connectivity System, that is, lifeforms.

Function #10: Since immaterial space-time is the Mind of God made manifest, and since the ultimate purpose of the Game of Being is to produce lifeforms, space-time maintains, entirely inherent within itself, the capability to inject the information necessary to facilitate the origin of the cycle of life into any location within the Field of Play, whenever and wherever suitable conditions arise. Moreover, once lifeforms have been established in any particular locale, space-time possesses the ability, limited only by the relevant ecosystem, to gradually guide the evolution of those lifeforms towards ever greater degrees of complexity.

Function #11: The eventual and inevitable dissolution of immaterial space-time will function to bring this episode of the Game of Being to an end, in accordance with the decree of the Creator that in the Game 'all beginnings must have an ending.'

In our discussion of the potential ways in which the

universe might come to end as outlined by Katie Mack, we encountered two aspects of the models presented which we stated will play a part in the ending of this episode of the Game of Being. From the vacuum decay model we learned that, in Mack's words, "our universe has *a kind of fatal instability built into it* (emphasis added)." In agreement with this statement, we have concluded that the Creator built into the very fabric of the Field of Play itself the seeds of its own eventual destruction.

What event will trigger the self-destruction of the Field of Play? We believe it will be what Mack referred to as 'Heat Death.' In the Heat Death model presented by Mack, this event will occur after all the galaxies have become utterly isolated from one another, and all the stars have used up their nuclear fuel and have burned out. Since the universe is not in fact expanding, the first part of this scenario will never happen, but the second part most certainly will. However, the Heat Death which brings about the end of the Game of Being will be an event which is independent of the death of the stars.

We suggest that the final destruction of the Field of Play will begin when the temperature of some region of the bubble of space-time falls to absolute zero, the temperature of the Realm of the Mind of God. When this happens the space-time in that region will . . . . will what? It turns out that we don't have a ready-made word to describe what will happen next, because the end of space-time will be an unprecedented event. To say that space-time will "dissolve," "evaporate," or "melt" all imply a change of state of matter from one state of being into another. None of these descriptions apply because one, space-time is not matter but is immaterial, and two, because the Heat Death of space-time and all the matter which it contains will not result in changed matter, but in no matter at all. The word "disintegration" suggests the collapse of some larger object into its smaller constituent parts, but the Heat Death of space-time and the matter contained within it will result in no parts. Because this Heat Death is associated with a lowering of the temperature of space-time, one might think that space-time

might “freeze” and then “shatter.” But this too implies that some number of smaller pieces would be the result of this process. How about “unravel?” But if a knitted sweater unravels we are left with a pile of yarn. We could resort to saying simply that space-time will “disappear.” But the law of the conservation of matter states that matter can be neither created nor destroyed, so under normal circumstances objects contained within the Field of Play never actually completely disappear. They may change their position in space-time. The keys you thought you left on the counter top which have inexplicably “disappeared” will eventually show up somewhere else, perhaps in the pocket of your jacket. Or objects can change their form. The law of the conservation of energy allows things to change form, but the energy cannot entirely disappear as long as it is situated within the Field of Play. So when the logs in your fireplace have burnt up, they have not really disappeared; they have simply changed their form from a piece of wood to a pile of ashes and molecules of gas, giving off heat and light in the process.

But when the temperature of a region of the Field of Play (a given volume of space-time) falls to absolute zero, it will cease to be a portion of the Field of Play and will revert to a state of being un-manifest. At absolute zero the Field of Play (which is made of space-time) will undergo a transmutation, and change back to being the Pure Consciousness of the Mind of God in which energy is absorbed and dissipated into true nothingness.

So what word might we use to describe the process of the Heat Death of the universe? We propose that the most appropriate word for this process is “uncreation,” for in this process the Mind of God which had been made manifest as immaterial space-time and energy-matter will return to the non-being or uncreated state of the Pure Consciousness of the Mind of God from which it sprang. We thus propose that the ending of the universe be known as 'the Uncreation.'

How will the Uncreation come about? What are its specifics? To understand this we must understand a basic property

of space-time, and to understand that we must have a deeper understanding of the concepts of energy, mass, and heat.

We begin with standard definitions of these three terms. In Random House's Word Menu dictionary, energy is defined as "the capacity to do work." Defined as such, energy is measured in "ergs" (the unit of work done by a force of one dyne acting across one centimetre,) where a "dyne" is a unit of force that produces acceleration of one centimetre per second per second on a mass of one gram. This definition of energy, seemingly derived from an attempt to quantify the output of a machine such as a steam engine and no doubt very useful in a physics laboratory where precise measurements are required, has always struck us as being too narrow and anthropomorphic. A more general and, we think, a more useful definition is to define energy as the capacity to cause a given amount of change in a given volume of space-time over a given span of time. In either case, the essential point to grasp is that energy is not a phenomenological manifestation of the universe: energy does not actually exist. 'Energy' is a way of measuring certain aspects of phenomenological manifestations that do exist. 'Energy' is purely a concept created by the human intellect, and it has no existence in the universe independent of the human mind. It is a system of measurement. And what does it measure? It measures *change.*

Turning now to the definition of mass, we find that according to Random House mass is defined as "the quantity of matter in an object, measured by its resistance to a change in its motion." Here again we find a term which does not correspond to any actual phenomenological manifestation within the Field of Play. As with energy, 'mass' is a pure concept which has no existence in the universe independent of the human mind, created by the human intellect in order to provide a measurement of the behaviour of material objects. So it, too, is a system of measurement. What does it measure? It measures *resistance to change.*

This brings us back to the law of the conservation of energy

mentioned a moment ago. According to Einstein's equation $E = mc^2$, mass and energy are two different aspects of one fundamental manifestation. What is this fundamental manifestation? It is change, one of two general features which characterize the Game of Being as specified by the Creator: 'Everywhere within the boundary of the Game, change shall be unceasing.' 'Energy' is a measure of how much change has taken, is taking, or will take place in a given system. 'Mass' is as measure of how much resistance there will be to that change.

According to Hans C. Ohanian, author of the book, *Einstein's Mistakes,* (essential reading for anyone who wishes to truly understand Einstein and his ideas,) mass can be thought of as 'congealed' energy. In this we think that he, along with Einstein and physicists in general, err. The problem is with Einstein's famous equation. For while it produces mathematically correct solutions, it is conceptually flawed and fails to grasp the essence of what is actually occurring. It is nonsensical to think that one system of measurement, which measures one aspect of phenomena, becomes, when multiplied by some number, equal to another system of measurement, which measures the diametrically opposed aspect of phenomena. Mass is not congealed energy. It is matter, which is not a mere concept but is that which actually exists, which can be thought of as congealed change.

So it is conceptually erroneous to think that Energy is in some way *equal* to Mass. The conceptually correct interpretation of this dynamic is to say that a given amount of matter, measured by its mass (its resistance to change) will, under certain circumstances, *yield* a certain amount of energy (a certain amount of change) which can be calculated by multiplying the measured amount of mass by the speed of light squared.

Matter is not the only way in which change is made manifest. According to the current theoretical understanding, the basic process that powers a star like the sun is what is known as the proton-proton chain. The process starts when two hydrogen nuclei (two protons) slam together. The collision results in the creation of

a positron (the positively charged antimatter version of an electron), a neutrino, and a deuterium nucleus made up of one neutron and one proton fused together. These four particles together possess more mass (more resistance to change) than the original two protons. The additional mass is derived from the kinetic energy of the original two protons. Kinetic energy is the energy of motion. But motion is just another manifestation of change. So change has added mass, which is a measure of a particle's resistance to change, to one of two pieces of matter (one of the original protons) which are in themselves 'congealed' change.

The next step in the chain takes place when the deuterium nucleus collides with another proton. This results in the creation of a helium-3 nucleus containing two protons and one neutron, and the emission of a gamma ray. The helium-3 nucleus is slightly more massive than the combined masses of the deuterium nucleus and the proton with which it collided. Once again kinetic energy - - - change - - - has been transformed into matter. The gamma ray possesses no mass and so has no resistance to change; it, like all electromagnetic radiation, is a pure manifestation of change itself. So the process creates a loop in which change is transformed into matter, and in which matter gives rise to more change.

The final step in the chain of creating a stable helium-4 nucleus occurs when two helium-3 nuclei, each of which started out as the collision of two protons, themselves collide, resulting in the creation of a stable helium-4 nucleus made up of two protons and two neutrons, plus two more protons. According to current theory, from this process emanates the 'energy' which prevents a star from undergoing gravitational collapse. But 'energy' is just a system of measurement. How can a mere measurement system prevent a star from collapsing? Nor does this theory take into account the existence of space-time. The theoretical understanding of how stars function is in need of some revision, a matter to which we will turn presently.

Now we must deal with the concept of heat and come to an understanding of why the concept applies differently to matter than

it does to immaterial space-time. This is important because at the end of the 19th Century a puzzle arose which physics could not explain. In his book, *About Time, Einstein's Unfinished Revolution,* Paul Davies describes the situation:

> "The . . . problem concerned the melding of electromagnetic radiation theory and thermodynamics. Each of these subjects was spectacularly successful in its own right. . . . Nevertheless, in the marriage of these two great theoretical schemes there arose a devastating paradox. According to the fashionable picture, space was filled with an invisible substance called the luminiferous ether. Electromagnetic fields were envisaged as strains or distortions in this medium. The trouble was that the hypothetical ether seemed to have an unlimited thermal capacity, an insatiable appetite for heat. Nothing could apparently prevent ordinary matter from progressively surrendering all its heat to the ether in the form of electromagnetic vibrations of arbitrarily high frequency. This apparently inescapable instability implied that material bodies should be unable to retain heat, or to remain in thermal equilibrium with their environment, in blatant contradiction with common sense and experimental evidence." (220)

Since we are convinced that the luminiferous ether - - - what we have been calling 'space-time' - - - does in fact exist, there must be a solution to this conundrum. What is it?

Random House defines "heat" as the "quantity of thermal energy being added to an object, or moved from one object to another, because of a temperature difference." Note that heat is defined here as a property of "objects," which are made of matter.

As we noted earlier, temperature can be defined in two ways. In one definition, temperature is a "physical quantity *measured* (emphasis added) by the average kinetic energy of particles in matter." So we see that temperature, like the concepts of energy and mass, is a system of measurement, not something which has an existence independent of the human mind; 'temperature' is merely a concept. It measures the average motions (changes in position) of particles in matter. It, too, measures change.

If you turn your oven on and allow it to heat up, and then hold your hand an inch or so above the top of the stove your hand will experience what we call 'heating.' The specifics of what is actually happening is that the particles that make up the matter of the stove top, which have previously absorbed the infrared rays of electromagnetic radiation emitted by the oven's element, are in turn emitting infrared electromagnetic radiation waves which are being absorbed by the particles in your hand, thus increasing the average kinetic energy of those particles. This process our Awareness Connectivity System interprets as 'heat' or an increase in temperature, the measurement of which would be higher than a measurement taken prior to the element in the oven being turned on. The immaterial space-time that fills the one-inch gap between your hand and the top of the stove is not affected by this process; its temperature is not changed. The temperature of the air in that one-inch gap is affected by the passage of the infrared waves through it. The air contains molecules of gas which are a form of matter, so the kinetic energy of those gaseous particles will be increased by the passage of those infrared waves through them and the temperature of that air will increase. So it is clear that heating is the result of the interaction between electromagnetic radiation and matter. However, the space-time in the one-inch gap is not affected by the passage of the electromagnetic radiation through it because it is not made out of matter; it is immaterial. There are no particles of space-time for the electromagnetic radiation to interact with. While it is constantly giving birth to so-called virtual particles, space-time itself has no constituent pieces. Space-time is

just one (very) large flexible immaterial thing, the temperature of which is not affected by any electromagnetic radiation or the temperature of any matter which passes through it.

This becomes clearer when one considers the Sun and its effects on the Earth and the space-time around it. The Sun is very hot. The temperature of its corona, the outer edge of its atmosphere, is currently thought to be between one and three million degrees Kelvin. It is a not uncommon belief that the heat of the Sun is transferred directly from the Sun through space to warm the Earth. But this is not the case. Just outside the Sun's corona, the temperature of space-time is a mere 2.7 degrees Kelvin, the temperature of the so-called cosmic microwave background. Indeed, the temperature of the space-time occupied by the corona is only 2.7 degrees K. Because space-time is immaterial and not made out of particles, it is unaffected by the temperature of the matter which passes through it; in this case the hot gases of the corona. The situation is the same for the space-time which is temporarily occupied by the core of the Sun where the temperature of the plasma found there is even higher. We say temporarily occupied because of course the Sun is moving at a considerable velocity and is constantly entering into, passing through, and leaving behind new portions of space-time.

Here on the Earth we feel the 'heat' of the Sun not because the Sun's heat has travelled through space to reach us, but because when the electromagnetic radiation emitted by the Sun interacts with the particles of the matter of which our bodies are made, it increases the kinetic energy of those particles in a process which our Awareness Connectivity System interprets as a warming sensation. The Earth's atmosphere absorbs a significant portion of the Sun's electromagnetic radiation and re-radiates it back out into space. If the protective blanket of the atmosphere wasn't there, daytime temperatures on the surface of the Earth would be similar to the daytime temperature on the surface of the moon which reaches 134 degrees Celsius, well above the boiling point of water, which would turn our planet into a barren arid hunk of rock devoid

of life.

So we see that the excitation of the atoms which make up matter is one way in which matter brings about the emission of electromagnetic radiation. Using the example of your oven again, we know that when you turn the oven on an electric current flows through the element. This current causes the electrons in the atoms which make up the element to jump temporarily to higher so-called energy levels as they absorb the energy of the electric current. As the electrons return to a lower energy level they emit the energy they have absorbed in the form of electromagnetic radiation with wavelengths corresponding to the lower end of the visible light and infrared portions of the electromagnetic spectrum. (This idea that electrons jump up and down various 'energy levels' is the current explanation for this process. We shall present an alternative explanation in due course). This is why the oven element glows with a red light. The infrared radiation then heats the air, but not the space-time, within the oven. This process makes it possible for you to bake your cookies. And we have seen that in the cores of stars electromagnetic radiation is produced by the compression of matter by an intense gravitational field (the proton-proton chain.) But matter is not the only source of electromagnetic radiation in the Field of Play.

Electromagnetic radiation is also emitted by immaterial space-time. At this point in the evolution of the universe the temperature of the immaterial bubble of space-time is a mere 2.7 degrees Kelvin, causing it to emit electromagnetic radiation in the microwave portion of the electromagnetic spectrum. This is the source of the so-called cosmic microwave background. This radiation is not brought about due to the behaviour of any particles as is the case with matter because immaterial space-time does not consist of particles. The radiation emitted by immaterial space-time is simply a consequence of the continued cooling of the once very hot bubble of space-time.

This being the case, we can look back in time and imagine the conditions prevalent in the Field of Play when the temperature

of the bubble of immaterial space-time was hotter than it is today. At one point in time, when the temperature of the bubble of immaterial space-time was high enough to emit electromagnetic radiation at the high end of the spectrum of visible light, to human eyes the entire Field of Play, except for the filaments of charged particles which light could not penetrate, would have glowed with a bright blue light. From the outside, the Field of Play would have appeared as a bright blue translucent marble, streaked throughout with tendrils of darkness. As the Field of Play cooled the wavelength of the electromagnetic radiation emitted by the hot bubble of space-time would have lengthened. Later on the entire universe would have glowed with a bright yellow-white light similar to that emitted by the Sun today. Later still a reddish glow would have illuminated all of the cosmos. Unfortunately there could not have been any lifeforms present within the Field of Play to witness what surely must have been a wondrous sight. During those times, which was before any element-making star factories had been assembled, the Field of Play was far too hot to permit the emergence of lifeforms.

So it is clear that the electromagnetic radiation emitted by matter does not affect immaterial space-time, because immaterial space-time does not consist of particles. The physical property of absorbance is a measure of the electromagnetic radiation absorbed by a substance. Since immaterial space-time is not a substance, it does not possess this property. It therefore cannot absorb heat; it can only emit heat. If immaterial space-time cannot absorb heat, how did it come to be so hot in the past? The bubble of space-time was so hot after the Cosmic Inflation event because it was created during the very high temperatures prevalent during the duration of the necessary condition. It did not acquire its heat after its creation. It was created hot. However, while the electromagnetic radiation emitted by matter does not affect immaterial space-time, the electromagnetic radiation emitted by immaterial space-time does interact with and affect matter. This idea is confirmed in two ways, one in what is for now theory, and the other by empirical evidence.

In the extremely hot early universe, immediately following the Cosmic Inflation event when the virtual particles being shed by immaterial space-time were supplied with energy sufficient to become actual matter and antimatter particles, the electromagnetic radiation being emitted by the hot bubble of immaterial space-time, at that point in the form of highly energetic gamma rays and x-rays, prevented the matter that survived the matter-antimatter annihilation from forming stable atoms. We do not know for how long this condition prevailed, but we do know that stable atoms did not form until the temperature of the bubble of space-time fell below approximately 3000 degrees K. So clearly the electromagnetic radiation emitted by immaterial space-time was affecting the behaviour of matter. This is the theoretical portion of the confirmation.

The empirical evidence confirming the fact that electromagnetic radiation produced by immaterial space-time does interact with matter is to be found in the discovery of the so-called cosmic microwave background. The 1964 discovery of this microwave radiation, which we say is not, as currently accepted theory claims, the result of an event that occurred very early in the universe some 380,000 years after the Cosmic Inflation event, but, rather, is being produced by the continued cooling of the bubble of immaterial space-time in the here and now, was made possible because that microwave radiation interacted with something made of matter: Arno Penzias's and Robert Wilson's aluminum antenna.

So, not for the first time, the question arises "What happened to all of this electromagnetic radiation? Where did all this energy go?" The first law of thermodynamics, also known as the law of the conservation of energy, states that energy can be neither created nor destroyed and is constant in a closed system. But viewed through a wide enough frame of reference, it becomes clear that this law does not hold for all circumstances. After all, at one point there was literally no-thing, so there was no change, and since energy is a system of measurement which measures a given amount of change, there was then no energy. Then suddenly, after

the Cosmic Inflation event, there was some-thing, in which change was occurring, to which the system of measurement we call 'energy' can be applied. So in this sense we can say that there was a time when 'energy' was created. Furthermore, we suggest that the first law of thermodynamics does not apply to the universe as a whole because the Field of Play is not a closed system.

We have seen that electromagnetic radiation is produced by both matter and immaterial space-time. Currently accepted theory states that in the nuclear furnaces in the centre of stars mass is turned into energy and released into the universe in the form of electromagnetic radiation. The law of the conservation of energy says that this energy lasts forever. If that is the case, then the temperature of the universe should be steadily rising. But it is widely accepted that the temperature of the universe is much cooler than it once was. In his book, *At The Edge Of Time*, cosmologist Dan Hooper states that current theory suggests that the temperature of the universe has decreased by 1.0 degree K over the last four billion years. (221)

Now, if the universe is expanding as currently accepted theory states, the fact that the temperature of the universe is not increasing can be explained away by claiming that there is an ever-increasing volume of space-time to be heated, so the overall temperature of the universe stays the same or even drops. But if the universe is not expanding and is finite as we have argued, then there must be an alternative explanation for why the temperature of the Field of Play is not increasing. We suggest that the temperature of the universe is not increasing for two reasons: one, because the electromagnetic radiation emitted by matter (stars) does not affect immaterial space-time for the reason previously discussed; and two, because the electromagnetic radiation emitted by both matter and immaterial space-time, where it does not come into contact with or pass through matter, eventually leaks out of the Field of Play at its boundary with the Realm of the Mind of God, where it is absorbed and dissipated by the infinite conditions of absolute zero which prevail there. The universe is not a closed system. There

will be many who will immediately ridicule this idea, but we submit that it is much more based in logic than the idea that gravity is weaker than the other of forces of nature because it is leaking into a higher dimensional realm called the 'bulk', a concept that has been embraced by some within the cosmological community.

We now have an understanding of why space-time - - - formerly known as the 'ether' - - - does not act as an insatiable heat sink sucking the heat out of all material objects. So we return now to the topic of the Uncreation and the end of this episode of the Game of Being.

From one perspective we can say that the Heat Death process which will bring about the Uncreation has already begun; indeed it began when the Field of Play was first created. Just as all lifeforms begin to die the moment they are born, so the Heat Death of the universe began the first moment it started to cool, immediately after the Cosmic Inflation event.

Astronomers estimate that in today's universe galaxies like the Milky Way produce approximately seven new stars per year. However, ten billion years ago that number would have been ten times greater. The collision of galaxies, such as the pending collision of the Milky Way and Andromeda galaxies, results in a burst of new star formation, but that situation is temporary. Over the long term the rate of creation of new stars will steadily decline. Eventually, in galaxies everywhere, stars will be dying out more quickly than they are being created.

Although their lives are long by human standards, the lives of stars are finite. Stars with the mass of the Sun live a stable existence for billions of years, while very large mass stars may live for only 10 million years before exploding as supernovas. Red dwarf stars greatly outnumber the more massive stars and could last for trillions of years. Astronomers have estimated that in approximately 100 billion years the last of the stars that are not red dwarfs will have died out.

The ultimate goal of the Game of Being is to produce lifeforms, and we might assume that the Creator has designed the

Field of Play to last for as long as there is likely to be lifeforms inhabiting it. Although this may some day change, our current understanding suggests that the appearance of lifeforms requires the existence of earth-like rocky planets with water on them, situated in the 'Goldilocks' zone around a stable sun-like star which has a lifetime long enough for lifeforms to evolve. Stars much more massive than the Sun do not last long enough for lifeforms on any of their orbiting planets to evolve. Red dwarf stars last long enough but are somewhat unstable, regularly bathing any planets orbiting them with hi-energy radiation which would be deadly for life. Stars like our Sun are thought to make up about four percent of the stars in our galaxy, and it is assumed that this figure will apply to other spiral galaxies like the Milky Way. As the universe ages and fewer and fewer new stars and planetary systems are created, the probability of new lifeforms appearing somewhere within the Field of Play will steadily decrease. In 80 to 100 billion years, as the last of the non-red dwarf stars die out, that probability will shrink towards zero.

The Uncreation will begin in earnest when some region of the bubble of immaterial space-time loses all its heat and its temperature falls to absolute zero. When this occurs that region of space-time will undergo a transmutation back into the un-manifested state of the Pure Consciousness of the Mind of God, reversing the transmutation that a portion of the Mind of God underwent to form the necessary condition, which preceded the moment of Cosmic Inflation that brought into existence the Field of Play. In that region of space-time the production of virtual particles will cease. Similar to the regions of space-time around so-called black holes but for a different reason, a region of space-time which reaches a temperature of absolute zero will lose its flexibility and become impervious to the transmission of electromagnetic radiation, which will be absorbed and dissipated into the growing 'hole' in space-time.

The Creator designed the Field of Play so that once a hole in space-time has been created and the Uncreation transmutation

has begun, the volume of the hole will rapidly increase without regard to the temperature of any space-time it encounters, and with a growth rate that will exceed the speed of light. The cosmic speed limit which prevents anything from travelling through space-time at faster than light-speed does not apply to the behaviour of space-time itself. When the rapidly growing hole in space-time encounters matter, the space-time which makes up the greater part of the volume of an atom will immediately undergo transmutation, and the electrons, neutrons and protons within the atom, which are themselves tiny semi-permanent perturbations of space-time, will instantaneously 'pop' out of existence. This process will not be the same as that which takes place during nuclear fission where heavy atoms are split into smaller fragments. During the transmutation back into the state of Pure Consciousness, entire atoms and their constituent parts will simply be consumed by the growing hole of absolute zero space-time. Although it may be unlikely that any lifeforms will still be present within the Field of Play by the time the process of the Uncreation ensues, the end for any lifeforms that have managed to survive till then will be swift and pain free. There will be no warning of their imminent demise; one moment they will be present and the next moment they won't. This process will continue until the entire Field of Play, all of the bubble of space-time and all the energy-matter that it contains, has undergone Uncreation back into the un-manifest state of the Pure Consciousness of the Mind of God and, in accordance with the Creator's decree, all beginnings within this episode of the Game of Being will have had an ending.

We have referred to this episode of the Game of Being. There is no reason to believe that this has been a singular occurrence. There is every possibility that this is neither the first nor will it be the last episode of the Game of Being. We can estimate the potential total lifetime of our current universe to be somewhere between 50 and 100 billion earth-years, but this is simply guesswork. We have no way of determining how long it took for the hot bubble of space-time to cool down from the

temperature it possessed at the end of the Cosmic Inflation event to the temperature which allowed the formation of stable atoms; nor do we know with certainty how long it took for those atoms to form the first generation of stars. We do know that the oldest stars currently extant are approximately 12 billion earth-years old. And the idea that the last of the non-red dwarf stars will burn out in 100 billion years is also only an educated guess. The critical number is how long it will take for the temperature of some portion of the bubble of space-time to fall to absolute zero. As we mentioned earlier, cosmologists have estimated that the temperature of the universe has fallen by 1.0 degree K over the last four billion years to just 2.7 degrees K above absolute zero. We do not know the rate of heat loss at the boundary between the Field of Play and the Realm of the Mind of God, although we have assumed that the rate of heat loss was greater in the past than it is now, and we perhaps may assume that the rate will further slow as the temperatures of the two regions converge. This figure might be calculable if we knew the radius of the Field of Play, but the current estimate for this of some 46.5 billion light years is based upon the assumption that the universe is still expanding and thus is not reliable. However, based on the estimate of a 1.0 degree K lowering of the temperature of the universe over the last four billion years, this suggests that it will be at least some 12 billion years before some portion of the bubble of space-time reaches a temperature of absolute zero. This is a considerably shorter span of time than the estimate provided by astronomers concerning how much longer Sun-like stars will populate the universe, so perhaps our assumption that the Creator has designed the Field of Play to last for as long as there is likely to be lifeforms inhabiting it is invalid. Or perhaps it will take considerably longer for the temperature of the bubble of space-time to fall to absolute zero.

Still, we can consider, for the sake of argument, a total life expectancy of this universe of 50 to 100 billion earth-years to be an in-the-ballpark figure. This is an unimaginably immense period of time by human standards, but if the Creator's life span is eternity as

we and the Traditional monotheistic religions suggest, then God has an unlimited amount of time to create an infinite number of 100 billion earth-year long episodes of the Game of Being. There is nothing which prevents the Creator from repeating the process that gave birth to our particular Field of Play, and to then experience physical existence again as the new and different lifeforms manifest in yet another episode of the Game. So while the lifetime of all the manifestations, animate and inanimate, including the space-time manifest as the Field of Play itself, in any one episode of the Game is finite, the Game of Being itself and its potential for re-occurrence is infinite and eternal.

Chapter Thirty-four

RETURN TO PHYSICS:

INVALID ASSUMPTION #3

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We will turn aside now from our theological and metaphysical musings, and continue with our exploration of physics. In the prologue to this work we stated that over the last four hundred years, Science has made three key assumptions concerning the phenomenological nature of the universe upon which a significant portion of the edifice of knowledge known as physics is based. We believe that each of these three key assumptions is in fact invalid, and that the interpretation of empirical data through the lenses of these invalid assumptions has led to conclusions regarding the phenomenological nature of the universe, such as the notion that the universe is expanding, which are erroneous.

The first of these invalid assumptions was made by Issac Newton: according to the legend he observed that the Earth somehow reached out and pulled a falling apple towards it, and so he assumed that material bodies exert an attractive force - - - what

we call 'gravity' - - - on other material bodies. This assumption about the nature of gravity is widely considered to be valid today, even though Einstein concluded and Arthur Eddington demonstrated that gravity is not some mysterious force drawing material bodies towards one another, but is actually a curvature of space-time caused by the presence of material bodies. Our explication of this theory in the context of the solar system and our Milky Way galaxy and its environment provides a satisfying explanation for how gravity actually functions.

The second invalid assumption was made by physicists in the 19th Century who assumed that the 'luminiferous ether' - - - what throughout this discussion we have been referring to as 'space-time' - - - is a *material* phenomenon. When the Michelson-Morley experiment failed to detect a 'breeze' presumed to exist as a result of the Earth's motion through the ether physicists concluded, on the basis of their invalid assumption regarding the nature of the ether, that the ether does not exist. This conclusion was reached despite the clear evidence that light is a wave phenomenon, which requires that if there are light waves, then something must be waving.

We have suggested that the Michelson-Morley experiment failed to detect an 'ether breeze' not because the ether (space-time) does not exist, but because it is *immaterial*; a phenomenon in the universe which is completely distinct from matter. The ether is not made out of matter; on the contrary, matter is made out of it. With this understanding of the ether/space-time phenomenon we have provided a theory that sheds a new perspective on the Big Bang/Cosmic Inflation events, explains black holes and the extreme red-shifting of the light from quasars, provides an explanation for gravity which is consistent with Einstein's General Theory of Relativity, accounts for the cosmic microwave background, does away with the need for the unfounded notions of dark matter and dark energy, provides an explanation for the large-scale structure of the universe and, as we shall see, accounts for the red-shifting of light as it travels through space-time.

We turn now to the other invalid assumption which has contributed to the faulty conclusions physicists have reached regarding the fundamental nature of the universe. This third invalid assumption, which has confounded our understanding of time, was made by Albert Einstein in 1905 in what came to be called the Special Theory of Relativity. The invalid assumption contained within that theory is that the speed of light is constant for all observers.

As a result of his ideas Albert Einstein is a historical figure of legendary stature the world over. In 2000 he was named "Person of the Century" by Time magazine. But while a certain general knowledge of his ideas is widespread, actual understanding of his ideas is rather thin. If asked, the average person-on-the-street is liable to reply, "Einstein? Sure, I know about Einstein. He was the E = mc^2 dude." Those who are slightly more knowledgeable might be able to muster the statement that "Einstein discovered that gravity is the curvature of space-time by mass." Those with even more knowledge might say with assurance, "Einstein figured out that the speed of light is constant. It always travels through the vacuum of space at a speed of 300,000 km per second." (The figure of 300,000 km/second has been rounded up for computational convenience. The modern measured value for the speed of light is actually 299,792 km/second.) But there are relatively few members of the general public who truly understand what Einstein meant when he declared that the speed of light is constant.

Chapter Thirty-five

THE GALILEAN TRANSFORMATIONS

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To appreciate the import of Einstein's declaration we must first come to grips with what are known in physics as the "Galilean transformations," named in honour of Galileo, who was the first to formulate them mathematically. They are straight-forward, and in the age of the automobile are something that the average person understands at an almost instinctual level. Say you are sitting in a parked car by the side of the road and a vehicle is moving down the road towards you at a constant velocity of 100 km per hour. That vehicle is therefore *approaching* you at a rate of 100 km per hour. Now lets say that your vehicle is also travelling with a constant velocity of 100 km per hour, towards the first vehicle. The Galilean transformations, and common sense, say that your vehicle and the first vehicle are *approaching each other* at a rate of 200 km per hour. This accounts for the fact that so many high-speed head-on collisions are frequently fatal.

Obviously, the rate at which you and the vehicle coming

towards you approach one another is equal to the sum of your velocity and that vehicle's velocity. If you are parked at the side of the road (velocity = 0), then the vehicle coming towards you with a constant velocity of 100 km per hour will be approaching you at a rate of 100 km per hour. If your vehicle is moving towards the oncoming vehicle with a constant velocity of 100 km per hour, then the rate at which the two vehicles are approaching each other will be 200 km per hour. It is very important that the difference between the rate at which the two vehicles are approaching one another, and their individual respective velocities, be clear in your mind. The rate of approach of the two vehicles is directly dependent on the sum of the two vehicles' respective velocities, but the individual respective velocity of each vehicle is totally independent of the rate at which the two vehicles approach one another. For example, if your vehicle is moving at a constant velocity of 50 km per hour, and the other vehicle is moving towards you with a constant velocity of 150 km per hour, then the rate of approach between the two vehicles will still be 200 km per hour. The individual velocity of each vehicle contributes to, but is independent of, their rate of approach. Equally important, and equally obvious, the velocity (the speed) of each vehicle is independent of the velocity of the other. In our example, the velocity of the oncoming vehicle is a constant 100 km per hour, regardless of whether the velocity of your vehicle is 0 or 100 km per hour. We have been at pains to belabour the obvious here because, as we shall see, it is precisely on this point that a significant conceptual and linguistic muddying of the waters has taken place.

We can now return to the question of what Einstein meant when he declared that the speed of light is constant. When Einstein declared that the speed of light is constant, he meant that light does not behave in accordance with the Galilean transformations. According to Einstein's Special Theory of Relativity, if a beam of light is travelling towards you at its supposed inherent velocity of 300,000 km/second, and you are moving towards the beam of light

with a velocity of 50,000 km/second, *the rate of approach* between you and the beam of light will not be 350,000 km/second as the Galilean transformations demand, but will be equal to the velocity of the beam of light, 300,000 km/second. According to Einstein, if you are travelling towards the beam of light with a velocity of 100,000 km/second, the rate at which you and the beam of light approach one another will not be 400,000 km/second as you would logically expect, but will remain at 300,000 km/second, equal to the velocity of the beam of light. In other words, according to the Special Theory of Relativity, and contrary to the demands of the Galilean transformations, the rate at which a beam of light *approaches an observer is independent of the motion of the observer,* and that therefore the speed of light is constant.

On the basis of this assertion, Einstein made two completely logically necessary but nonetheless astonishing deductions: one, that from the perspective of an observer, clocks in a frame of reference moving past the observer (imagine a vehicle of some sort, be it an automobile or a rocket ship) will 'tick' more slowly than a clock that is at rest relative to the observer's frame of reference. This deduction has been interpreted as evidence for the idea that from the observer's perspective time will pass more slowly for the passengers in that vehicle than it does for the observer (physicists say that for the passengers - - - from the perspective of the observer - - - time 'dilates';) and two, the even more astounding deduction that from the perspective of the observer the vehicle moving past the observer will shrink along the dimension parallel to the direction of the vehicle's motion. Einstein's theory claims that this shrinkage occurs to all bodies which are in motion, but only becomes significant enough to become apparent when an object is moving with a velocity that is a significant percentage of the speed of light.

Why is this theory called the Special Theory of Relativity? It is because the consequences of the theory apply in a way which is relative to the individual(s) who are playing the role of observer. Einstein pointed out that, for the passengers in the vehicle in our

example, it would *appear* (the issue of what appears to be occurring as opposed to what is actually occurring will come up again later in our discussion) from their frame of reference that it is the observer who is moving past them, and Einstein concluded therefore that from their perspective it would be the observer's clock which would appear to 'tick' more slowly relative to the passengers' clocks, and so from their point of view time would pass more slowly for the observer, and the observer's body would shrink along the dimension of the observer's motion relative to the vehicle containing the passengers.

"But wait," you might find yourself saying, "How can time slow down? And if time can slow down, how can it be slowing down simultaneously for both the observer and the passengers in the vehicle moving past the observer? Isn't that logically impossible?" Just so. And yet the equations of the Special Theory of Relativity lay out a mathematical explanation of how this is possible, and if Einstein's mathematics say the universe actually works in this bizarre fashion, then it must be correct, no? We shall see. Do cows actually jump over the moon?

Chapter Thirty-six

TIME: A BRIEF HISTORY

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Before we can begin to disentangle the knotted logic of the Special Theory, we must first take a brief tour through the history of the concept of time. What is time? This question has perplexed humans for thousands of years. Spoiler Alert: at the end of this portion of our journey we will arrive at the conclusion that time does not exist.

We begin our journey with the following comments from the physicist and author, Paul Davies:

> "In the madcap world of modern Western society, where time is money, railways, airline schedules, television programs, even cooking are subject to the tyranny of the clock. Our hectic lives are firmly bolted to the treadmill of time. We are slaves of our past and hostages to the future. But was it always thus? Running like a common thread through the history of human thought, East and West, North and South, is a belief that the entire paradigm of human temporality is rooted in

> some sort of monstrous illusion; it is but an elaborate product of the human mind." (222)

For much of human history, time was considered to be cyclical in nature. Traditional cultures observed the regularity of the daily rising and setting of the sun, the repetitious phases of the moon, the twice-a-day advancing and ebbing of the tides, the recurring march of the seasons of the year. Events occurred, and then at some later point the members of the culture would experience a re-occurrence of the same, or at least a generally similar, event. Time moved in a circle, and had no beginning and no end.

The cyclical concept of time was eventually challenged by a completely different understanding of this phenomenon. In his thorough-going review of the history and nature of time, *In Search of Time,* Dan Falk relates:

> "Among the members of one particular culture in the ancient Near East, in the early part of the first millennium B.C., a markedly different view of time took hold. For the Jews, history came to be seen as a sequence of unique events - - - one creation, one flood, one (eventual) appearance of the Messiah - - - all unfolding according to God's divine plan. This was a decidedly linear view of time. In this view, time proceeds inexorably from past to future; it is irreversible. It also demands a definite beginning: Creation happened just once. Infinity was for God, not for space and time." (223)

During this same general time-frame, the puzzle of time was being considered by the ancient Greek philosophers. Parmenides of Elea (c. 520 - 430 B.C.) argued that the past and the future are illusions; somehow he came to the conclusion that the

'real' world is timeless and unchanging. Obviously, this conclusion is flawed. The world is clearly not 'unchanging'. However, Parmenides' belief that the world is unchanging led him to conclude that time does not exist! So, although the basis for our conclusion that time does not exist differs from that of Parmenides, we find ourselves in agreement with him on this point. Strange are the twists and turns of humanity's struggle to come to an understanding of time.

Heraclitus of Ephesus (c. 535 – 475 B.C.) held a view that was directly in opposition to that of Parmenides. For Heraclitus change was paramount. He "saw the universe as inherently dynamic, caught up in an endless process of creation, destruction, and change." (224) It is interesting to note the confluence of Heraclitus' ideas with those of Hindu mythology with their worship of the gods Brahma the Creator and Shiva the Destroyer. Heraclitus also asked the question, "Is 'time' just another word for change?" As we shall see, the making of this specific connection comes very close to the mark.

For Plato (428 – 347 B.C.) time is not an independent entity like his famous archetypes, but is an aspect of the universe, "a kind of reflection of the rotation of the 'heavenly spheres' that hold the sun, moon, and stars." (225) So although Plato did not make the connection as explicit as did Heraclitus, he did acknowledge that time is associated with motion, and is therefore bound up with the notion of change.

Aristotle (384 – 322 B.C.) also questioned whether or not time actually exists. He eventually concluded "that time is rooted in motion and change; it is meaningful only with respect to the events embedded in its flow." (226) So we see that while the details of their analysis may have differed, there was general agreement among the major ancient Greek philosophers that time is somehow intimately connected to the process of change.

Writing during the collapse of the Roman Empire, St. Augustine of Hippo (354 – 430) asked, "What, then, is time? If no one ask of me, I know. But if I wish to explain to him who asks, I

know not." Significantly, "Augustine eventually came to suspect that time is all in our heads, merely something we construct with our minds." (227) As we shall see, we are quite certain that Augustine essentially solved the riddle of time almost two millennia ago.

In Europe, in the later medieval period, a new understanding of time began to emerge. This view conceived of time ". . . as an independently existing thing, an entity in its own right." (228) This belief about time culminated most famously in the ideas of Isaac Newton (1642 –1727), who formulated a conception of time that was decidedly different from that of both the ancient Greeks and Augustine. For Newton, time was not associated with change, and it was certainly not merely a notion contained in or arising from the human mind. Newton's view of time appears to have been heavily influenced by his mathematics teacher, Issac Barrow, who stated:

> "Time does not imply motion, so far as its absolute and intrinsic nature is concerned; not any more than it implies rest; whether things move or are still, whether we sleep or wake, Time pursues the even tenour of its way." (229)

Because of Newton's fame, Newton's definition of time, which says pretty much the same thing as Barrow, became much more well known. Newton claimed that "Absolute, true, and mathematical time, in and of itself and of its own nature, without reference to anything external, flows uniformly." Newton prioritized the concept of time, something which cannot be directly observed, over the existence of motion, something which is readily observable. Newton believed that somewhere in the universe there existed some sort of universal clock which:

> ". . . ticked away at a rate independent of [the motion of the] stars and planets; independent of

> our perceptions. It was simply there. Should all the matter in the universe disappear, it would still be there. It was fundamental." (230)

An important implication of Newton's view of time revolves around the concept of what it means to say that something is happening 'now.' For Newton, since time "flowed uniformly" everywhere in the universe, it is possible to imagine that an event occurring on the Earth, and an event occurring in the distant galaxy Andromeda (Newton, of course, knew nothing of Andromeda) can meaningfully be said to both be occurring 'now,' at the same instant in time. It was precisely on this point that Albert Einstein was to stumble some 240 years later.

Newton's view of absolute time was by no means universally accepted in his own day. The German mathematician and philosopher Gottfried Leibniz (1646 – 1716) and others, echoing the ancient Greeks who claimed that time is connected to motion and change, argued for:

> ". . .a "relational" view of time - - - the idea that time only makes sense in relation to the motion of physical bodies. . . . Time, the relationists argued, is *simply a way of comparing one event to another* (emphasis added.) In the relational view, time is not independent of the material objects that make up the universe. Just the opposite in fact: the physical objects and their motions are what define the passage of time. One might argue that this more closely matches our experience of the world: We do not "see" time, just as we do not see space. What we perceive are events in time, and objects in space." (231)

As we shall see, the insight that time "is simply a way of comparing one event to another" is vital to a correct understanding

of this slippery concept. Also, as we shall discover, Falk's claim that “we do not see space” will be proven to be untrue.

The insight that time “is simply a way of comparing one event to another” introduces into our considerations the necessity for measurement; if we are to compare one event to another, some sort of measurement will be required. The idea that it would be useful for humans to 'keep track of time' dates back to at least the dawning of the age of agriculture, some ten to twelve thousand years ago, when relativity large groups of humans gave up the hunter-gatherer lifestyle and gathered into permanent settlements. Significantly, it was during this period that the notions of private property and profit first began to take root in human societies. Falk notes:

> “Our ancestors began measuring time out of necessity: agriculture demanded attention to the seasons, and reaping the largest harvests demanded a knowledge of the sun and stars, and their endlessly repeating motions. But time's grasp would turn out to reach much further, influencing every facet of public and private life. For some, time was organic and flexible; for others, it ran in cycles, mirroring the cycles seen in nature. For still others - - - including ourselves - - - time [has become] inanimate, linear, and relentless.” (232)

The evolution of humanity's understanding and experience of time has been accompanied, some say driven by, humanity's steadily increasing capability to measure the passage of time with ever-greater precision. Agriculture required that time be measured by the number of days which must pass between the optimal time for planting and the optimal time for harvesting. The development of the trans-Atlantic trade between the Old World and the New required the invention of a time piece that could accurately keep

track of the hours of the day for a period of many weeks while at sea, so that the ships' crews could accurately calculate their position. The growth of railways required clocks that could accurately measure the minutes of every hour, day in and day out. The Global Positioning Satellite system that so many of us now rely upon to tell us where we are on the face of the Earth requires clocks that are capable of measuring time on the scale of billionths of a second.

While our ability to measure the passage of time has become ever-more precise, the basic process has remained the same: we are still measuring the duration of one event in comparison to the duration of some other regularly repeating event. Say you decide to walk to the corner store in your neighbourhood to buy a litre of milk. You check your watch as you walk out the front door, walk to the store, and check your watch again as you arrive. Your watch tells you that 10 minutes have elapsed. What does this really mean? It means that you have changed your location on the face of the Earth - - - one event - - - in 1/144th of a day, a fraction of some other regularly repeating event. Your watch allows you to measure in minutes the duration of change arising from one event - - - your stroll to the store - - - in terms of the duration of some other regularly repeating event - - - how many minutes it takes for the Earth to spin once on its axis.

You could have chosen to measure the duration of your change of position as a proportion of some other regularly occurring event. Theoretically you could have used a cesium beam tube clock which keeps time by counting the oscillations of cesium atoms. Cesium atoms oscillate with a frequency of 9,192,631,770 cycles per second. In that case you could say that your trip to the store took you 10 minutes x 60 seconds per minute x 9,192,631,770 cycles per second = 5,515,579,062,000 oscillations of a cesium atom. Although extremely precise, this would not be a very convenient manner of measuring the duration of change of everyday events for the ordinary person.

The point is that Leibniz was correct: time is simply a way

of comparing the duration of one event to the duration of another, whether it is measured in days, hours, minutes, or nanoseconds. More generally, we can say that like energy, mass, and temperature, time is a system of measurement, and that like energy, mass, and temperature, time measures change; specifically the duration of a given instance of change compared to the duration of an arbitrarily chosen regularly repeating instance of change. Furthermore, it becomes clear that like energy, mass, and temperature, time is a pure concept which possesses no phenomenological presence in the universe outside of the human mind. Augustine reached the correct conclusion: it's all in our heads.

If time is simply a mental tabulation of change, from whence does our sense of time passing arise? It is clear that the roots of the concept of time lie in our ability to remember events that have previously occurred, in our memory. This capability is one which is not restricted to humans; many lifeforms share it. As the example of the mimosas demonstrates, even plants possess the capability to remember the past.

At some point in the evolution of the human brain, perhaps in the brains of our pre-hominid forbears, certainly prior to the acquisition and development of language, the very first stirrings of the notion of time would have been seeded by the growing awareness of the ideas of 'before' and 'after'. At some point it would have dawned upon our ancestors that the appearance and disappearance of the thing up above which provides warmth and which cannot be directly gazed upon, is regularly followed by the appearance up above of the thing which does not provide warmth, can be gazed upon, and which constantly changes shape. One experience always followed the other in an endless cycle. Gradually, it would have been imprinted in the developing capacity of memory within the ancestral brain that if one was currently experiencing the heat of the noonday sun, later on (after) one would experience the cold light of the moon. Eventually the realization would have dawned that if one was currently experiencing the heat of the noonday sun, one would have to

experience the cold light of the moon before the warmth of the sun could be experienced again.

Thus were the notions of 'before' and 'after' implanted in the developing awareness of our ancient ancestors, the entire process taking place without any language and thus no words for sun, moon, warmth, cold, before or after; only a dim but growing awareness of the repetitive nature of their experience. But, due to their growing capacity to remember prior experiences, the seeds of 'time' had been sown.

Over the centuries there has been endless debate over the question of whether or not time had a definite beginning, and if so, when that beginning occurred. For Newton time has always existed. For many of today's cosmologists time began at the moment of the Big Bang. However, our analysis insists that time is a human created concept which has no phenomenological presence in the universe independent of our minds, and that therefore time 'began' with the gradual development of the notions of before and after in the brains of our pre-human ancestors.

The next major advance in the development of the concept of time may not have occurred until after humans (and perhaps other hominids) acquired language. Words provided the capability to name events as well as things, and the notions of before and after would soon have evolved into the ideas of yesterday, today, tomorrow. From there it was but a short leap from those specific orderings of time to the more generalized concepts of past, present, and future. Humans' growing ability to label things co-evolved with our ability to access what Canadian neuroscientist Endel Tulving has termed “episodic memory.”

> “ . . . episodic memory, which Tulving believes is unique to humans, gives us the ability to peer back across time, using our imagination to revisit just about any event that we choose.” (233)

Humans' ability to remember episodes from our past

histories permits what Tulving and others have termed 'mental time travel.' Psychologists have recognized the critical link between mental time travel into the past and mental time travel into the future. Psychologists Thomas Suddendorf and Michael Corballis

> ". . . have argued persuasively that the capacity for mental time travel gave our ancestors an invaluable edge in the struggle for survival. They believe there is a profound link between remembering the past and imagining the future. The very act of remembering, they argue, gives one the "raw material" needed to construct plausible scenarios of future events and act accordingly. Mental time travel "provides increased behavioural flexibility to act in the present to increase future survival chances." If this argument is correct, then mental time travel into the past - - - remembering - - - "is subsidiary to our ability to imagine future scenarios." (234)

The idea that our ability to remember the past and to imagine the future are linked is supported by "Brain imaging studies [which] have shown that, for either activity, we make use of similar regions in the brain's frontal and temporal lobes." (235) Researchers have discovered that humans are not born with a sense of time or the ability to mental time travel. Children up to the age of eighteen months live in a perpetual present. The ability to remember develops gradually as more neuronal connections are wired together in the brain. Significantly, the capability to engage in mental time travel does not commence until after the beginning of the acquisition of language. Interestingly, researchers have learned that children almost always learn the word 'tomorrow' before they learn the word 'yesterday.'

It is also clear that children's perception of time is influenced by cultural factors. In his book Falk notes:

> "In his book *Time in History* (1988), G.J. Whitrow points out that children in other cultures - - - he mentions a study carried out in Uganda and another among Australian Aborigines - - - found it 'difficult to relate the time they read on the clock to the actual time of day,' not because of any difference in intelligence, but because 'their lives, unlike ours, are not dominated by time.' " (236)

Whether or not the capability to engage in mental time travel is unique to homo sapiens is a matter of some controversy. There is reliable evidence for the proposition that birds such as scrub jays as well as chimpanzees engage in behaviours which suggest that they are planning for the future. Quoting psychologist William Roberts, Falk notes that such studies "suggest that some animals can mentally time travel into both the past and the future." However, other scientists including Suddendorf, Corballis, and Tulving disagree with this conclusion. For his part, Tulving believes that even in humans full-fledged mental time travel is a relatively recent development, something which emerged only within the last fifty thousand years.

For ourselves, we suspect that the capability to engage in mental time travel is not an all-or-nothing proposition. We believe that this capability probably exists on a continuum that is based on the sophistication and complexity of a given species' Awareness Connectivity System. Whereas homo sapiens can engage in mental time travel across a wide array of scenarios, species such as scrub jays and chimpanzees which possess an ACS which is less sophisticated and complex than that of homo sapiens, can only engage in mental time travel under restricted scenarios, such as the challenge of providing food at some point in the future.

In any event, it is clear that the human ability to mentally travel into the past and into the future has played a pivotal role in

the construction of the concept of time. As Suddendorf and Corballis have written:

> "The mental reconstruction of past events and construction of future ones may have been responsible for the concept of time itself, and the understanding of a continuity between past and future." (237)

All of the forgoing supports the conclusion that we have already reached: time is not an independent phenomenological entity existing in the universe as Newton believed. Time is merely a concept, a product of our minds, concocted by Awareness Connectivity Systems for the purpose of imposing a 'before and after' order upon the constant flow of external events, the interaction with which constitutes our realities as manifestations within the Field of Play.

Over the centuries many thinkers have spoken of the 'flow' of time, as if it is a river of some sort flowing throughout the entirety of the universe. Some have imagined that we are carried along with time's current as it sweeps us in an ever-present present out of a constantly receding past into a constantly on-coming future. Others have considered us to be spectators situated on the banks of the river of time, watching as a continual present appears out of the future and disappears into the past. This association of time with the image of a physical object like a river only serves to muddy the waters (sorry). Since time is merely a concept created by our minds, the attribution of the verb 'flow' to describe it is misleading and nonsensical; because as a mere concept it has no physical presence within the Field of Play, and thus it cannot possibly flow.

The Australian philosopher Jack Smart wrote: "Talk of the flow of time . . . is a dangerous metaphor that must not be taken literally. . . .Certainly we feel that time flows, [but] this feeling arises out of metaphysical confusion." (238) Smart concluded that

the 'flow of time' is merely an illusion. We agree that “Talk of the flow of time” is merely a “metaphor that must not be taken literally,” but we think that this image is not so much dangerous as it is simply confusing and misleading. Nor do we think that the feeling of the flow of time which we all experience “arises out of metaphysical confusion,” which implies that an intellectual stance has been taken. Rather, we believe that 'the feeling that time flows' arises directly from the way in which our Awareness Connectivity System processes information. This view is consistent with our overall conclusion that time is all in our heads.

There was a time in the late 1990's when your author agreed with the conclusion reached by Smart, and by Buddhism, that time is just an illusion. But, of course, the Buddhists believe that all of existence is illusory. Ontologically speaking, in the final analysis we believe that this Buddhist belief is correct. While objects appear to be different from one another, ultimately they are all manifestations of one thing: the Mind of God, illusory variations on the single theme of be-ing. Recognition and acceptance of this fact is, we believe, necessary, indeed vital, to the future continuation of human civilization. Nevertheless, the day-to-day realities we experience within the Field of Play *simultaneously* demand our awareness of the fact of individual in-the-present existence of separate things, temporary expressions of the Mind of God though they may be. The hammer which accidentally comes into contact with your thumb is quite separate from your thumb.

However, since then, our understanding of the nature of time has evolved. We are indebted to the writing of Paul Davies who, in his book *About Time, Einstein's Unfinished Revolution,* introduced us to the ideas of physicist and philosopher David Park. Davies wrote:

> “For Park, the passage of time is not so much an illusion as a myth, 'because it involves no deception of the senses.'” (239)

We now believe that labelling time as a myth rather than as an illusion provides a much more profound understanding of the nature of time. The Oxford English Dictionary defines an illusion as a "sensuous perception of an external object involving a false belief." Time, therefore, cannot be an illusion because it is not perceived through our senses nor is it an external object, it is merely a concept. Time is different than, say, the counter top in your kitchen which is an external object which our sense of touch leads us to falsely believe is a solid object, even though we know that it is made of atoms which themselves consist mostly of 'empty' space. The apparent solidity of the counter top qualifies as a genuine illusion. The apparent passage or flow of time does not.

On the other hand, the OED defines a myth as a "purely fictitious narrative embodying popular ideas on natural phenomena." This is a very accurate description of the phenomenon we call time. Although the subscribers to the Special Theory of Relativity claim otherwise (in due course we will demonstrate that they are mistaken,) there is no unchallenged or reliable evidence to support the proposition that a phenomenological entity identified as time exists in the universe, and therefore the idea that time exists is indeed "purely fictitious." And equally important, it is a "narrative" that is passed on from generation to generation. In the West (and we suspect increasingly in all cultures) as soon as children can count from one to twelve we teach them to 'tell' the time. The idea that time exists is inculcated, whether purposely or not, into our children's minds at a very early age. They are, in effect, brain-washed by this myth. The idea that time exists is a mythical narrative that is drilled into the minds of our young in exactly the same way as is the myth that a man once caused the waters of the Red Sea to part; or the myth that a man came back from the dead; or the myth that an angel repeatedly visited a man over a period of twenty years, putting into his mouth the word of God.

In the 1970's scientist Richard Dawkins introduced to the world the idea of 'memes.' Dawkins defined memes as a new kind

of replicator, similar to the replicators known as genes, but which do not replicate physically in the body, but, rather, replicate psychologically in "the soup of human culture." In *The Selfish Gene* Dawkins wrote:

> "Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or building arches. Just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation." (240)

We believe that the idea that time 'exists' is one of the earliest memes ever created. It is certainly one of the most persistent and successful memes in the history of humankind.

Chapter Thirty-seven

THE INVALIDATION OF SPECIAL RELATIVITY PART 1

* * * * * *

Having completed our whirlwind tour of the history of the idea of time, we are now ready to confront Albert Einstein's conception of time as he laid it out in his Special Theory of Relativity. In order to debunk the Special Theory, we will have to state its claims clearly and explore its consequences for our understanding of time, particularly of the understanding of most, if not all, of the members of the physics community. This process will involve the necessity of bringing to the attention of the reader the writings of some of those who have drunk deeply of the Special Theory Kool-aid, and who fervently believe that the depiction of time as described by the Special Theory is correct. As you read their accounts of the consequences of the Special Theory, you may well find their arguments to be, at least on the surface, logical and

sound; and yet at the same time you may find yourself to be in a state of confusion. This is perhaps inevitable, for the purveyors of these arguments are themselves in a state of confusion which has lasted for more than one hundred years. However, you may rest assured that we will demonstrate conclusively that the Special Theory of Relativity is invalid, and its supposed consequences are nonsensical and/or logically flawed, and so when you find yourself beset by doubt and confusion here is what we want you to do: get up out of the chair you are sitting in, take a deep breath, click your heels together three times, and repeat the following:

Time is a system of measurement, a myth and a meme. As such, it is a pure concept which has no phenomenological presence in the universe independent of the human mind. This means that time does not exist. Therefore, since time does not exist, it cannot flow, it cannot be physically travelled through, and it most certainly cannot dilate, or slow down.

Be not afeared my friends, all will become clear.

Before proceeding any further we must first deal with a matter of terminology. Throughout this work we have been referring to what was once known as the "luminiferous ether" as "space-time." There are a couple of reasons why we decided to employ this terminology.

Very early in these pages we mentioned the ideas of Einstein's former mathematics teacher, Hermann Minkowski, who, in a lecture delivered in 1908, three years after the publication of the Special Theory, stated, "Henceforth space on its own and time on its own will decline into mere shadows, and only a kind of union between the two will preserve its independence." On the occasion of that first reference, we questioned whether or not the union of those two terms would turn out to be wise. Well, the jury is in, and it turns out that the joining of those two terms was a serious ontological error. It was a serious error because it merged into one concept something that has an actual phenomenological

presence in the universe - - - space (the luminiferous ether) - - - with something which has no phenomenological presence in the universe - - - time. Of course, because of the widespread misinterpretation of the results of the Michelson-Morley experiment, Minkowski did not believe that the luminiferous ether (space) has a phenomenological presence in the universe. Ironically though, Minkowski must have believed that it is time which has a phenomenological presence in the universe, for he accepted the Special Theory's claim of time dilation, and how can something dilate unless it exists?

Minkowski dealt with this confusing merger of two disparate ideas by turning them into a mathematical abstraction (he was, after all, a Professor of Mathematics) in which he combined the three dimensions of space with a new fourth dimension - - - the 'dimension' of time. Minkowski developed a set of equations with which one could identify any two points in space and any two moments in time, and then calculate the so-called "space-time interval" between them. Interestingly, Paul Davies noted that:

> "Einstein himself wasn't too thrilled with the unified spacetime idea at first, dismissing Minkowski's new four-dimensional geometry as 'superfluous' pedantry, but he came around to the idea in due course." (241)

The problem with Minkowski's 4-dimensional space-time geometry is that it gives the impression that time is in some mysterious manner substantial. A wooden box is a three-dimensional object. Each of its dimensions is substantial, that is, each dimension is made of something: wood. By declaring time to be the fourth dimension, Minkowski erroneously endowed time, which is merely a concept, with something it does not possess: a phenomenological presence in the universe.

Because the believers in the Special Theory (virtually the entire physics community) do not see this problem as a problem,

Minkowski's four-dimensional space-time continuum concept became widely accepted as an accurate depiction of the fundamental nature of the universe, both within and without the world of Science. Cosmologists and astrophysicists alike refer to the four-dimensional 'fabric' of space-time, knowing full-well that Minkowski's concept is only a mathematical abstraction, yet are forced to resort to the use of the word 'fabric' to make sense of the phenomenon of gravitational waves. (Similarly, physicists avoid dealing with the gap in their logic regarding the existence of light waves without a medium through which said waves can propagate (the luminiferous ether) by conceiving of light to be made of 'photons', even though the 'anticorrelation' experiment of Alain Aspect and others demonstrated conclusively that natural light is a wave, not a particle, phenomenon.)

So when we began our exploration of the fundamental nature of the universe, we were presented with three choices when it came to choosing a name for the immaterial 'stuff' which is the foundation of the Field of Play. We could have reverted to the term the 'luminiferous ether,' but that concept has been so thoroughly (if incorrectly) discredited in scientific circles that we feared that no one would take our arguments seriously if we employed that particular terminology. We could have simply used the word 'space' right from the beginning, but we were concerned that its association with the idea of emptiness would have made it difficult for people to grasp the idea that space is a thing which has a phenomenological presence in the universe, albeit an immaterial one. So we settled on the term 'space-time' as our descriptor for the fundamental stuff of which the Field of Play is made because most people would be familiar with it and with its association of the notion of a 'fabric,' which would help the reader understand that space-time has a real (though immaterial) existence.

But the moment has arrived for us to perform a terminological, and therefore conceptual, clarification. Henceforth we will simply use the label 'space,' not 'space-time,' to describe the fundamental stuff of which the universe is made. This is because

space, though it be immaterial, has a phenomenological presence in the universe while time, being a mere concept, does not. Space exists. Time does not. Thus we say it is the curvature of space in the presence of matter that creates the phenomenon we call "gravity". It is the presence of space which makes possible the propagation of electromagnetic radiation from one point in the universe to another. It is space through which the electrons of an atom move as they orbit the atom's nucleus. It is space which fills the gap between you and your television screen across the room. The Field of Play is made of immaterial space which envelopes and permeates all the material objects (excepting neutron stars) contained within the Field of Play. Space is not made out of matter; matter is made out of it. Space is the Mind of God made manifest.

So if you should ever decide to invest some more of your valuable time in a re-reading of this book, you may safely substitute the word "space" whenever you encounter the phrase "space-time" (except during our discussion of the ideas of Hermann Minkowski), and know that you are on the correct path. We apologize for any confusion our choice of words may have caused in the minds of our readers, but we hope that we have now made ourselves clear.

We may now turn our attention to the nitty-gritty of the task of disentangling the web of confusion known as the Special Theory of Relativity. As we work our way through this web, reader, bear in my mind at all times that the Special Theory of Relativity rests *entirely* upon the *assumption* that the speed of light is constant for all observers; that is, that light does not behave in accordance with the Galilean transformations.

What motivated Albert Einstein to create the Special Theory? He was driven to its conclusions not by the discovery of any new empirical evidence about the nature of the universe, but for purely mathematical reasons. Einstein discerned that:

"There was a subtle but deep mathematical

> mismatch between Maxwell's theory of electromagnetism and Newton's laws of motion. Newton's laws were regarded as the founding dictum of physical science, and had long served as a model for all scientific description of change. . . . And yet they came into conflict with electromagnetic theory not just in a technical detail, but in the most basic manner, in the way that they incorporated the concept of motion." (242)

At the root of the problem lies a serious misconception about so-called 'relative motion.' Paul Davies describes this widely accepted misconception as follows:

> "The word 'relativity' here refers to the elementary fact that the *appearance* (emphasis added) of the world around us depends on our state of motion: it is 'relative.' This is obvious in some simple respects even in daily life. If I am standing on the station platform the express train roaring by appears to be moving very fast, whereas if I am riding in the train it is the station that looks to be rushing by. This obvious and uncontentious relativity of motion was known to Galileo and built into Newton's mechanics in the seventeenth century. What Einstein subsequently discovered is that not just motion, but space and time too are relative." (243)

"This obvious and uncontentious relativity of motion" is a concept which is flawed at a very basic level. While for the passengers on the train the platform appears to be rushing by, every one of those passengers knows perfectly well that it is they, and not the platform, which is in motion. The platform is fixed to the

Earth, while the train is in motion across the Earth's surface. The apparent motion of the platform is an illusion, and to associate the concept of motion with the platform in any way, other than its motion through space as part of Earth's motion through space, is a conceptual error. The whole notion of motion is very slippery and is fraught with illusory experiences. When you are flying in a plane at 10,000 metres, unless you look out the window or the plane encounters turbulence, you experience no sensation of being in motion at all even though you are moving at several hundred kilometres per hour relative to the Earth. Similarly, as you sit in your chair reading these words you experience the illusion of being at rest, even though you are rocketing through space at several hundred km/second. It is a serious error to base one's analysis of a fundamental facet of how the universe functions upon an illusion. As we shall see, this is not the only instance in the development of the Special Theory where incorrect conclusions were based upon illusory evidence.

It is not the train's motion relative to the station platform *per se* which is the factor of prime significance; the most salient factor in this situation is the velocity of the train, relative to the velocity of the platform, relative to the frame of reference which is common to both: in this case, the Earth. Obviously, the velocity of the platform relative to the Earth is zero. So the velocity of the train relative to the Earth is equal to the velocity of the train relative to the platform.

Let's consider two scenarios, one in which the train has a velocity of 50 km/hour, and another in which the train has a velocity of 100 km/hour. In both cases motion is perceived, and in both cases the passengers on the train experience the illusion of the station platform moving past them. Motion is motion. What is relative in each of these scenarios is the velocity of the train compared to the Earth, since the platform is fixed to the Earth. In general, it is velocities which are relative, not motion. "But," you might object, "velocity is just a way of measuring motion." So it would seem, on the surface. But the truth is more subtle than that.

Motion permits change, but velocity is the factor which determines the distance (the amount of space) a body will travel in an arbitrary amount of time. It is velocity which determines the amount of change that takes place in a given situation. In our example of the train and the station platform, it is not the mere fact of the train's motion *per se* which is of prime importance; rather, it is the velocity of the train relative to the velocity of the platform which is of primary significance.

Of course, in a situation where both bodies are simultaneously in motion relative to a given frame of reference (say, the Earth) the velocity associated with those two bodies will be relative to their individual velocities. This is what we demonstrated in our earlier example of two vehicles moving at uniform velocities towards one another. In that case, the vehicles' velocity relative to one another - - - the rate of their approach towards each other - - - was equal to the sum of their respective individual velocities. This is also true for our example of the train and platform. If the train is moving with a constant velocity of 100 km/hour, then its velocity relative to the platform (their rate of approach towards one another) will be the sum of its velocity - - - 100 km/hour - - - plus the velocity of the platform - - - 0 km/hour - - - equals 100 km/hour.

Why are we once again belabouring the seemingly obvious? We are doing so because Einstein generalized the notion that "space and time too are relative" from the idea that motion is relative. But as we have just demonstrated, it is not the mere motion of bodies which is relative, motion is simply motion; what is relative is the velocities attached to those bodies. Einstein's failure to appreciate this subtle distinction eventually led him to the erroneous assumption that the speed of light is constant.

While this failure to understand clearly the fundamental issue regarding the motion of one body moving past another contributed to Einstein's confusion, the primary difficulty lay with where he placed his emphasis in his analysis of the problem of relativity. Einstein based his analysis on the concept of time. The

day after the evening during which he had completely "solved" the problem, Einstein said to his close friend Michael Besso with whom he had been discussing the issue:

> "Thank you. I've completely solved the problem. An analysis of the concept of time was my solution. Time cannot be absolutely defined, and there is an inseparable relation between time and signal velocity." (244)

It is completely accurate to state that "there is an inseparable relation between time and signal velocity," but Einstein went from this observation to a consideration of the effects of motion upon the experience of simultaneity, an aspect of time. In so doing, he elevated time to a position of importance which is not warranted.

Three factors come into play when considering a situation where a signal is being sent from one point to another. The primary factor to be considered is the distance between the two points; the distance between the two points we call the 'determinant' factor. For simplicity's sake we will imagine our two points to be fixed in space: two towns 100 km apart. Max, in town A wishes to send a message to Luna, who is in town B. Living in the times before the invention of fax machines or the internet, Max has two options available to him. He can phone Luna, in which case his message (the signal) will be delivered to Luna at the speed of light. Or, if he wants Luna to have a written record of the message, he can hand a letter to a courier who will drive to town B at a rate of say 50 km/hour and deliver the message to Luna.

If Max chooses to phone Luna, his message (the signal) which he wishes to send her will traverse the 100 km distance between towns A and B almost instantaneously. On the other hand, if he chooses to send his message by courier, it will take two hours for the signal to reach Luna, assuming that the courier does not stop for lunch along the way. The key point is that the velocity of each

method of sending the message is different; the velocity attached to each method of sending the message varies. So, in general, we can say that the second factor which comes into play when considering a situation where a signal is being sent from one point to another is the velocity with which the signal is sent. Thus velocity is the 'variable' factor.

The third factor which comes into play in the sending of a signal from one point to another is the amount of time it takes for the signal to travel between the two points. This factor depends entirely upon the distance between the points (the determinant factor), and the velocity with which the signal is sent (the variable factor). We can express this relationship mathematically with the equation time = distance / velocity. Thus the time factor varies with either the distance or the velocity factors. Time is therefore considered to be the 'derivative' factor.

Einstein's analysis of the problem he was confronting in terms of time, the derivative factor, instead of distance, the determinant factor, led him to a confused understanding of the relativity of simultaneity, which in turn led to a number of other erroneous conclusions.

To expose the flaw in Einstein's understanding of the relativity of simultaneity, we must first present that understanding as it is currently commonly accepted. To do this we will present a copy of Einstein's analysis of the relativity of simultaneity as presented by Dan Falk in his book, *In Search of Time*, complete with the accompanying diagrams. Falk's heading for this section of his book is *"The Problem of 'Now'."*

> "The slowing down of fast-moving clocks is just one of the ways in which special relativity assaults our common sense view of time. It also forces us to re-think the idea of simultaneity. We say that two events are simultaneous if they happen at the same time; in Newton's world, this was a very straightforward idea. But in Einstein's

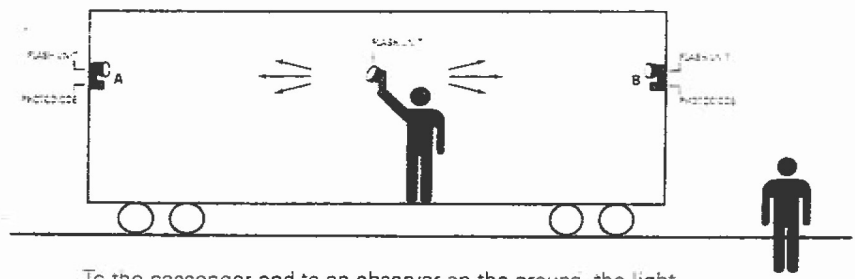
universe, we have a problem: two events that may be simultaneous for me may not be simultaneous for you, *depending on our relative motion.* (emphasis added) This is called the "relativity of simultaneity."

"Suppose . . . that we have a railway car . . . equipped with a couple of simple gadgets: at either end of the car we install a camera's flash unit along with a photodiode, and we wire it up so that when light, from any source, hits the photodiode, it triggers the flash (page 491, diagram (a)). (We can imagine that the car is dark enough that unless we introduce extra light, the flash units just sit there and do not fire.) Lets call the unit on the left A and the one on the right B. Now I take up a position in the middle of the car, halfway between A and B. I have a third flash unit, which I am holding in my hand. If I set off the flash, what happens? Light from the flash reaches A and B at the same time, and forces them both to fire. From my perspective, the flashes triggered at A and B are simultaneous.

"Now imagine that the railway car is moving along from left to right, at some speed close to the speed of light (page 491, diagram (b)). Standing in the middle of the car, I set off my flash and again see the flashes at A and B as simultaneous. (Einstein's first postulate demands this; it simply says that I can equally well describe myself as being at rest, with the station and the platform speeding by.) But what does an observer on the ground see? From her perspective, the back of the car (A) is "chasing" the beam of light, while the front of the car (B) is running away from it. From her point of view,

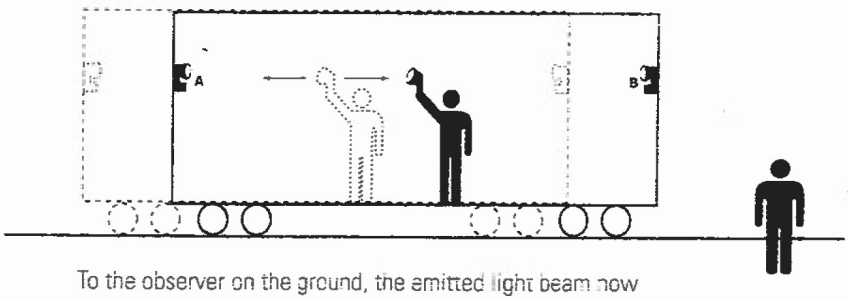
Why Simultaneity Is Relative

a) Flash emitted from center of stationary train car



To the passenger and to an observer on the ground, the light from the flash emitted at the center of the car reaches the two ends of the car at the same time. The photodiodes trigger the secondary flash units at A and B simultaneously.

b) Flash emited from center of car as train moves near speed of light



To the observer on the ground, the emitted light beam now reaches A first, as the back of the train "catches up" to the beam of light. He sees the secondary flash unit at A fire before the unit at B fires. The events at A and B – still simultaneous for the passenger – are no longer simultaneous for the observer on the platform.

FIGURE 6

the beam travels a shorter distance to reach A than it does to reach B. According to Einstein's second postulate, she sees the beam itself moving at the usual speed, c - - - and concludes that the time needed for the beam to reach A, and trigger its flash, is less than the time needed for the beam to reach B. In other words, she sees the flash at A before she sees the flash at B. The events are no longer simultaneous." (245)

Before we get into the logical flaws contained in the above account we should note two things. One is that we have not yet in these pages stated specifically the two "postulates" upon which Einstein based the Special Theory. We shall do this in due course. The second thing we wish to note is a terminological quibble we have with Falk's use of the word "chasing" in the phrase "From her perspective, the back of the car (A) is "chasing" the beam of light." The word "chase" usually implies the pursuit of something which is moving away from you. It is important that the reader be clear in their mind that in the situation described by Falk "the back of the car (A)" and the beam of light emitted by the flash unit in the centre of the car are rushing towards one another.

Having clarified that matter we are ready to begin. For starters, let us state clearly that the "relativity of simultaneity" is a true phenomenon in the universe. Events that appear to occur at the same time for one observer may appear to occur at two different times for another observer. But the idea that this phenomenon depends on the relative motion of the observers is completely erroneous. As we will demonstrate in a moment, it is quite possible for this phenomenon to occur even when all relevant observers are at rest relative to one another. The phenomenon of the relativity of simultaneity does not depend on the relative motion of the observers; it depends entirely on the position of the observers relative to the source of the signal. What is of consequence is the total distance the beam(s) of light must travel before it reaches the

observer. This is so because in the analysis of any signal/observer situation, it is the *distance travelled* by the signal which is the determinant factor.

To demonstrate this we will conduct a different thought experiment in which all observers are at rest relative to one another. Since this is a "thought" experiment we can stipulate certain conditions that are not possible in a real-life situation. This is acceptable as long as the outcome of the experiment is consistent with what would occur if the stipulated conditions actually did exist. In this thought experiment we are going to stipulate two impossible things: first, we are going to slow the speed of light to 1 km/second, and second, we are going to stop the Earth from moving through space; that is, in this experiment the Earth will be at rest. We make the first stipulation so as to make it easier for our imaginations to picture the distances involved in the experiment. Without this stipulation we would have to imagine the experiment being carried out over hundreds of thousands of kilometres; with this first stipulation in place, we will be able to imagine the experiment being carried out over a distance of 4 km. We require the second stipulation because with such a low speed of light (1 km/second), the Earth's velocity through space (30 km/second) would blur and interfere with the results of our experiment.

Imagine two short towers situated 4 km apart. Mounted on each tower is a radio receiver and powerful searchlight which will flash on and off once when the radio receiver receives a signal. The two search lights are pointed at each other, and one will flash in red light, the other in green light. Situated in between those two towers, precisely 2 km from each, is a third tower. Mounted on it is a transmitter which is capable of sending simultaneously a signal to each of the receivers on the other two towers.

There are 3 observers in this experiment. One is situated 1 km from the red tower and 3 km from the green tower; one is situated 1 km from the green tower and 3 km from the red tower; one is situated at the central tower, 2 km from both the red and green towers. Each observer is equipped with a specialized pair of

binoculars. These binoculars are constructed so that the collecting lenses are each rotated 90 degrees in the horizontal plane to the lenses in the eyepieces. These binoculars allow the observers to look in two opposite directions simultaneously. The experiment will be carried out at night so that the beams of light from the search lights will be more visible.

When each of the observers is in their appointed positions and looking through their binoculars, the centre tower transmitter sends a signal to the receivers on the red and green towers. The speed of this signal is irrelevant to our experiment as long as it is the same in both directions. The receivers on each tower receive this signal at the same moment in time, causing the red and green searchlights to flash simultaneously. What is the experience of the observers?

Even though the two searchlights flashed simultaneously, the observer who is 1 km from the red tower will see the light from the red searchlight 2 seconds before she sees the light from the green searchlight. The observer who is 1 km from the green tower will see the light from the green searchlight 2 seconds before he sees the light from the red searchlight. Thus, although the two searchlights flashed simultaneously, both of these observers will experience the illusion that the searchlights flashed 2 seconds apart. Meanwhile the observer in position at the centre tower will see the red and green lights at the same time, concluding, correctly, that the searchlights flashed simultaneously.

The three observers all have different experiences even though the searchlights flashed simultaneously, and more to the point, even though they were all at rest relative to one another. This thought experiment demonstrates that the relativity of simultaneity does not depend on the relative motion of a given observer as claimed by Einstein; rather, it depends on the total distance which separates the source of the signal from the observer which the signal must travel to reach the observer.

Now, if the observer is in motion during the period in which the signal is travelling from the source to the observer, this

will affect the location in space and thus the point in time at which the observer receives the signal. If the observer is in motion towards the source of the signal, she will receive the signal sooner than if she had been at rest relative to the source of the signal. If the observer is in motion away from the source of the signal, she will receive the signal later. This is not due to some weirdness about motion or time. This is because if the observer is in motion towards the source of the signal she will receive the signal sooner because the distance between the source of the signal and the observer is being constantly reduced. Conversely, if the observer is in motion away from the source of the signal, she will receive the signal later because the distance between the source of the signal and the observer is being constantly increased. In either case, it is not the motion of the observer *per se* which determines the timing of the observer's receiving of the signal. What determines that timing is the total distance travelled by the signal from its source to the observer. Distance is the determinant factor.

"But," says our wide-awake reader, "motion in that case determines distance, so isn't motion the determinant factor?" It is true that motion affects the distance the signal must travel to reach the observer if the observer is in motion. But as our thought experiment with the red and green searchlights demonstrates, it is possible for the phenomenon of the relativity of simultaneity to occur even when there is no motion involved whatsoever. The idea that the relativity of simultaneity depends upon the relative motion of the observers is a mirage.

Returning now to Falk's example, Falk's analysis of the situation presented in the diagrams on page 491 neglects to include a significant factor. Falk's account fails to take into consideration the fact that both the passenger and observer do not 'see' the light emitted by the flash units at A and B until that beam of light has traversed the distance between them and the flash units, whatever that distance may be. The passenger and the observer do not 'see' the light from the flash units when the flash units flash. They 'see' the flash units flash when the light emitted by the flash reaches

their retinas, which only occurs after the beams of light have travelled the distance between the flash units and the observers. The inclusion of this factor allows us to more fully understand the situation.

Bearing this factor in mind, we can now examine Falk's description of what happens when a flash is emitted from the centre of a stationary train car (p. 491 diagram (a)). Falk says: "To the passenger and the observer on the ground, the light from the flash emitted at the centre of the car reaches the two ends of the car at the same time." This much is true. He goes on: "The photodiodes trigger the secondary flash units at A and B simultaneously." This too is true, but it is not the whole story. Whether or not either the passenger or the observer experiences the simultaneity of the flashing of the units at A and B depends entirely on the position they are in while the experiment is being carried out, because the light from the flash units at A and B will have to travel to that position (wherever it may be) before the passenger or the observer 'sees' the flash units flash.

Let us examine the situation from the point of view of the passenger. We accept that the flash units at A and B have flashed simultaneously. If the passenger is situated at the centre of the train car (as he is in Falk's account), then he will have the experience of the flash units flashing simultaneously because each beam of light from A and from B will travel an equal distance through the train car to the passenger, since he is positioned halfway between the two. However, he will experience that simultaneity if, and only if, he maintains that position.

Imagine that the flash unit which the passenger holds in his hand is instead suspended from the ceiling of the train car, still halfway between A and B, and that it can be activated remotely. If the passenger is situated in any location at all other than the halfway point between A and B, he will not experience the flashes of A and B as simultaneous, even when they are, in fact, simultaneous. If the passenger is situated say, halfway between the flash unit suspended from the ceiling and flash unit A, when the

flash units at A and B flash (simultaneously) he will see the beam of light from flash unit A before he sees the beam of light from flash unit B, because the distance from flash unit A to the passenger is shorter than the distance from flash unit B to the passenger. This analysis holds true for every position in the train car the passenger may be situated in other than the position which is exactly halfway between flash units A and B.

Having said that, we must acknowledge that in a real-life situation, it will seem to the passenger that the flash units at A and B flash simultaneously no matter where he is situated in the train car. If he is situated in a position other than the centre of the car, he will not be aware that the beams of light from A and B did not reach him simultaneously, even though that is in fact the case. This is because the speed of light is so fast and the distances involved are so small, and because the human Awareness Connectivity System is incapable of discerning as separate, events which are only a few billionths of a second apart.

We can make what actually happens more apparent by conducting another thought experiment in which we slow the speed of light down to say, one metre/second - - - this is the approach we took in the thought experiment involving the red and green searchlights - - - or we could imagine the train car to be hundreds of thousands of kilometres long. In either of those scenarios, we could demonstrate clearly that the passenger actually experiences the simultaneity of the flashes at A and B if, and only if, he is situated in the centre of the train car. The unavoidable conclusion is that in a real-life situation, unless the passenger is situated at the centre of the train car he will, like the passengers in the train watching the station platform slide past them, be experiencing an illusion.

This same line of reasoning applies to the observer on the ground. Their experience of simultaneity or non-simultaneity depends entirely on their position relative to the flash units at A and B. This analysis confirms what our own thought experiment demonstrated: that it is the distance between the source of a signal

and any given observer that determines whether or not the occurrence of two disparate events will be experienced by that observer as simultaneous. The presence of motion is a complicating factor, but it is extraneous to our analysis and understanding of these situations.

To demonstrate this further, we will now examine diagram (b) on page 491 along with Falk's explanation. Diagram (b) is titled "Flash emitted from centre of car as train moves near speed of light." (To simplify our discussion we will label the position at the centre of the car as C.) Underneath the diagram, Falk offers the following explanation of events: "To the observer on the ground, the emitted light beam now reaches A first, as the back of the train "catches up" to the beam of light." This statement is true enough, but once again Falk's terminology is unfortunate. The beam of light emitted at C towards A is not moving away from the back of the train, and so the back of the train does not "catch up" to the beam of light. The beam of light and the back of the train (to which the photodiode and the secondary flash unit A are attached) are in motion towards each other, and will run into each other head-on. Falk continues: "He [the observer on the ground] sees the secondary flash unit at A fire before the unit at B fires." Whether or not this statement is true actually depends on the position of the observer relative to the train car when the flash units at A and B fire, but for the purposes of this discussion we will assume that the position of the observer relative to the train car is such that Falk's statement is a true and accurate description of what the observer experiences, and further, and most importantly, we agree that this statement is a true and accurate description of what actually occurs. In the accompanying text Falk states: "From her [the observer on the ground] *point of view* (emphasis added), the beam travels a shorter distance to reach A than it does to reach B." This is a misleading statement. That the beams from C travel a shorter distance to reach A than to reach B if the train is in motion is an indisputable fact, which is completely independent of any particular observer's point of view. Under every set of

circumstances in which the train is in motion as depicted in diagram (b), regardless of the train's specific velocity (it does not need to be near the speed of light), the beam of light from C will reach the photodiode at A before the beam of light from C will reach the photodiode at B. As long as the train is in motion, the flash unit at A will *always* fire before the flash unit at B, completely irrespective of the experience of any observer, passenger or otherwise.

Falk continues: "The events at A and B - - - *still simultaneous for the passenger* (emphasis added) - - - are no longer simultaneous for the observer on the platform." But we have just established that if the train is in motion, flash unit A will *always* fire before flash unit B. How can it be that for the passenger at C the flash units at A and B *appear* to fire simultaneously while the train is in motion?

We begin by noting that as is the case when the train car is stationary, the passenger on the moving train will experience the simultaneity of the firing of the flash units at A and B if, and only if, he is positioned at C. At any other location in the car the light beams from the flash units A and B will intersect with the passenger in a one/two sequence, although these two events will follow so closely one upon the other that the passenger cannot consciously discern any distinction in time between them. The fact of the train's motion will have no effect on this outcome.

Now to the main question: since the train is in motion, the flash unit at A will always fire before the flash unit at B. Why does the passenger situated at C experience the flashes as being simultaneous? The reason that a passenger situated at C will experience the flashes as being simultaneous is because the sum of the distances the light beams travel from C to A, and then back again from A to C, is equal to the sum of the distances the light beams travel from C to B, and then back again from B to C. Since all four light beams all travel at the same speed - - - 300,000 km/second - - - they will travel these equal distances in equal amounts of time. Thus the passenger will have the experience that

the flash units A and B fired simultaneously, even though in fact flash unit A fired before flash unit B. The passenger at C has experienced an illusion.

When the train is stationary, the distances CA and CB are fixed and are equal, and so the passenger at C experiences the firing of the flash units at A and B as simultaneous. But when the train is in motion, the actual distance the beam of light from C must travel before activating the photodiode at A will be less than the distance CA. How much less depends on the velocity of the train. And the actual distance the beam of light from the flash unit at A must travel before reaching the retinas of the passenger situated at C will be greater than the distance CA by the same amount (this is assuming that the train is moving at a constant velocity.) However, the total distance travelled by the two beams of light will always be equal to 2 x CA. The same analysis applies to the two beams of light travelling between C and B, only in reverse. The beam of light travelling from C to B will be the longer leg of the round-trip journey, while the beam of light travelling from B to C will be the shorter leg. The total journey will be equal to 2 x CB. Since CA = CB, the passenger at C will experience the firing of the flash units at A and B as simultaneous, *even though that is not in fact what occurred.*

Note that except for the recognition of the fact that light will travel equal distances in equal amounts of time, the time factor plays no role in our analysis of the two situations. Whether the train is stationary or in motion, all the occurrences which take place are entirely explainable in terms of the distance factor: the actual distances the beams of light must travel uniquely determine the experiences of the participants in this thought experiment. The inclusion of the time factor, which Falk introduces at the end of his commentary, is unnecessary and completely extraneous to our understanding. As for relative motion, motion is obviously the key difference between a stationary and a moving train. But our thought experiment involving the red and green searchlights clearly demonstrates that the relativity of simultaneity can be experienced

when no motion is present. In Falk's thought experiment the relevance of motion is limited to the specific velocity of the train, which determines the length of the individual legs of the light beams' journeys, but does not effect the essential fact that the sum of those legs always equals 2 x CA and 2 x CB.

Earlier we stated that in the analysis of signal/observer situations, velocity is the variable factor, and so it is here. In that earlier discussion of a message sent by Max to Luna, it was the velocity of the signal that varied. In Falk's thought experiment, the velocity of the signals (the beams of light) is the same for all instances, that is, it does not vary; but the velocity of the setting (the train car) is subject to variation.

So what can we conclude from all of this? Physicists would say that the main point is that the passenger has the same experience when his frame of reference (the train car) is in motion at constant velocity as he does when his frame of reference is stationary, and that there is no way for the passenger to distinguish between the two experiences. Our reply to this observation is that while it is true, the larger point is that when stationary the passenger experiences what actually occurs, but when in motion what the passenger experiences is an illusion.

The heading above Falk's diagrams says: "Why Simultaneity is Relative." The diagrams and Falk's commentary underneath them lead one to conclude that the relativity of simultaneity depends upon the relative motion of observers. But our careful analysis of those diagrams reveals that this is not the case. The relativity of simultaneity depends not on motion, but on the distance a signal (or signals) must travel from its source to any given observer. Distance is the determinant factor.

Now, the distance between two objects is a matter of measurement. We measure distances by standard units of measurement, be it centimetres, metres, kilometres, or for very great distances, in light-years, the distance light travels in one year. When we measure the distance between two objects, what are we actually doing? What is it that is actually being measured? What

is being measured is space, the amount of space, between object A and object B. Space is thus very real and very present. As the ancient Greek philosopher Democritus (460 – 360 B.C.) perceived, the universe consists fundamentally of two classes of things: atoms (matter) and space. In considering Falk's thought experiment concerning the relativity of simultaneity, it was by concentrating on the amount of space between the flash units and the two observers that we were able to satisfactorily explain the events which occurred. The acknowledgement of the amount of space involved was fundamental to our understanding, because space is fundamental; it exists. Time, on the other hand, is a mere concept which has no phenomenological presence in the universe independent of the human mind, and is only the derivative factor in signal/observer problems.

As for relative motion, it is a trickster. The reliance upon the notion of relative motion as the lens by which to examine the fundamental workings of the universe has resulted in the granting to mere illusions the status of actual occurrences. Obviously, this is an unsound foundation upon which to build the edifice of empirical facts which inform us about the nature of being.

Underlying our forgoing discussion of the relativity of simultaneity is our struggle to understand Einstein's thought processes as he developed the Special Theory. Einstein himself was always somewhat reticent about how he brought the Special Theory into the light of day.

> "[Einstein] was later to declare that [the relativity principle in electrodynamics] had been his 'life for over seven years and this was the main thing,' but he found it difficult to retrace the development of his ideas over that period." (246)

As we noted earlier, at the end of the 19th Century there was a problem in physics which consisted of ". . . a subtle but deep mathematical mismatch between Maxwell's theory of

electromagnetism and Newton's laws of motion." (247) It was this mismatch which Einstein sought to resolve. In a draft of an article published in the science publication Nature in 1920, Einstein stated that "[The] phenomenon of magnetoelectric induction compelled me to postulate the [special] relativity theory."(248) As we stated earlier, Einstein himself said that an analysis of the concept of time was the key to his solution. Einstein's biographer Albrecht Folsing claimed that "Einstein's analysis started off with the question of what is meant by simultaneity in two different places." (249) We have seen (from Falk's description) that Einstein based his analysis of simultaneity on the concept of relative motion, and we have seen how that analysis results in a flawed understanding of the relativity of simultaneity.

However, the question is how, in light of his analysis of the relativity of simultaneity, did Einstein arrive at the assumption that the speed of light is constant, that is, that light does not behave in accordance with the Galilean transformations? As a result of his analysis of the relativity of simultaneity Einstein concluded that like motion, time and dimension must be relative. Did he come to this conclusion because he assumed that the speed of light is constant; or did he assume that the speed of light is constant because his analysis of the relativity of simultaneity led him to believe that time and dimension are relative?

The historical record is entirely unclear. In a footnote to the Nature article referred to above, Einstein wrote, " The difficulty to be overcome was in the constant nature of the velocity of light in a vacuum, *which initially I thought I would have to discard."* (250) (emphasis added) Folsing follows this quote with the following comments:

> "This is one of the few indications of endeavours in the course of which [Einstein] intended to do without the universally constant velocity of light, inherent in the theory. The velocity of light was to be constant only for an observer stationed next

> to the light source, whereas all observers moving relative to that source would measure a different value, depending on their on relative velocity with regard to the source. That was not only plausible but also in line with Einstein's ideas on light quanta." (251)

Einstein's own words make clear that at one point in his deliberations he harboured serious doubts about the constancy of the speed of light. What changed his mind? No one knows. In his biography of Einstein, Folsing writes:

> "Einstein's paper of 1905 reveals nothing of the background to his stroke of genius, and in later years he always referred to it with regrettable brevity. . . . Whenever the genesis of the theory came up in conversation, Einstein expressed himself "in a strangely impersonal manner. He called the hour of birth of the relativity theory 'the step.'" Thus we know that the hour of birth was that fine May evening when Einstein discussed his "difficult problem" with Besso, and we also know that Einstein found his solution by "an analysis of the time concept." But just what the two of them discussed, and how the crucial idea emerged, and how Einstein, immediately afterward, "completely solved" his problem - - - all that remains concealed in the darkness of a night in May." (252)

What was "the step?" On this we can only speculate, but we suspect that "the step" was Einstein's decision *to assume* that the speed of light is constant for all observers.

We are now ready to dive into the depths of the Special Theory of Relativity. In order to be able to explain to the reader

why the Special Theory is invalid, we must first ensure that our readers are familiar with the theory's basic tenets. Over the years we have read a number of explanations of the theory which were intended for the non-scientifically trained general public, but the best of them by far remains the version by which we ourselves were first introduced to the details of the Special Theory, in the pages of Gary Zukav's excellent book, *The Dancing Wu Li Masters*. We urge any lay-person who wishes to know more about the history of the developments in the field of physics over the course of the 20th Century to obtain a copy and to read it thoroughly. It may change your life. It certainly changed ours.

We will now quote at some length from Zukav's chapter titled *"Special Nonsense."* To begin:

> "In short, the two foundation stones of the special theory of relativity are the principle of the constancy of the velocity of light (the Michelson – Morley experiment) and the principle of relativity (Galileo). Said more specifically, the special theory of relativity rests upon these two postulates:
>
> (1) The velocity of light in a vacuum is the same in all frames of reference (for all observers) moving uniformly, relative to each other, and
> (2) All laws of nature are the same in all frames of reference moving uniformly, relative to each other.
>
> "Of these two postulates, the first one, the principle of the constancy of the velocity of light, is the troublemaker. There is no way that it and the classical transformation laws both can be true. According to the classical transformation laws (and common sense) the speed of light must be its

velocity as it is emitted from a source plus or minus the velocity of the observer, if the observer is moving toward the source or away from the source. According to experiment, the speed of light remains constant regardless of the state of motion of the observer. Common sense and experimental findings are in violent disagreement.

"Einstein's beginner's mind told him that, since we cannot argue with what is (the experimental evidence), then our common sense must be wrong. With this decision to disregard common sense and to base his new theory on the only clothes he could see that the emperor was wearing (the constant speed of light and the principle of relativity) Einstein stepped boldly into the unknown, in fact, into the unimaginable. Already on new territory, he proceeded to explore where no person had gone before.

"How could it be that to every observer the speed of light is the same regardless of their state of motion? To measure speed, it is necessary to use a clock and a ruler (a rigid rod). If the speed of light as measured by an observer at rest relative to a light source is the same as the speed of light as measured by an observer in motion relative to the source, then it must be that, somehow, the measuring instruments change from one frame of reference to the other in just such a way that the speed of light always appears to be the same.

"The speed of light appears constant because the rods and clocks used to measure it vary from one frame of reference to another depending upon their motion. In short, to an observer at rest, a moving rod changes its length and a moving

clock changes its rhythm. At the same time, to an observer traveling along with a moving rod and clock, there is no apparent change at all in length or rhythm. Therefore, both observers measure the speed of light to be the same, and neither can detect anything unusual in the measurement or in the measuring apparatus. . . .

"These were the initial fruits of Einstein's basic *assumptions* (emphasis added) (the principle of the constancy of the velocity of light and the principle of relativity): First, a moving object appears to contract in its direction of motion and become shorter as its velocity increases until, at the speed of light, it disappears altogether. Second, a moving clock runs more slowly than a clock at rest, and continues to slow its rhythm as its velocity increases until, at the speed of light, it stops running altogether.

"These effects only appear to a "stationary" observer; one who is at rest relative to the moving clock and rod. They do not appear to an observer who is traveling along with the clock and rod. To make this clear, Einstein introduced the labels "proper" and "relative." What we see when we observe our stationary rod and our stationary clock, if we ourselves are stationary, is their proper length and proper time. ("Proper" means "one's own.") Proper lengths and proper times always appear normal. What we see if we are stationary and observe a rod and a clock traveling very fast relative to us is the relative length of the moving rod and the relative time of the moving clock. The relative length is always shorter than the proper length, and the relative time is always shorter than the proper

time.

> "The time you see on your own watch is your proper time, and the time that you see on the watch of the person moving past you is the relative time (which appears to you - - - not the person moving past you - - - to run more slowly). The length of the measuring rod in your own hand is its proper length, and the length of the measuring rod in the hand of the person moving past you is its relative length (which appears to you - - - but not to the other person - - - to be shorter). From the point of view of the person moving past you, he is at rest, you are moving, and the situation is reversed." (253)

That, in a nutshell, is Einstein's Special Theory of Relativity and all of its fantastical consequences. Are you confused? Then read it again. Are you finding yourself tempted to believe it? If you are so tempted, remember to stand up, take a deep breathe, click your heels together three times and say: "Time is a system of measurement, a myth and a meme. . . ." (you know the rest.) If you are at first blush skeptical, you are correct to be so. For it is based *entirely* upon an invalid assumption, and it is indeed, as Gary Zukav stated, "special nonsense."

We shall demonstrate that Einstein's assumption that the speed of light is constant for all observers, that is, that it does not obey the Galilean transformations, is invalid, by conducting a simple thought experiment. But before we commence that experiment, we will dissect some of the statements contained in the excerpt of Zukav's explanation of the Special Theory.

This excerpt opens with a reference to the Michelson – Morley experiment, but we will set that aside for now and return to it in a moment. We wish to examine first Einstein's use of the word "postulate." The Oxford English Dictionary defines a postulate as a "thing claimed or *assumed* (emphasis added) as basis of

reasoning." In other words, a postulate amounts to an assumption which may or may not rest upon any empirical evidence to support it. Einstein's claim that the speed of light is constant was made without reference to any empirical evidence. The Michelson – Morley experiment of 1887 was interpreted by some (including Zukav) as evidence of the constancy of the speed of light, but Einstein, who published his paper on the Special Theory of Relativity (which was not the actual title of his paper but the name it came to be known by) in1905, always claimed later that he had been unaware of that experiment and its results, and that it played no part in the formulation of his theory. So Einstein's astounding claim was made without any empirical evidence to back it up. His claim was pure conjecture and, not wishing to admit that he was basing his extraordinary theory on an unproven assumption, he elevated his conjecture to the status of a "postulate," which sounds much more impressive. Einstein's choice of words here resembles the behaviour of America's Founding Fathers who disguised the privileges they were granting themselves by calling them "rights." Einstein calculated that the physicists of his day were more likely to accept his theory and its strange, if not to say outrageous, consequences, if he stated that it was based upon a "postulate" rather than an unproven assumption without any empirical evidence to support it. And by and large, it worked. Although there was some opposition, the leading physicists of that age wholeheartedly accepted the theory and celebrated his 'insights' as genius.

The other point we wish to touch upon at this juncture is Zukav's statement that "The speed of light appears constant because the rods and clocks used to measure it vary from one frame of reference to another depending upon their motion." When we first read that line over 40 years ago, we were gobsmacked. The notion that objects in motion shrink in the dimension parallel to their motion due purely to the fact that they are in motion is absolutely surreal, and the fact that very intelligent and learned persons had accepted this idea as the way the universe functions

without a single shred of evidence to support it struck us as simply incredible. It still does. To this day, over 100 years later, there is still no indisputable empirical evidence to support this fantastical idea. We shall delve no further into the matter at this point, other than to say that in regard to such evidence which has accumulated to support Special Relativity's claims, we shall see that our deceptive friend 'motion' has another mischievous trick up its sleeve.

Chapter Thirty-eight

ANALYSIS OF

MICHELSON – MORLEY

* * * * * *

We are now ready to deal with the Michelson – Morley experiment, which we will discuss at some length. According to Zukav, the results of that experiment supposedly 'proved' two things: one, that the luminiferous ether does not exist; and two, that the speed of light remains constant regardless of the state of motion of the observer. The reader will recall that we have had an earlier encounter with the Michelson – Morley experiment in these pages. At that point we provided an account of that experiment as described by Zukav in the chapter titled *Beginner's Mind* in *The Dancing Wu Li Masters.* We suggest to our readers that they take the time at this point to reacquaint themselves with Zukav's description and our own comments pertaining to his description, before proceeding any further with our present discussion. It is to be found on page 65.

Our purpose during that earlier discussion of the Michelson – Morley experiment was to refute the first of the two conclusions just referred to which arose as a result of that experiment. We made the argument that the experiment failed to detect the luminiferous ether not because it does not exist, but because physicists had made an invalid assumption concerning its nature. Michelson and Morley expected to detect an 'ether breeze' because they assumed that the luminiferous ether was in some sense material. We have argued that the luminiferous ether (sometimes spelled aether), which at that point we were calling 'space-time' but which we are now referring to simply as 'space,' does indeed exist, but that it is *immaterial,* a fundamentally different state of being from that of matter. The Michelson – Morley experiment did not prove that the ether does not exist; it proved only that an ether breeze does not exist. We submit that, through all the arguments presented in these pages prior to this point, we have successfully made the case for the proposition that an immaterial state of being we call 'space' which, among its several functions, makes possible the propagation of light waves, does in fact exist.

We turn now to the second of the two conclusions which the Michelson – Morley experiment supposedly proved, and which, in Zukav's account, is the first postulate of the Special Theory: that the speed of light remains constant regardless of the state of motion of the observer. Zukav comments that "According to [the Michelson - Morley] experiment, the speed of light remains constant regardless of the state of motion of the observer. Common sense and experimental findings are in violent disagreement." But a careful analysis of the experiment reveals that neither of these two statements is true.

To carry out this analysis we will present a more detailed account of the Michelson – Morley experiment than that which is presented by Zukav in *The Dancing Wu Li Masters.* This account is to be found in the university-level physics text, *Beyond The Mechanical Universe*, written by Richard P. Olenick, Tom M. Apostol, and David L. Goodstein, professors of physics and

mathematics at the California Institute of Technology. We begin by reproducing the professors' schematic representation of a Michelson interferometer, found on page 357 of their text. It is basically the same diagram as that which is found in Zukav's book, but it has the additional benefit of labelling the three mirrors used in the experiment M, M1, and M2.

The textbook also provides some useful background historical information. During the 19th Century various attempts had been made to detect the motion of the Earth through the ether, which most physicists assumed had to exist. A.A. Michelson, who was a physics instructor at the U.S. Naval Academy and a specialist in precise optical measurements, became interested in this problem after reading a letter sent by James Clerk Maxwell to one of Michelson's colleagues. In that letter, Maxwell suggested a simple method by which the speed of the Earth through the ether might be calculated. We will now quote at some length from Olenick *et al's* textbook:

> "Maxwell presented a very simple argument. Imagine that the earth is moving at some speed v through the aether. If a beam of light travels at speed c in the rest frame of the aether, then an earthbound observer, moving through the aether at speed v, should measure c + v for the speed of light when the light is travelling against the motion of the earth [that is, with the aether breeze]. Similarly, the observer should measure c – v for the speed of a beam of light moving in the same direction as the earth [that is, against the aether breeze]. By comparing the speed of light in the forward and backward directions with respect to the speed of the earth, one should be able to measure the speed v of the earth through the aether.
>
> "The speed of the earth through the aether

was taken to be its speed about the sun: 3 x 10^4 metres/second, or 10^-4 times the speed of light. The difference in the two speeds c + v and c – v is 2v, which is extremely small compared to c. . . . the difference in time for light to travel a certain distance down and back depends on (v / c)^2, which is even smaller and very difficult to detect by experiment. The challenge of devising an optical instrument sufficiently sensitive to detect the earth's motion led Michelson to study the interference of light. . . .

"A diagram representing the principle of a Michelson interferometer is shown in Fig.45.7.

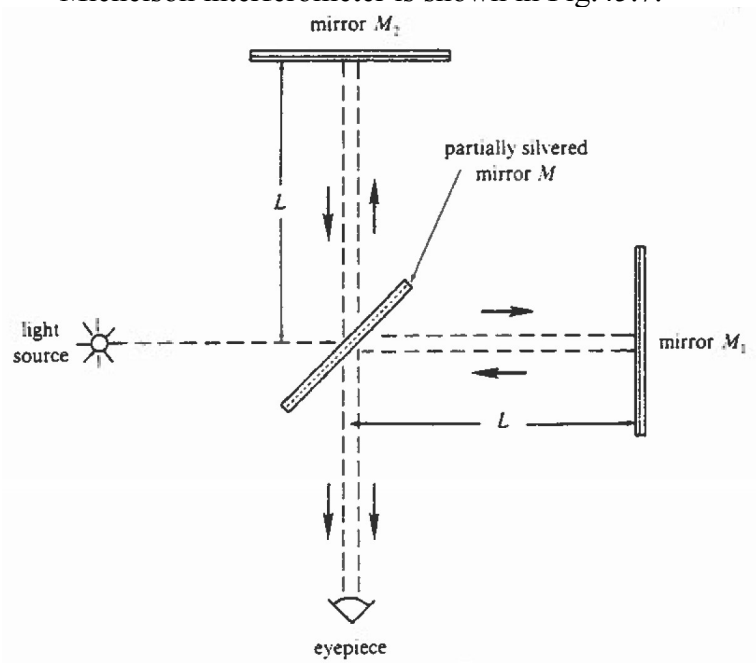


Figure 45.7 Schematic representation of a Michelson interferometer.

FIGURE 45.7

"A beam of light is directed at a plate of partially silvered glass that partly transmits and partly reflects light. The silvered surface splits the beam into two components that travel in perpendicular directions, as shown. The transmitted beam travels a distance L to a mirror M1 and is reflected back along the same path to the silvered glass plate. Similarly, the reflected portion of the beam travels an equal distance L, reflects from mirror M2, and returns along its original path to the glass plate. At the glass plate both beams recombine as two superposed beams that are directed into a detector, a telescope. "If both beams travel the same distance and arrive in phase with one another, they produce a bright fringe from the constructive interference. On the other hand, if the two beams travel different distances and arrive slightly out of phase, destructive interference will result. Consequently a series of bright and dark fringes is seen, similar to those shown in Fig. 45.8. If the length of either arm of the interferometer is changed slightly, the fringe pattern will also change slightly, by an amount that can be detected through the telescope.

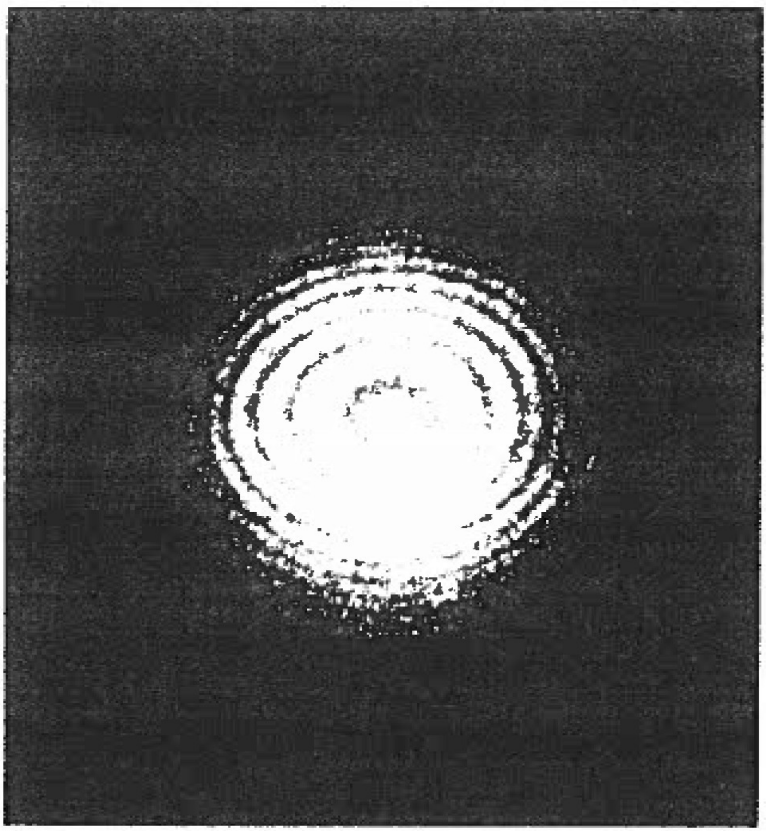


Figure 45.8 View of interference fringes from a Michelson interferometer. (Courtesy of Bob Paz, California Institute of Technology.)

FIGURE 45.8

"Now imagine the whole apparatus moving relative to the aether at speed v in the direction of the mirror M1. From the viewpoint of the laboratory frame, an aether wind is blowing past the apparatus. It is easy to calculate the effect of this aether wind on the travel times for light along the arm of the interferometer parallel to and perpendicular to the wind. If the times are different, the beams will have travelled different distances and that difference will show up as either constructive or destructive interference fringes in the telescope.

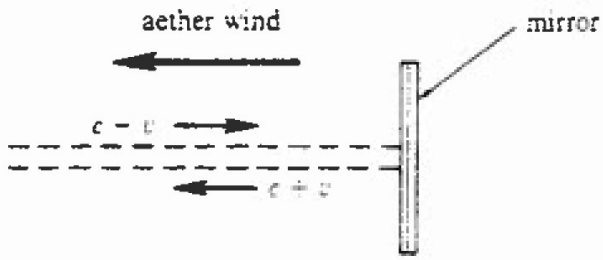


Figure 45.9 Light beam traveling parallel to the aether wind.

FIGURE 45.9

"When light travels against the wind, as shown in Fig. 45.9, its speed is c – v, and when it travels downwind, its speed is c + v. Now the time T required for one round trip is the sum of time out and time back. In each case the time required is simply the distance L divided by the speed for *that portion of the trip,* (emphasis added) so the total time is

$$T = L / c - v + L / c + v$$

Adding the fractions we obtain

$$T = \frac{2Lc}{c^2 - v^2} = \frac{2L / c}{1 - v^2 / c^2}$$

The numerator of this last expression [2L / c] is the time it would have taken if everything were at rest and there was no relative motion to worry about - - - the total distance 2L divided by c, the speed of light. The denominator [1 – v^2 / c^2] represents the correction factor due to the aether wind." (254)

Dear reader, do not be overly concerned if you have not been able to follow the mathematics just presented. Ultimately it is unimportant because although the equations are mathematically correct, that is, they follow the grammatical rules of basic arithmetic, the argument they make is logically flawed, that is, they describe a situation which does not actually exist. So keep your thinking cap on and be patient; all will be explained.

It is important to keep in mind that Maxwell, Michelson, Morley and the other physicists of that era all assumed and firmly believed that the ether was in some way material, and that the

passage of the Earth through the ether would result in an ether breeze. They believed that this breeze would literally affect the speed of light. The speed of a beam of light travelling into the breeze would have its intrinsic speed of 300,000 km/sec reduced by the speed of the breeze, assumed to be 30 km/sec, the calculated speed of the Earth around the Sun, to 299,970 km/sec. Similarly, they expected that the speed of a beam of light travelling in the same direction as the breeze would have its intrinsic speed of 300,000 km/sec increased to 300,030 km/sec.

Imagine a boat travelling across a smooth lake at a rate of 20 km/hour with respect to the shore. Now imagine that the boat enters the mouth of a river which drains into the lake, and which has a flow rate of 10 km/hour. Unless more power is supplied to the boat's engine, its velocity with respect to the shoreline of the river will be reduced to 10 km/hour. This is exactly analogous to what the physicists of the 19th Century believed would happen to a beam of light heading 'up-river' into the ether breeze. They believed this because they assumed that, like the water in the river, the ether was in some way, material.

Naturally, this assumption was built into their analysis of the experiment. As our physics textbook states:

> "Now imagine the whole apparatus moving relative to the aether at speed v in the direction of the mirror M1. From the viewpoint of the laboratory frame, an aether wind is blowing past the apparatus. . . .
>
> When light travels against the wind, as shown in Fig. 45.9, its speed is c – v, and when it travels downwind, its speed is c + v."

We have now arrived at the point in the narrative where the mathematical description of the experiment, and what actually exists, part company. To repeat what was stated just a moment ago, our physics textbook states:

"Now the time T required for one round trip is the sum of time out and time back. In each case the time required is simply the distance L divided by the speed for *that portion of the trip,* (emphasis added) so the total time is

$$T = L / c - v + L / c + v$$

Adding the fractions we obtain

$$T = \frac{2Lc}{c^2 - v^2} = \frac{2L / c}{1 - v^2 / c^2}$$

The numerator of this last expression [2L / c] is the time it would have taken if everything were at rest and there was no relative motion to worry about - - - the total distance 2L divided by c, the speed of light. The denominator [1 – v^2 / c^2] represents the correction factor due to the aether wind."

The calculation of time T for one round-trip from M to M1 and back is based on the assumption that an ether breeze exists, and that therefore the actual velocity of light during its journey from M to M1 will be c – v, and that the actual velocity of light during its journey from M1 back to M will be c + v. *But if there is no ether breeze - - - and there isn't because the ether is immaterial - - - then the statement* T = L / c – v + L / c + v *is logically flawed and untrue.* Therefore the denominator in the final equation, (1 – v^2 / c^2), which "represents the correction factor due to the aether wind" is both logically incorrect, and entirely extraneous, because there is no aether wind. The correct calculation of time T for one round-trip from M to M1 and back thus becomes: T = 2L / c. As it turns out, this calculation for the value of T is the equation

physicists actually use in their calculations. However, they disregard the term (1 – v^2 / c^2) not because it is logically flawed (which it is), but because (v / c)^2 is such a small number that its effects on the outcome can be ignored.

It is at this point that our trickster friend relative motion enters the picture, and it is casting the same old illusory spell, causing observers to believe that the same series of events unfolds regardless of whether they are in motion or at rest. Our physics textbook states that T = 2L / c "is the time it would have taken if everything were at rest and there was no relative motion to worry about." This statement is partly correct and partly misleading. If everything were at rest, the time T for one round-trip from M to M1 and back again, that is MM1M, is indeed equal to 2L / c. This much is correct. But the second part of that statement implies that since relative motion is present in the experiment, the time T for one round-trip from M to M1 and back to M is not equal to 2L / c. This is incorrect.

The situation in the Michelson – Morley experiment is quite similar to the train car thought experiment presented by Dan Falk which we analyzed earlier. Aside from the fact that one is a thought experiment and the other was an actual experiment, there are two differences between the two experiments. The first difference is the position of the observer vis-a-vis the apparatus. Falk's passenger was positioned in the centre of the train car. In the Michelson – Morley experiment the observer, looking through the telescope, is effectively at one end of the 'train car', situated at M. If the apparatus (either the train car or the interferometer) is at rest, then the total distance travelled by a light beam from the observer's position to the far end of the apparatus and back again is 2L, and the time T required to complete that journey is equal to 2L / c. If the apparatus is in motion, the beam of light leaving the position of the observer (M, or the centre of the train car) must travel the distance L, plus the distance the apparatus has moved while the beam of light was in transit in order to reach M1 or the flash unit at B. This distance is determined by the velocity of the apparatus

through space. On the return trip the distance the beam of light must travel to return to the observer at M or at the centre of the train car will be the distance L, minus the distance the apparatus has moved while the beam of light was in transit. As long as the apparatus is moving at a constant velocity, the plus and minus distances cancel out, and so the total distance travelled by the light beam can be considered to be equal to 2L, and so even when the apparatus is in motion the time T required for the beam of light to make a round-trip will be equal to 2L / c. As our analysis of Falk's 'train car' thought experiment demonstrated, this is an indisputable fact, which is completely independent of the velocity of the apparatus or the experience of any observer.

Our friendly trickster relative motion messes with observers' minds, performing the illusion that the four beams of light in question (out and back when at rest, and out and back when in motion) all travel the same distance L, when, in fact, if the apparatus is in motion the beam of light going out travels a distance greater than L, and the beam of light coming back travels a distance less than L. We now have a complete understanding of why, for the beam of light taking the path MM1M, the time T required for the journey is, assuming a constant velocity, *always* equal to 2L / c.

The second difference between the two experiments is that in the thought experiment the passenger at the centre of the train car cannot tell from the firing of the flash units alone whether or not the train is in motion. Whether he is at rest or in motion, both flash units will *appear* to flash simultaneously, even though when he is in motion that appearance is in fact an illusion. In the Michelson – Morley experiment the observer at M will always be able to deduce that he is in motion because of the appearance of destructive interference observed through the telescope, the cause of which we will now consider in more detail.

We must now consider the situation for the beam of light taking the path MM2M and derive an explanation for the pattern of bright and dark fringes shown in Fig. 45.8. The textbook notes that:

> "If both beams travel the same distance and arrive in phase with one another, they produce a bright fringe from the constructive interference. On the other hand, if the two beams travel different distances and arrive slightly out of phase, destructive interference will result. Consequently a series of bright and dark fringes is seen, similar to those shown in Fig. 45.8."

Now, the length of the two arms of the interferometer are equal: MM1 = MM2. That being the case, why is destructive interference observed as shown in Fig. 45.8, indicating that the two beams of light have travelled different distances? This is because the two beams of light have indeed travelled different distances. The beam of light travelling perpendicular to the motion of the earth through space, that is, the beam of light taking the path MM2 travels a distance equal to MM1 on its journey from M to M2. However, on its return journey from M2 to M, the distance travelled by the beam of light is not equal to M1M. This is so because while the beam of light is travelling from M to M2, and then back again from M2 to M, the mirror at M has been in motion parallel to MM1 and perpendicular to MM2. This means that the beam of light returning from M2 to M strikes M at a different point from that which the beam travelling from M to M2 emerged. This means that the distance travelled by the beam M2M is greater than the distance travelled by the beam MM2. This means that the round-trip distance travelled by the light beam travelling from M to M1 and back again does not equal the round-trip distance travelled by the light beam travelling from M to M2 and back again. This means that the two light beams arrive back at M out of phase with one another, resulting in the destructive interference pattern shown in Figure 45.8. Zukav's account of the Michelson – Morley experiment neglects to include this significant detail.

We cannot carry on without noting that the textbook's

explanation and calculations for the forgoing are seriously flawed. Once again, as with the calculations concerning the time T required for the beam of light to travel the distance MM1M, the mathematics relied upon are arithmetically correct, but they describe something which does not actually occur, so the calculations are logically flawed. The authors of this textbook, along with Michelson and Morley and the physics community generally, appear to be under the mistaken impression that the path a beam of light takes through space is in some way dependent on the frame of reference of a given observer. This idea is simply incorrect. Examine closely the following statements from the textbook and the accompanying diagram, Figure 45.10.

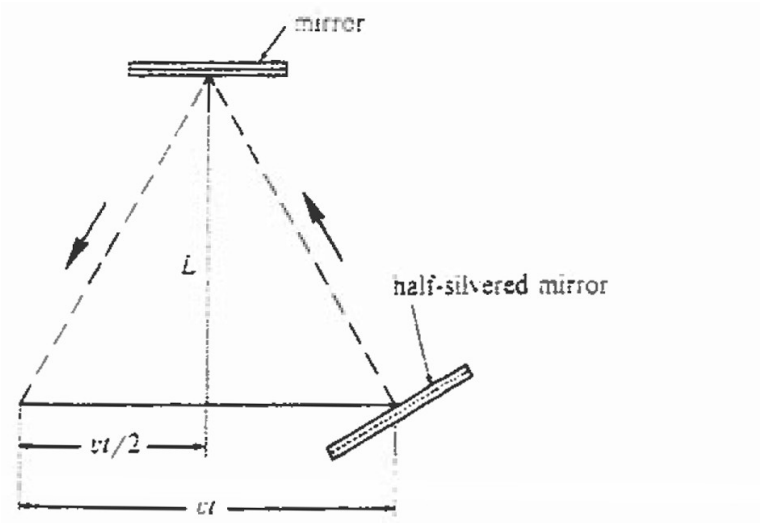


Figure 45.10 Light beam viewed from the aether frame.

FIGURE 45.10

The textbook goes on to state:

> "The distance the light beam travels can be found from the Pythagorean theorem and is equal to 2 x the square root of (vt / 2)^2 + L^2. The speed of light in the aether rest frame is simply c, so the time it takes the light beam to travel down and back is this distance divided by c." (256)

As we have previously concluded, the statement "As the light travels up and down toward the mirror [M]. . . . the earth moves a distance vt [distance equals velocity x time] through the aether, so the light doesn't return to the same place because the mirror [M] is moving" is an accurate statement. Remember that all three mirrors are in motion on paths parallel to the motion of the Earth through space. Because of that motion, the path of the light beam M2M is longer than the path of the light beam MM2. But the paths of the light beams MM2 and M2M as shown in Figure 45.10 (the dashed lines) and the mathematical calculations based upon that diagram are completely erroneous. In actual fact the light beam MM2 always strikes the mirror M2 at an angle of 90 degrees and is reflected back down the same path it took to arrive at M2, as shown in Figure 45.7. This fact is completely independent of the frame of reference of any observer, whether or not that observer is at rest relative to the aether, or in motion with the interferometer. Therefore, the distance the light beam travels cannot be found from the Pythagorean theorem and is not equal to 2 x the square root of (vt / 2)^2 + L^2. Therefore the textbook's conclusion that the time t required for the light beam MM2M to complete its journey is equal to 2L / c divided by the square root of 1 – v^2 / c^2 is false.

The ultimate cause of this error is the misapprehension that the path a beam of light takes through space depends on the frame of reference of the observer. As we shall see, this misapprehension appears again in this textbook (and in other books including Falk)

in connection with the puzzle that we came to call "the Trolley Problem." We shall explore the Trolley Problem in due course.

Returning for the moment to Olenick *et al's* mathematical treatment of the Michelson – Morley experiment, we see that both the calculated time T (for the light beam MM1M) and the calculated time t (for the light beam MM2M) are fallacious, because they both involve errors of logic. In any event, the textbook and Michelson concluded that:

$$T - t = L \times v^2 / c^3$$

The textbook goes on to state:

> "This [the above equation] yields an incredibly small time difference T – t, and Michelson realized that he couldn't possibly measure the quantity T – t to compare with the predicted value. . . Instead, he realized that by rotating the entire apparatus by 90 degrees he would reverse the roles of the two light paths MM1M and MM2M. The time difference between the two waves entering the telescope would also be reversed, *thus changing the phase difference between the superposed waves and altering the positions of the interference fringes.* (emphasis added) He decided to simply rotate the interferometer by 90 degrees and look for a shift of the interference fringes." (257)

And yet, when Michelson and Morley rotated the interferometer by 90 degrees they did not observe any shift in the fringes at all. They were therefore forced to conclude, much to Michelson's dismay, that there was no ether breeze (which was quite correct) and that therefore the ether did not exist (which was quite incorrect). But the reason Michelson did not observe any

shift in the interference fringes when he rotated the interferometer 90 degrees had absolutely nothing to do with the existence or non-existence of the ether, and everything to do with yet another logical flaw in Michelson's (and the textbook's) analysis of the experiment.

Michelson reasoned that by rotating the interferometer 90 degrees he would reverse the roles of the two light paths MM1M and MM2M. This much is true. The path of the light beam MM2M which had been perpendicular to the motion of the Earth through space would now be parallel to that motion, and the time required for that light beam to complete the round-trip journey would be $T = 2L / c$. The path of the light beam MM1M which had originally been parallel to the motion of the Earth through space would now be perpendicular to that motion, and it would now be the case that the path of the light beam M1M would be shorter than the path of the light beam MM1, because while the light beam MM1M was making its round-trip journey the mirror M was, of course, still in motion.

To help the reader visualize this situation, we have taken Figure 45.7 from the textbook and rotated it 90 degrees, just as Michelson did with the actual interferometer. When studying the diagram in this new configuration, keep in mind that the motion of the Earth through space is still assumed to be from left to right across the page. This means that the light beam MM1M (the light that has been transmitted through the half-silvered mirror M) whose path was formerly parallel to the motion of the Earth, is now taking a path which is perpendicular to the motion of the Earth. Meanwhile, the light beam MM2M (the light which has been reflected by the half-silvered mirror) whose path was formerly perpendicular to the motion of the Earth, is now taking a path which is parallel to the motion of the Earth. Note in particular the new orientation of the half-silvered mirror M which, of course, has also been rotated 90 degrees, and is still in motion on a path which is parallel to the motion of the Earth. Recall that in the original orientation of the interferometer, the path of the light beam M2M was, due to the motion of the Earth and hence due to the motion of

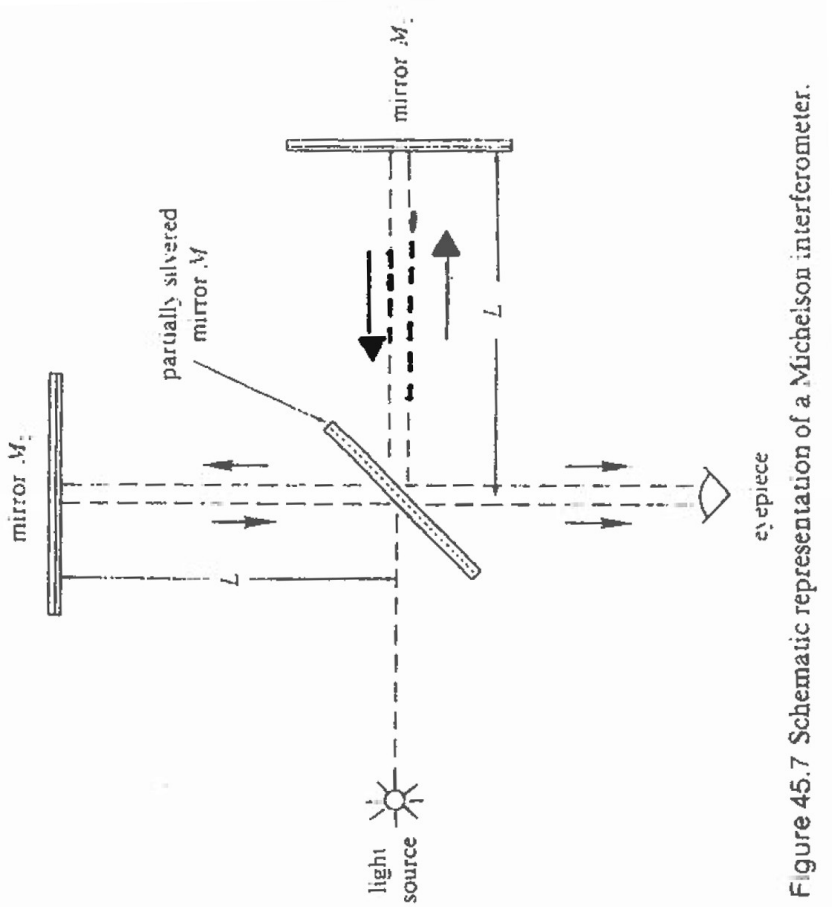


Figure 45.7 Schematic representation of a Michelson interferometer.

FIGURE 45.7 ROTATED 90 DEGREES

the mirror M, *longer* than the path of the light beam MM2. In the rotated-90 degrees-orientation of the interferometer, the path of the light beam M1M will, due to the new orientation of the half-silvered mirror M and the motion of the Earth, be *shorter* than the light beam MM1.

In the original orientation of the interferometer the path of the light beam MM2M (the light beam which was perpendicular to the motion of the Earth) had been longer than the path of the light beam MM1M. As a consequence of this, the waves of light making up the light beam MM2M arrived back at M out of phase with the light waves making up the light beam MM1M. This resulted in a particular pattern of interference fringes.

In the rotated-90 degrees-orientation of the interferometer the path of the light beam MM1M (which is now the light beam which is perpendicular to the motion of the Earth) is shorter than the path of the light beam MM2M, again resulting in the two beams of light arriving back at M out of phase. But, because the velocity of the Earth is constant, the amount by which the length of the path taken by MM1M is shorter than the path taken by MM2M in the rotated-90 degrees-orientation of the interferometer is precisely equal to the amount by which the length of the path taken by MM2M was longer than the path taken by MM1M in the original orientation of the interferometer. In both orientations, even though they have swapped positions, the path of the light beam MM2M is longer than the path of the light beam MM1M by precisely the same amount. As a consequence of this the light waves making up the two beams, MM1M and MM2M, in each of the two orientations, would be out of phase by precisely the same amount, resulting in identical sets of interference fringes, which is what Michelson and Morley observed. All of this is due entirely to the 90 degree difference in the orientation of the half-silvered mirror M.

Michelson had reasoned that by rotating the interferometer 90 degrees "the time difference between the two waves entering the telescope would also be reversed, thus changing the phase

difference between the superposed waves and altering the positions of the interference fringes." This line of reasoning is partly correct. The time difference between the two waves entering the telescope would indeed be reversed. In the original orientation the light beam perpendicular to the motion of the Earth, MM2M, because it had to travel further, would take more time to return to M than would the light beam MM1M. In the rotated-90 degrees-orientation the light beam perpendicular to the motion of the Earth, MM1M, because it has a shorter distance to travel, would take less time to return to M than would the light beam MM2M. But the two perpendicular distances involved, one longer (in the original orientation) and one shorter (in the rotated orientation) than the distance travelled by the light beam taking a path parallel to the motion of the Earth, were longer and shorter, than that distance, by exactly the same amount. In both orientations, the path taken by the light beam MM1M is shorter, by precisely the same amount in both cases, than the path taken by the light beam MM2M. So, contrary to Michelson's expectation, there would be no change in the phase difference between the superposed waves and hence no alteration in the positions of the interference fringes.

Michelson's explanation for his inability to observe any alteration in the positions of the interference fringes was to conclude that the luminiferous ether did not exist, although for the rest of his life he could not bring himself to accept that conclusion. However, for over 130 years physics and physicists have accepted that explanation. But we have just demonstrated that Michelson's analysis was logically flawed, and therefore his conclusion is suspect. His experiment did not disprove the existence of the ether as is commonly believed; instead it demonstrated two things: one, that there is no ether breeze, which tells us something about the nature of the ether, namely, that the ether is immaterial; and two, the rather mundane fact that beams of light which traverse different distances will do so in different times.

There are two general observations to be made regarding the 130 year-long confusion which has obscured the true analysis

of the Michelson – Morley experiment. The first is this: this experiment is essentially a signal/observer problem. Michelson, Morley, and Olenick *et al* based their analysis of the experiment on the time factors T and t, which in the end led them to the calculation of a quantity too small to be measurable ($T - t = L \times v^2 / c^3$). But in signal/observer problems time is the derivative factor. We were able to disentangle the faulty logic in their reasoning by focusing not on the amount of time it took for the light beams to complete their journeys, but on the various distances the light beams travelled. In signal/observer problems distance is the determinant factor, and is the pathway to true understanding.

The second observation is that physicists' over-reliance on the language of mathematics, including in this case the inappropriate application of the Pythagorean theorem has, for 130 years, simply blinded them to the logical flaws in their reasoning regarding the Michelson – Morley experiment. Mathematics is a powerful and useful tool, but like any other language, it can obscure as well as enlighten.

We are now ready to deal with Zukav's comment that "According to [the Michelson - Morley] experiment, the speed of light remains constant regardless of the state of motion of the observer. Common sense and experimental findings are in violent disagreement." This statement is simply not supported by the evidence. There is nothing in our analysis of the experiment which suggests that the speed of light, relative to the speed of the interferometer, is behaving in a manner which is not in accord with the Galilean transformations. There is every reason to believe that, in the initial configuration of the interferometer, the speed of the beam of light MM1, relative to the speed of the mirror M1, is $c - v$, where c is the speed of light and v is the speed of M1. Using the analogy of a car and truck travelling in the same direction, the beam of light, which is travelling at 300,000 km/second, is overtaking the mirror M1, which is travelling at 30 km/second, at a rate of 299,970 km/second. And there is every reason to believe that the speed of the beam of light M1M, relative to the speed of

the half-silvered mirror M, is c + v, where v is the speed of M. The beam of light M1M and the mirror M are thus approaching each other at the rate of 300,030 km/second, completely in keeping with the Galilean transformations. There is absolutely nothing about the experiment to suggest that this is not the case. Therefore, Zukav's statement that the speed of light remains constant regardless of the state of motion of the observer, the observers in this case being situated at M1 and M, is logically flawed, and the claim that common sense and experimental findings are in violent disagreement is false.

The reader can be forgiven for thinking that we must now be finished with the Michelson-Morley experiment, but that is not the case. In retrospect the solution to the puzzle of why there was no change in the pattern of the interference fringes when the interferometer was rotated 90 degrees - - - the two orientations of the half-silvered mirror M - - - seems so obvious. Why did it take 130 years for someone to arrive at the correct explanation? The answer to this question is important, because the chain of events which ensued following the experiment eventually led Albert Einstein, and then the rest of physics, to embrace the conceptually flawed Special Theory of Relativity.

To outline the history of these events we will once again rely on Gary Zukav's account in *The Dancing Wu Li Masters.* As you read through this accounting, bear in mind that Michelson and Morley's original purpose in conducting the experiment was to measure the velocity of the Earth through the luminiferous ether.

> "[In a Michelson interferometer] a light source emits a beam of light toward a half-silvered mirror . . . The original beam of light is split by the half-silvered mirror into two segments, each of which travels an equal distance, but at right angles to each other, and back again. The two beams then reunite via the same half-silvered mirror and travel into a

measuring device. By observing the interference created by those converging beams in the measuring device, any difference in velocity between them can be determined accurately.

"When the experiment was performed, *not the slightest difference in velocity could be detected between the two beams of light.* (emphasis added) The interferometer was turned 90 degrees so that the beam going against the ether wind now was directed across it, and the beam going across the ether wind now was sent directly into it. *Again not the slightest difference in velocity between the two beams could be detected.* (emphasis added)

"In other words, the Michelson-Morley experiment had failed to prove the existence of the ether. Unless an explanation could be found, physicists would be faced with choosing between two unsettling alternatives: either (1) the earth is not moving (and Copernicus was wrong), or (2) the ether does not exist. Neither of these was very acceptable.

"Michelson and Morley thought that perhaps the earth carried a layer of ether with it as it moved through the ether set, just as it carries its atmosphere with it as it travels through space and, therefore, close to the surface of the earth, the ether breeze cannot be detected. No one had a better hypothesis until an Irishman named George Francis FitzGerald proposed (in 1892) an outrageous explanation.

"FitzGerald reasoned that perhaps the pressure of the ether wind compresses matter just as an elastic object moving through water becomes shortened in the direction that it is

traveling. If this were true, then the arm of the interferometer pointing into the ether wind would be somewhat shorter than the arm that is not pointing into it. Therefore, a reduction in the velocity of the light traveling into the ether wind and back might not be detected because the distance that the light travels also is reduced. In fact, if the amount by which the interferometer arm pointing into the ether wind is shortened just corresponds to the amount by which the velocity of the light traveling up that arm and back is reduced, *then both beams of light in the experiment will reach the measuring device at exactly the same time* (emphasis added) (the beam with the higher velocity traversing a greater distance in the same time that the beam with the slower velocity traverses a lesser distance).

"FitzGerald's hypothesis had a major advantage over all the others. It was impossible to disprove. It said simply that there is a one-dimensional contraction (in the direction of motion) that increases as velocity increases. The catch is that *everything* contracts. If we want to measure the length of an object that is moving very fast compared to the speed of light, we have to catch up with it first, and when we do, according to the theory, the measuring stick that we are carrying with us also contracts. If the object measured seventeen inches at rest, it still would measure seventeen inches. Nor would anything look contracted because the lenses in our eyes also would contract, distorting them just enough to make everything look normal.

"One year later a Dutch physicist,

> Hendrik Antoon Lorentz, while working on another problem, independently arrived at FitzGerald's hypothesis. Lorentz, however, expressed his discovery in rigorous mathematical terms. This, of course, upgraded FitzGerald's hypothesis to a position of respectability and it began to gain a surprising degree of acceptance, considering its fantasy-like quality. Lorentz's mathematical formulations of the FitzGerald-Lorentz contraction became known as the Lorentz transformations.
>
> "The stage was now set. All of the scenery was in place. The failure to detect the ether. The Michelson-Morley experiment. The constancy of the speed of light. The FitzGerald-Lorentz contractions. The Lorentz transformations. These are the facts that continued to confuse physicists at the beginning of the century. All of them but Albert Einstein. When he looked at these pieces of scenery, what his beginner's mind saw was the special theory of relativity." (338)

Okay. We now have, courtesy of Gary Zukav, a sketch of the chain of events that led from the Michelson-Morley experiment to the creation of the Special Theory of Relativity by Albert Einstein. In order to expose the comedy of errors which led to that outcome, we must examine Zukav's account point by point.

1. We begin with Michelson and Morley's mathematical analysis of the results of their experiment, which is absent from Zukav's account. We have already examined their analysis in detail and will not repeat it, other than to emphasize that the reason they failed to understand the experiment's results was because their analysis was focused on *the amount of time* that it took for the beams of light to travel up and down the arms of the

interferometer. But we know that in signal-observer problems time is the derivative factor, and that the key to solving such problems is to focus on the *distance(s)* the signal(s) travel. Distance is the determinant factor, and the key to understanding.

2. In the first paragraph of our excerpt, after a brief description of the experimental set-up, Zukav notes that "By observing the interference created by those converging beams in the measuring device, any difference in velocity between them can be determined accurately." So far, so good. The beginning of the second paragraph states: "When the experiment was performed, *not the slightest difference in velocity could be detected between the two beams of light,"* (emphasis added) and, after the interferometer had been rotated 90 degrees, "*Again not the slightest difference in velocity between the two beams could be detected.* (emphasis added) These two italicized statements are very, very misleading. If one has not read a more detailed explanation of the results of the experiment such as that which is to be found in Olenick *et al's* textbook, Zukav's statements lead one to believe that, since the lengths of the two arms of the interferometer are equal, the two beams of light arrived back at the half-silvered mirror in the same amount of time. But the appearance of the interference fringes as illustrated in Figure 45.8 (p.516)**,** which Zukav does not specifically refer to, are evidence of the fact that the two beams of light did indeed arrive back at the half-silvered mirror at different times.

Now, the time it takes for a signal to arrive at a given point is found by the equation: time = distance / velocity, which means that the time required by a given signal to arrive at a given point will vary, if either the distance the signal travels, or the velocity of the signal, or both, varies. But the appearance of the interference fringes demonstrated that the two beams of light *must* have arrived back at the half-silvered mirror at different times, and so it follows that either the distances they travelled, or the velocities they travelled at, or both, were different, one from the other. Zukav's account glosses over these important facts, and leads the reader to

believe that there was no difference between the two signals; but, as our previous analysis of the experiment revealed, and as the appearance of the interference fringes requires, in fact there was a difference.

3. So, contrary to Zukav's statements, in the immediate aftermath of the experiment, there remained the possibility that the two beams of light had indeed travelled up and down the arms of the interferometer at different velocities. And, according to Zukav's own account, Michelson and Morley continued to believe in the existence of the ether. Zukav writes: "Michelson and Morley thought that perhaps the earth carried a layer of ether with it as it moved through the ether set, just as it carries its atmosphere with it as it travels through space and, therefore, close to the surface of the earth, the ether breeze cannot be detected." If Zukav's account is accurate, it reveals just how confused Michelson and Morley were, and how tantalizingly close they were to the correct solution to the conundrum. Because if there was no detectable ether breeze (which turned out to be true, for the reason that the ether is immaterial) close to the surface of the Earth because the Earth carried a layer of ether with it as it moved through space, then the ether could have had no effect on the velocity of the beam of light travelling parallel to the Earth's motion. Therefore the appearance of the interference fringes could not be explained by a variation in the velocities of the two beams of light. Since time = distance / velocity, it should have been clear to them that therefore it must have been a variation in the distances travelled by the two beams of light which was responsible for the appearance of the interference fringes. But for some reason this did not occur to them.

4. Ironically, this was the solution that George Francis FitzGerald came up with. But his explanation for the variation in the distances travelled by the two beams of light was not the obvious observation and completely logical conclusion that *the two different orientations of the half-silvered mirror* resulted in the beams of light travelling perpendicular to the motion of the Earth

travelling two different distances, each of which was different from the distance travelled by the beam of light travelling parallel to the motion of the Earth by the same amount, but the utterly fantastical idea that the pressure of the ether on the arm of the interferometer facing into the ether breeze caused that arm to contract. And not only was FitzGerald's suggestion utterly fantastical, the reasoning associated with it was obviously flawed. In his account of FitzGerald's reasoning Zukav writes: "In fact, if the amount by which the interferometer arm pointing into the ether wind is shortened just corresponds to the amount by which the velocity of the light traveling up that arm and back is reduced, *then both beams of light in the experiment will reach the measuring device at exactly the same time* (emphasis added) (the beam with the higher velocity traversing a greater distance in the same time that the beam with the slower velocity traverses a lesser distance)." BUT, the appearance of the interference fringes *proves conclusively* that the two beams of light reached the half-silvered mirror *at different times.* So the whole idea that the arm of the interferometer facing into the ether wind contracted under the pressure of that wind was the explanation for the results of the experiment, *and the reasoning associated with that idea,* betrayed a total misunderstanding of the basic facts of the situation, and is therefore completely erroneous.

5. Zukav begins his next paragraph with the statements: "FitzGerald's hypothesis had a major advantage over all the others. It was impossible to disprove." But in physics there is a rule of long standing which states that a hypothesis is considered to be 'scientific' only if there is a possibility of disproving the hypothesis. A hypothesis which cannot be disproved is not science; it is mysticism. FitzGerald's hypothesis that objects shrink as they move through space clearly belongs in the realm of the mystical. How did this mystical idea, for which there was zero empirical evidence, come to be accepted by the scientific establishment? Answer: through the magical power of mathematics!

6. In his next paragraph Zukav explains what happened next: "One year later a Dutch physicist, Hendrik Antoon Lorentz, while

working on another problem, independently arrived at FitzGerald's hypothesis. Lorentz, however, expressed his discovery in rigorous mathematical terms. This, of course, upgraded FitzGerald's hypothesis to a position of respectability and it began to gain a surprising degree of acceptance, considering its fantasy-like quality."

The historical record regarding Lorentz's knowledge of the specifics of Michelson's experimental set-up is unclear, as is the date on which Lorentz became aware of the FitzGerald hypothesis. We do know that in an August, 1892 letter to Lord Raleigh, Lorentz asked, "Can there be some point in the theory of Mr. Michelson's experiment which has yet been overlooked?" indicating that he had at least some doubt concerning the explanations that had been suggested up to that time. In any event Lorentz, and a number of other physicists, including Poincare and Einstein, busied themselves over the next two decades developing and refining what came to be known as the Lorentz "transformations," a mathematical confabulation which bestowed scientific respectability upon a completely mystical idea: the crazy idea that things shrink when they are in motion came to be accepted as a scientific truth, for no other reason than that it had been expressed in a set of mathematical equations. Physicists, beguiled by mathematics, simply abandoned common sense, and, not for the last time, embraced the mystical. Since that time, physicists have *chosen,* repeatedly, to profess *mathematically derived solutions* for various phenomena they do not understand, for things for which there was no solid empirical evidence: shrinking objects, photons, black hole singularities, dark matter, dark energy, quarks and gluons, the Higgs boson. Throughout the 20th Century, guided by the light of the mystical lamp of mathematics, physics has tumbled down one rabbit hole after another, all the while believing the imaginary worlds they were creating out of mathematical cloth were exposing the fundamental nature of the universe, when nothing could be further from the truth.

7. In the final paragraph of our current excerpt of Zukav's

work, Zukav writes: "The stage was now set. All of the scenery was in place." One of the pieces of the scenery was "[T]he constancy of the speed of light." But as we have already pointed out, the understanding of the results of the Michelson-Morley experiment that was current at that point in time in no way established that the intrinsic speed of light was constant. In fact, the claim was quite the opposite. As Zukav himself points out three paragraphs earlier, FitzGerald's hypothesis was that the beam with the *higher velocity* traversed a greater distance in the same time that the beam with the *slower velocity* traversed a lesser distance. Different beams, *different velocities*. And then, to add yet another dollop of confusion, in the Special Theory of Relativity Einstein did not merely claim that it is the *intrinsic* speed of light that is constant, but that the *relative* speed of light is constant; that is, that the speed of light violates the Galilean transformations. So, step by confused mathematical step, physics moved ever deeper into the mystical, all of it due to the flawed analysis of the Michelson – Morley experiment. The experiment that had set out to determine the velocity of the Earth through the ether led all of 20th Century physics down the Special Theory rabbit hole, resulting in a hundred-plus years of confused and erroneous conclusions concerning the fundamental nature of the universe.

The question remains: if the luminiferous ether exists, why was its presence not revealed in the Michelson-Morley experiment? Why was there no 'ether breeze?' The existence of space, formerly known as the ether or the aether, cannot be directly detected by tests such as the Michelson-Morley experiment because it is the immaterial Mind of God made manifest. Like the human mind, which is connected to it via a complex Awareness Connectivity System, space is ethereal; it is not, to use Einstein's phrase, "ponderable," and its presence can only be inferred from the observation of its various functions, and through its interactions with, and its effects upon, the material manifestations to which it has given birth, and which it envelopes and permeates.

Chapter Thirty-nine

THE INVALIDATION OF SPECIAL RELATIVITY PART 2

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Now, as promised, we shall conduct a simple thought experiment which will demonstrate conclusively that the speed of light does not remain constant regardless of the state of motion of the observer, and that light's behaviour is such that it is in full accord with the Galilean transformations, and that all claims to the contrary are manifestly untrue.

Imagine two observers. We will call them Jamie and Joyce. They are about to take the ride of their lives. They are in space and facing each other, situated 1.8 million kilometres apart. Like a cowboy in the chute astride a bull in a rodeo, Jamie and Joyce are each sitting upon a device which is capable of generating a beam of light which they will be able to ride. Halfway between them, 900,000 km from each, is a transmitter which will simultaneously send a radio signal to both devices, triggering a simultaneous generation of the two light beams.

Since this is a thought experiment, we can ignore the fact that the instantaneous acceleration from 0 to 300,000 km/second which Jamie and Joyce will experience would immediately kill them, and we will ignore our assertion that even if they managed to survive the acceleration, the pressure of space passing through their bodies at 300,000 km/second would completely destroy the atomic bonds holding the atoms of their bodies together, reducing them to streamers of sub-atomic particles moving rapidly through space.

The rate at which celestial bodies pass through space is so low, compared to the speed of light, that the passage of space through those bodies is, under many, although not all, circumstances, essentially friction-less. The fastest celestial body ever observed is thought to be a black hole which formed out of the collision of two smaller black holes, and gave off a signal detected by the Laser Interferometer Gravitational-Wave Observatories in the U.S. and Italy. This signal has been designated GW200129. On the basis of that signal astronomers have calculated that the resultant black hole has been accelerated to a velocity of somewhere between 700 and 1500 km/second. As fast as that is by human standards, it is still only about one-third of one percent of the speed of light, far too low for the pressure of space to have any noticeable effect on most material bodies.

This is not true for all elements however. For the class of elements known as “radioactive” elements such is not the case. Radioactivity is the spontaneous disintegration of unstable atomic nuclei accompanied by emission of alpha or beta particles or gamma radiation. This process is currently thought to be governed by the so-called 'weak force.' But we submit that like the 'force' of gravity and the 'G-force,' this 'weak force' does not actually exist. Radioactivity is not caused by some mysterious force. Radioactivity is actually the process of erosion of certain elements brought about by their passage through space. The atomic bonds holding together the nuclei of radioactive substances are weaker than the bonds holding together the nuclei of non-radioactive substances, thus making them susceptible to steady erosion by the

pressure of space as they pass through it. Each radioactive element erodes at its own particular rate, called its half-life. The half-life of any particular element is the length of time during which one half of a sample of that element decays. The velocity of a radioactive element through space plays only a small part in determining that element's half-life, while the two major determinant factors are the strength (or weakness) of the atomic bonds holding the nuclei together, and the amount of stress experienced by the space through which the radioactive element is passing.

Matter pulls on space, and when it does it places the space surrounding it under stress. The more massive the body, the greater the amount of stress experienced by the space surrounding it. As we have seen with 'black holes' (neutron stars of a certain minimum mass), space can become so stressed that it becomes rigid, and loses the ability to allow electromagnetic radiation to pass through it. The amount of stress that space is under affects the rate at which it will erode a given sample of a radioactive substance. On the Earth, the radioactive substance radon, commonly known as radium, has a half-life of 3.8 days. But on a planet which is significantly more massive than the Earth, the space through which that planet travels will be significantly more stressed than the space surrounding Earth, which will increase the rate at which radon on that planet erodes, thus decreasing the length of its half-life.

This theory can be tested experimentally. Take two precisely equal portions of some radioactive substance which has a relatively short half-life. Place them in two separate but identical suitable containers. Leave one container on the surface of the Earth, and send the other to orbit the Earth on the International Space Station for some arbitrary amount of time. According to this theory, the closer to the centre of a massive body, the more stressed the space surrounding the massive body will be. If this is true, and if it is true that the more stressed space is, the more rapidly it will erode radioactive substances, then the portion of the radioactive substance left on the Earth should, over a sufficient period of time, have a measurably shorter half-life than the portion which is

orbiting the Earth. This means that when the two portions are brought back together again for comparison, the portion which remained on Earth should be smaller than the portion which was sent into orbit. If that should turn out to be the case, this experiment would provide powerful evidence for the existence of immaterial space.

Returning to our thought experiment, Jamie and Joyce are astride their devices, ready to ride their beams of light into history. The radio transmitter centred between them sends its signal, and three seconds later they are both instantly accelerated to 300,000 km/second and rapidly approaching each other. Remember that their launch pads are situated 1.8 million kilometres apart. After one second they will each have travelled 300,000 kilometres and the distance remaining between them will have been reduced to 1.2 million kilometres. After one more second has passed the distance remaining between them will have been reduced to 600,000 kilometres. After one more second has elapsed they each will have travelled the last 300,000 kilometres to the transmitter and, with not even enough time to wave in passing, will carry on in opposite directions out into space. There they will place a square of cardboard they've been holding onto in front of the beam of light they've been riding which will absorb, reflect and scatter the light beam, bringing their ride to a halt. A spaceship which has been standing by will then pick them both up and the champagne will be uncorked, with the entire crew toasting their marvellous adventure. (This last part is, of course, complete nonsense. If their bodies survived the ride, the snuffing out of their steeds would not prevent the momentum of their bodies from carrying them forever ever-deeper into space. But this is a thought experiment, and we can drink all the champagne we want.)

The speed at which Jamie and Joyce each travelled through space was 300,000 km/second, the intrinsic velocity of light. But with each passing second they were 600,000 km closer together than they were one second before. Quite clearly, they were *approaching each other* at a relative speed of 600,000 km/second,

the sum of their individual velocities, as required by the Galilean transformations (and common sense). Thus the claim that the speed of light remains constant regardless of the state of motion of the observer is shown to be manifestly untrue; Einstein's postulate fails; and therefore the Special Theory of Relativity is shown to be invalid.

Note that the analysis of this thought experiment focuses on the distance remaining between Jamie and Joyce with each passing second. In this signal/observer problem Jamie and Joyce are the signal but, as we shall see, it would not be possible for them to observe each other's approach. While it is possible to conceive of an observational system which could record the experiment for later analysis, it would be impossible to observe this experiment as it was occurring in what is commonly referred to as 'real time'. However, the main point here is that once again distance is the determinant factor, and the key to understanding.

Having employed a thought experiment which disproves Einstein's postulate that the speed of light is constant and thus undermines the claims of Special Relativity, it is appropriate at this juncture to examine a thought experiment that Einstein himself used to demonstrate the notion of 'time dilation,' one of the phenomenon which he claimed would be a consequence of the theory.

Einstein imagined himself to be a passenger on a train that is situated in a station that is next to a clock tower in a town square. There is an observer situated in the town square. Einstein is carrying a clock. Einstein checks the clock he is carrying against the clock in the clock tower, and ascertains that they are synchronized. The train then pulls out of the station and begins to rapidly accelerate, until its speed begins to approach the speed of light. Einstein then checks the time on the clock he is carrying with him, and then looks back at the clock in the clock tower back in the town square. He observes that the clock tower clock now lags behind the clock he has with him. Meanwhile, back in the town square, the observer checks the time on the clock tower clock.

That clock indicates to the observer the same time that Einstein's clock on the train revealed to Einstein. However, when the observer then checks Einstein's clock, he observes that it lags behind the clock tower clock. We agree that this is indeed what would happen if this set of circumstances were to occur.

There are two possible explanations for this phenomenon. The explanation that Einstein leapt to is that since the time indicated by the clock tower clock now lags behind the clock on the train, it would *appear* to Einstein that, back in the town square, time itself has actually slowed down. Similarly, Einstein reasoned, for the observer in the town square, it would *appear* that time on the train has slowed down. Since the difference between the two clocks was their relative motion, Einstein concluded that time flows at different rates for observers moving relative to one another.

We have three objections to Einstein's explanation for this phenomenon. The first of these is that it assumes that time exists. Clearly, if time does not in fact have a phenomenological presence in the universe, as we have argued, then it cannot flow at different rates in different locales; indeed, it cannot 'flow' at all.

Our second objection to Einstein's explanation is that his explanation is based upon mere *appearances.* It is the job of the scientist to delve beneath surface appearances and discover what is actually occurring in any given situation. In the thought experiment Einstein acknowledges that for both Einstein and the observer in the town square, time continues to flow at its 'normal' rate at their locale. This fact strongly suggests that Einstein's conclusion, *appearances* to the contrary notwithstanding, is based upon an illusion. The Oxford English Dictionary defines the word 'illusion' as “sensuous perception of an external object involving a false belief.”

Our third objection to Einstein's explanation is that he based his explanation on the fact that the clock on the train is in motion relative to the clock tower clock. However, that was not the only difference between the two clocks. At the moment when Einstein

checked the time on his clock against the time on the clock tower clock the two clocks were in different positions in space, far away from each other. Since the train was moving at a velocity approaching the speed of light, at the moment of comparison the two clocks would have been a considerable *distance* from one another, and as we have learned from our red searchlight – green searchlight thought experiment, in signal-observer problems distance is the *determinant* factor.

Let us say that when Einstein checked the clock he was carrying with him on the train it said the time was 5:00 o'clock, and that when he looked back at the clock tower that clock said it was 4:59. Now, is the explanation for this set of facts that time actually has, from Einstein's perspective, slowed down at the clock tower? O**r,** is the explanation that the light signal which indicates 5:00 o'clock on the clock tower clock is still in the process of traversing the *distance* between the clock tower and Einstein (as was the case in our red searchlight – green searchlight thought experiment)?

To help us answer this question let us conduct Einstein's thought experiment once again, but under a slightly different set of circumstances. According to Special Relativity, time flows at different rates for observers who are moving relative to one another. So let us now consider the situation in which the train on which Einstein is situated is travelling at the non-relativistic speed of 100 km/hour and comes to a halt when it is exactly one light-minute (the distance light travels in one minute) away from the clock tower, and is now at rest relative to the clock tower. Einstein looks at his clock and observes that it says 5:00. He then looks in the direction of the clock tower. What will he see? Since, according to Special Relativity, time dilation is a consequence of the relative motion between the two frames of reference, and since Einstein is now at rest relative to the clock tower, the clock tower clock should now also say that it is 5:00, since there is no longer any relative motion involved. But it will not. It will say that it is 4:59. This is *not* because the passage of time at the location of the clock tower has 'dilated' or slowed down relative to the passage of

time on the train. This is so because the *distance* between the train and the clock tower is one light-minute, and therefore it will take one full minute for the light signal indicating 5:00 on the clock tower to reach Einstein on the train. By the time that signal does arrive at the train, Einstein's clock will say that it is 5:01. This is due entirely to the one light-minute separation between the two clocks - - - *distance being the determinant factor* - - - and has nothing whatsoever to do with their relative motion. As long as the train is one light-minute distant from the clock tower, whether the train is in motion or at rest relative to the clock tower, the clock tower clock will always *appear* to lag behind Einstein's clock by one minute even though, having been synchronized at the beginning of the experiment, the two clocks are, in fact, still synchronized.

(This scenario is valid as long as the clock on the train is a mechanical clock. As we shall see, if the clock on the train which is moving at near light speed is an atomic clock, it will no longer be perfectly synchronized with the clock tower clock because its measurement of the passage of time will have been affected by its rapid passage through space.)

We submit that it is obvious which explanation is correct. One is based upon mere appearances, while the other is based upon verifiable fact. *Nobody's time slows down from anybody's perspective,* no matter how fast they are moving relative to one another. Time does not exist, and therefore cannot slow down. Einstein's explanation for his thought experiment is simply false, which, in turn, renders the Special Theory of Relativity invalid.

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So Einstein's Special Theory of Relativity has been shown to be invalid. What, then, to make of the 'evidence' which has been gathered over the past century which purports to support Special Relativity's claims? Special Relativity makes two specific claims: to once again quote Zukav, ". . . to an observer at rest, a moving rod changes its length and a moving clock changes its rhythm."

According to the theory, the contraction of a moving rod will only become apparent to an observer if the rod is moving towards or away from them at a significant portion of the speed of light. Ignoring for the moment our assertion that any object accelerated to a significant portion of the speed of light would simply disintegrate under the pressure of space passing through it, and since in any event we have not yet figured out how to accelerate ordinary objects to anywhere near the velocity required to make such contraction apparent, there is virtually no empirical evidence available to support this particular claim.

However, while we cannot accelerate humans, automobiles, or rocket ships to near light speeds, particle physicists have developed the technology to accelerate sub-atomic particles to very nearly the speed of light. Using particle accelerators, physicists routinely smash sub-atomic particles into each other at extremely high velocities, as we have previously described. Writing in 1993, before the construction of the Large Hadron Collider or the Relativistic Heavy Ion Collider had been completed, Dr. John Gribbin provided the following description of the then, and as far as your author is aware, still current, theoretical understanding of what occurs when such collisions take place:

> "To get a picture of the kind of collision that will result when two such nuclei meet head on, consider the (as yet hypothetical) example of what happens to a gold nucleus accelerated to 0.999957 times the speed of light.
>
> "A gold nucleus contains 118 neutrons and 79 protons, so it has 79 units of positive

> charge, providing the handle by which it may be accelerated to such speeds using magnetic fields. At this speed, relativistic effects will make the mass of the nucleus increase, while it shrinks in the direction of motion to become a flattened pancake. *These effects are predicted by Einstein's special theory of relativity*, (emphasis added) and have been routinely confirmed in countless experiments of this kind. *A moving object really does get heavier and shrink in the direction of its motion as its speed gets closer to the speed of light.* (emphasis added)
>
> "The two effects involve the same relativistic factor, so in this particular example the mass increases to 108 times its rest mass, while the thickness of the nucleus along the line of flight shrinks to 1 / 108 times the thickness of a stationary gold nucleus. Do not worry about the odd 8. In round terms, it is a hundred times heavier (with a mass of more than 100 GeV per nucleon). But at the same time the thickness of the pancake has now shrunk to one hundredth of its former size - - - the thickness along the line of flight is now only 1 per cent of its diameter measured across the line of flight. With 100 times as much mass in one hundredth of the volume, the nucleus literally has a density 10,000 times greater (100 x 100) than the same nucleus at rest." (258)

So, the current theoretical understanding is that at velocities exceeding 99% of the speed of light, so-called "relativistic effects will make the mass of the nucleus increase, while it shrinks in the direction of motion to become a flattened pancake. These effects are predicted by Einstein's special theory of relativity," But we

have demonstrated conclusively that the Special Theory of Relativity is invalid. What faith, then, can we have in its predictions? More precisely, what faith can we have in its power to explain or account for the observations made concerning various phenomenological events? The only logical answer to this question is: none.

But the effects predicted by Einstein's special theory of relativity ". . . have been routinely confirmed in countless experiments of this kind. A moving object really does get heavier and shrink in the direction of its motion as its speed gets closer to the speed of light." But the Special Theory of Relativity is fundamentally flawed, and therefore its descriptions of, and explanations for, various phenomena cannot be relied upon. Therefore if it is true that "a moving object really does get heavier and shrink in the direction of its motion as its speed gets closer to the speed of light," then such phenomena must be susceptible to some alternative explanation.

Dealing first with the claim that "a moving object really does get heavier . . . . as its speed gets closer to the speed of light." This notion arises from Einstein's famous equation E = mc^2, which in turn was derived from the equations describing the Special Theory of Relativity. But the equations describing the Special Theory of Relativity are based upon an invalid assumption and are therefore fatally flawed. Einstein's equation E = mc^2 treats energy and mass as if they are real phenomenological aspects of the universe, but earlier we demonstrated that energy and mass are mere concepts, systems of measurement, which have no existence in the universe which is independent of the human intellect. Energy is a measurement of the amount of change occurring in a given situation, and mass is a measurement of the amount of resistance to that change. It is meaningless to suggest that they are in some sense 'equal' to one another. The equation E = mc^2 is therefore conceptually flawed.

The false equivalency established by E = mc^2 has resulted in confusion regarding the concepts of mass and weight. In the

excerpt quoted above Gribbin states, ". . . .in this particular example the mass increases to 108 times its rest mass. . . . In round terms, *it is a hundred times heavier* (emphasis added) (with a mass of more than 100 GeV per nucleon)." This notion is quite incorrect. The gold nucleon travelling at 0.999957 times the speed of light is not 100 times heavier than that same nucleon when it is at rest. When it is travelling through space at near light-speed the gold nucleon actually *weighs less* than it does when it is at rest, for when it is travelling through space (at any speed) it is weightless. What increases as its velocity increases is its resistance to change. If the force required to accelerate the gold nucleon when at rest to one kilometre/second is equal to x, then the additional force required to increase the velocity of the nucleon already travelling at 0.999957 times the speed of light by 1 more km/second will be 108 times x. The gold nucleus travelling at 0.999957 times the speed of light is 108 times more resistant to change than the same nucleon when it is at rest.

Although this value may have been calculated, as far as we know, no one has ever successfully placed a single gold nucleon upon a scale and weighed it in grams. And obviously it would be impossible to 'weigh' a sub-atomic particle moving at near light-speed. Note that Gribbin expresses the mass of the speeding nucleon as being more then 100 GeV. GeV is the abbreviation for 1 billion electronvolts. An electronvolt is a unit of measurement for measuring energy. Because of the difficulties involved in actually weighing sub-atomic particles, physicists routinely express the mass of sub-atomic particles in electronvolts. This practice may be mathematically convenient, but it is based upon a misconception. Mass and energy are not equivalent. They are, in fact, concepts which are in opposition to one another.

So we see that it is not true that "a moving object really does get heavier . . . . as its speed gets closer to the speed of light." What occurs as a moving object's speed gets closer to the speed of light is not an increase in its weight, but an increase in its resistance to change.

Anyone who has ever driven a car understands this dynamic. If a car is being driven at 50 km/hour it will take a certain amount of braking to bring the car to a halt in a given distance. If the car is travelling at 100 km/hour it will take more than twice as much braking to bring the car to a halt over the same distance. This is why all student drivers are taught to leave an additional car length between them and the car in front of them for each additional 10 km/hour of velocity. But this is not because the weight of the car increases as it gains speed. The car weighs the same at 50 km/hour, or 100 km/hour, as it does when it is at rest in the driveway. What has changed (increased) when the car has a velocity of 100 km/hour compared to when it has a velocity of 50 km/hour is its inertial mass, its resistance to change, that is, its resistance to being brought to a halt. Or, for that matter, its resistance to an increase in its velocity. It will take more force to increase the velocity of the car from 100 to 110 km/hour than it takes to increase the velocity of the car from 50 to 60 km/hour, even though the increase in velocity in both cases is the same 10 km/hour.

The confusion around these matters, both inside and outside scientific circles, arises from a misconception regarding what is meant by the words 'mass,' 'weigh,' and 'weight.' Zukav lays out the common understanding of these terms in *The Dancing Wu Li Masters:*

> "There are two kinds of mass, which means that there are two ways of talking about it. The first is gravitational mass. The gravitational mass of an object, roughly speaking, is the weight of the object as measured on a balance scale. Something that weighs three times more than another object has three times more mass. Gravitational mass is the measure of *how much force the gravity of the earth exerts on an object* (emphasis added). . . .

> "The second kind of mass is inertial mass. Inertial mass is the measure of the resistance of an object to acceleration (or deceleration, which is negative acceleration). . .
>
> "Inertial mass and gravitational mass are equal. This explains why a feather and a cannonball fall with equal velocity in a vacuum. The cannonball has hundreds of times more gravitational mass than the feather (it weighs more) but it also has hundreds of times more resistance to motion than the feather (its inertial mass). Its attraction to the earth is hundreds of times stronger than that of the feather, but then so is its inclination not to move. The result is that it accelerates downward at the same rate as the feather, although it seems that it should fall much faster." (259)

Zukav defines gravitational mass as the measure of how much force the gravity of the earth exerts on an object. But as our readers are by now keenly aware, gravity is not a force. Therefore there simply is no such thing as 'gravitational mass.' There is only inertial mass, which Zukav correctly defines. Therefore the notion that inertial mass and gravitational mass are equal is not the explanation for "why a feather and a cannonball fall with equal velocity in a vacuum." The reason why a feather and a cannonball side by side fall with equal velocity in a vacuum is the same reason why most of the stars in spiral galaxies orbit the centres of those galaxies at the same velocity: they are situated in a region of space which is experiencing the same amount of curvature.

So, if the weight of an object is not the measure of how much force the gravity of the earth exerts on that object (because there is no such 'force'), then what is it? To answer this question we must revisit our understanding of how the phenomenon of gravity is manifest.

As the Earth moves through space it creates (or carries with it) a constantly shifting valley or depression in the space through which it is moving (remember that when we originally introduced this concept we were still referring to the medium through which the Earth is moving as “space-time”). The bottom of this valley is to be found at the centre of the Earth. Any object which crosses the constantly moving gravitational rim of the Earth's valley will, unless it has enough momentum to prevent this from occurring, fall towards the bottom of the valley. The lifeforms and everything else which exist on the surface of this planet are situated on a 'ledge' that protrudes out into the valley, which keeps us all from falling down to the valley's bottom. That ledge is the spherical surface of the Earth. Since we exist within the gravitational rim of the Earth's valley in space, and since all objects within that rim will always fall towards the bottom of the valley unless they possess enough momentum to prevent that from occurring, all the objects on the surface of the Earth are in fact 'falling' towards the centre of the planet. Only the 'solid' nature of the surface of the Earth prevents this 'falling' from being apparent. Therefore, when we weigh ourselves on the bathroom scale, what we are actually doing is measuring the amount of pressure the matter which makes up our bodies (which can be measured by a measurement system which is expressed in terms of our inertial mass) is exerting on the surface of the Earth as it tries to fall down to the bottom of the valley.

The astronauts aboard the International Space Station are said to be experiencing 'weightlessness.' But because they are orbiting the Earth at a considerable velocity, their inertial mass is actually greater than it would be if they were standing at the corner of Hollywood and Vine. However, since their bodies are not pressed up against the rigid surface of the Earth they do not 'weigh' anything, and are thus experiencing 'weightlessness.' The astronauts are considered to be in 'free fall,' but the only really significant difference between their situation and that of those of us who are Earthbound is that their inertial mass is not in a position where it is pressing up against the rigid surface of the planet.

Everything on the surface of the Earth is also falling, but not 'freely,' since the falling motion is impeded by the Earth itself.

Imagine a sturdy wooden box which has the dimensions of 1 metre long by .5 metres wide by .5 metres high. It is filled with lead, and together the box and its cargo of lead weigh 150 kg, so when it is at rest its inertial mass is equal to 150 kg. There are handles at each end of the box, and on its lid is a steel ring. A strong rope is attached to the ring and is looped over a major branch of a tree. The box has been hoisted into the air so that the bottom of the box is 1 metre from the ground. Now, it would be possible for the average person to exert enough force on the box to cause it to swing from side to side. If they push on the side of the box with enough force to cause it to move a couple of centimetres, the box will swing back towards them and gently bump into them. The box's motion will have increased its inertial mass by only a small amount. However, if they exert enough force to move the box 1 metre or more they had better get out of its way. If they do not, the box's increased inertial mass will knock them on their butt.

When the box of lead is at rest its inertial mass is equal to 150 kg, and the average person can easily cause it to move from side to side. But while it is sitting at rest, only the very strongest of humans would be capable of grasping the box by the handles and lifting it upwards so that the rope goes slack. Why is that? In both cases the box is 'falling,' its falling motion impeded by the rope and the tree branch. We are 'falling' with it; our falling motion is impeded by the rigidity of the ground upon which we are standing. The box's inertial mass remains the same, so why is it so much more difficult to lift it upwards through space than it is to cause it to move from side to side? The reason that it is so much more difficult to lift the box upwards than to push it from side to side is because when we try to lift it, we are trying to push (or pull) the box up a hill. We cannot see the hill. It is invisible, but it is there. It is made of space. Living on our ledge in the valley in space that is created by the Earth's mass, the sides of the valley rise steeply up and away from us wherever we are situated on the surface of the

Earth. Just as it is easier to ride a bicycle along a flat stretch of road than it is to ride up a hill, so it is easier to push the box of lead sideways across the invisible hill of space than it is to lift the box up the hill of space.

Dr. Gribbin introduced us to the notion of "rest mass." The rest mass of an object is equal to its inertial mass when the object is not in motion, relative to its immediate surroundings. (It is necessary to add this proviso because in actuality of course, everything in the universe is in motion. There is no material object in the universe which is truly at rest. Note the use of the word "material." Immaterial space is at rest, in the sense that it does not move from one location to another. However, it is capable of motion. It warps or curves in the presence of mass, and it is constantly vibrating as electromagnetic and gravitational waves pass through it). The rest mass of an object remains constant unless matter is either added onto or subtracted from the object. The rest mass of your body remains, on average, the same from day to day. If on someday you indulge in a sumptuous feast, your rest mass on that day will increase by a slight amount. If you indulge in sumptuous feasts day after day and do not exercise, your rest mass will increase over time. Whatever your rest mass is at any given moment, it would be the same no matter where in the universe you might be, whether that be on the moon, the Earth, or the surface of a neutron star. However, your 'weight' on each of these three very different celestial bodies would be different due to the differences in the strength, or, to be more precise, the *shape,* of the gravitational fields induced by them. Situated on the surface of each of these bodies, your rest mass would be identical. Your rest mass is determined by the total amount of matter of which your body consists, and this fact is completely independent of other factors. But in each case, the *pressure* applied by your inertial mass 'falling' towards the bottom of the valley in space created by those bodies, upon each body's surface, would be different, and thus your weight would be different in each case.

If we conducted our experiment with the 150 kg box of lead

on the moon and the neutron star, the results would be different from what we observed on the Earth. There being no trees on the moon or on neutron stars, we shall have to add to our experiment a sturdy stand of sufficient height which has a heavily weighted base and an arm sticking out from it from which the box of lead may be suspended. On the moon we would find that the amount of force required to move the box from side to side would be, for all practical purposes, the same as it is on the Earth. This experiment could actually be carried out on the moon. But on the surface of a neutron star this would strictly be a thought experiment, for as we shall see, on a neutron star it would be impossible to hoist the box of lead off its surface, so we would not be able to place it into a position where we could make it swing.

But it would be a different story when it came to trying to lift the box upwards. On the moon we would find that it is not only the muscle-bound who are able to lift the box enough to create some slack in the rope, because on the moon the weight of the box of lead would be only 25 kg. On the neutron star however, it would be impossible for any human to lift the box by even a millimetre. In both cases the rest mass of the box is the same as it was on Earth, so why the different results? The conventional answer to this question is that due to the different strengths in the 'force' of gravity, the box will weigh less on the moon than on the Earth, making it easier to lift; and the box will weigh more on the neutron star, making it more difficult to lift. This answer is not inaccurate, but it is misleading. There is no mysterious 'force' involved. The difference in the three situations is actually due to the variation in the degree of the steepness of the slope of the valleys in space created by the moon, the Earth, and the neutron star.

Since the moon is much less massive than the Earth, the degree of the steepness of the slope of the valley created in space by the moon is much less than the degree of the steepness of the slope of the valley created in space by the Earth. Since the hill made of space surrounding the moon is less steep than the hill made of space which surrounds the Earth, it is easier to lift objects

up it. This explains why during the Apollo lunar missions the small rocket engines attached to the lunar modules were able to lift the astronauts off the surface of the moon, while huge rockets were required to lift the command and lander modules off the surface of the Earth.

On the other hand, the valley created in space by a neutron star has extremely steep sides, so steep that, other than a collision with another neutron star, there is no known force in the universe which has the power to lift an object off the surface of one of these massive beasts. If you were standing on the surface of a neutron star it would be impossible to even lift your arms above your head. So if you should somehow find yourself on the surface of a neutron star you'd better have lots of patience, because you are there for good.

So much for Gribbon's claim that, according to Special Relativity, an object gets 'heavier' as its velocity increases. As it travels through space from the batter's bat to the fielder's glove the baseball is weightless, no matter what its velocity may be. It only acquires a 'weight' once it is in the glove. As the velocity of an object increases, its inertial mass (its resistance to change) increases, but its weight (zero) remains the same. When a car is travelling down the highway at 100 kph, it 'weighs' the same as it does when it is parked in the driveway. Now, what about Special Relativity's claim that a moving object really does shrink in the direction of its motion as its speed gets closer to the speed of light?

According to Special Relativity, an object in motion appears, to an observer at rest relative to the object, to contract in its direction of motion and become shorter as its velocity increases until, at the speed of light, it disappears altogether. Imagine a 10 cm x 10 cm x 1 metre piece of lumber travelling through space in a direction which is parallel to its 1 metre dimension. According to Einstein's theory, for an observer at rest relative to the piece of lumber, as the piece of lumber's velocity increases towards the speed of light the length of the piece of lumber will shrink at an increasingly rapid rate, but its other two dimensions will remain

unchanged. This effect is said to be due to *the motion* of the object, in and of itself.

Since no object with the mass of the piece of lumber in our example has ever been accelerated to anywhere near the speed of light, there is absolutely zero empirical evidence to support this truly bizarre claim. However, physicists have interpreted observations made on the behaviour of sub-atomic particles in particle accelerators as evidence that this shrinkage phenomenon actually occurs. As Dr. Gribbin noted earlier, physicists have theorized that if a gold nucleus was accelerated to 0.999957 times the speed of light it would shrink ". . . . in the direction of motion to become *a flattened pancake.* (emphasis added) These effects are predicted by Einstein's special theory of relativity, and have been routinely confirmed in countless experiments of this kind." If this is true, and we have no reason to believe that it is not, and since we know that the Special Theory of Relativity is invalid, then there must be an alternative explanation for this "flattened pancake" phenomenon.

We recall, from some point in our past, having watched a film of a man in a wind tunnel, an apparatus for studying the airflow around objects such as the wings of airplanes. Apparently a video of this experiment could for a time be found on YouTube, but it is no longer available. However, a short description of the experiment can still be found on the internet. The test subject was strapped into a chair which had been bolted to the floor. He was wearing a soft helmet of some kind which covered his ears and was secured by a strap under his chin. As the velocity of the wind in the tunnel increased, the skin on his face flattened, pulling his mouth into a thin line. To get an idea of what he looked like, stand in front of a mirror and pinch your cheeks, pulling the skin out and back. The force of the air flowing past the man had the same effect on his face. The pressure of the air was causing a distortion in the shape of the features of the man's face.

Now, that man was at rest and the air was moving past him at what was, for air, a very high velocity of over 450 mph. But the

effects upon his face would have been the same if the air had been still, and it was he who was moving through the air at that same velocity. This situation is an analogue for what happens to sub-atomic particles when they are accelerated to near light-speed. The pressure exerted by immaterial space upon the particles as they travel through it at those speeds distorts their shape into that of a flattened pancake. At the speeds humans encounter in our everyday lives, the pressure exerted upon our bodies and surroundings by their passage through space is negligible and goes unnoticed. But we have seen that for some forms of matter, radioactive materials, the passage through immaterial space causes a steady erosion of their rest mass. In general, the pressure exerted by immaterial space upon a material object increases as the velocity of the object through space increases. As we stated earlier, at velocities which are a significant percentage of the speed of light, material objects such as our piece of lumber would simply disintegrate. Science-fiction writers will hate us for this, but this means that dreams of travelling to distant star systems at near light-speed will forever remain unrealized and impossible to attain. Even if we were ever able to figure out how to accelerate massive objects like human bodies and the rocket ships to carry them to such velocities, we would only be sending them to certain destruction.

So, according to the Special Theory of Relativity, objects in motion shrink along their dimension parallel to the motion, purely by virtue of the object being in motion. The only empirical evidence for this outlandish, not to say magical, claim comes from the theorized behaviour of sub-atomic particles when those particles are accelerated to near light-speed. But we now see that there is a perfectly logical explanation for the theorized distortion of the shapes of those particles: that is, the pressure of immaterial space upon the particles as they pass through it. No magical thinking required.

And yet, ironically, it turns out to be true that if a massive object such as a rocket ship was able to attain the speed of light,

under certain circumstances it would indeed disappear, not because it had shrunk away to nothing, but because it would become invisible.

Imagine that you are on an outpost deep in inter-stellar space. The outpost has a powerful radar system which allows it to detect all moving objects within a one light-year radius of its location. The radar system works by sending out radio waves which travel through space at the speed of light, bounce off any object they encounter, and return, at the speed of light, to the receiver antenna on the outpost. (This is probably impossible at that scale, but this is a thought experiment so we can just pretend that it is possible.) Now imagine that a very hi-tech rocket, moving at the speed of light, enters into the one light-year radius zone of space which is covered by the outpost's radar system, and is heading directly towards the outpost. The radio waves emitted by the outpost, after having travelled through space for one year, will bounce off the rocket ship and begin, at the speed of light, their one year long journey back to the outpost. But the ship is also travelling at light-speed, which means that it will arrive at the outpost at the same time as the radar waves reflected off it. So this means that for the entire year during which the ship has been approaching the outpost (travelling at the speed of light it will take one year to traverse one light-year,) it will have been invisible to the outpost's radar system. At some point, as the ship flashes past the outpost and if the radar system's timing is just right, it will suddenly appear as a brief blip on the radar system, and will seem to have appeared out of nowhere. Once the rocket has passed the outpost, the radio waves sent out by the radar system will never be able to catch up to the rocket because it is travelling at the same speed as they are. Therefore they will never be able to reflect off the rocket and travel back to the outpost's antenna, and therefore its presence will remain undetected. For all practical purposes, a rocket travelling at the speed of light directly towards or directly away from an observer would be invisible. This also explains why Jamie and Joyce would not have been able to observe each other's

approach in that previous thought experiment.

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Having provided logical explanations for two of the effects which Special Relativity claimed were due solely to an object's motion, namely that objects become heavier and shrink as their velocity increases, we turn now to its third claim: that of time dilation. In Zukav's account, according to Special Relativity ". . . to an observer at rest . . . a moving clock changes its rhythm." It is in regard to this claim that the bulk of the 'evidence' in support of the Special Theory of Relativity has been accumulated. It is appropriate at this juncture to reiterate that when Einstein formulated this theory he did so in the complete absence of any empirical evidence whatsoever. Yet despite this lacking, the theory and its improbable consequences were readily accepted by the leading physicists of the day. Einstein biographer Albrecht Folsing writes that ". . . this was due not to conclusive experiments but to the fact that most physicists responded to its axiomatic, fundamental character and its beauty." (260) In other words, the physics community was impressed by the theory's mathematical elegance, and completely ignored the fact that the theory lacked an evidentiary basis, or that its tenets were an affront to common sense. Evidence was a long time coming. Elsewhere Folsing writes:

> "Half a century would pass before time dilation was observed as an isolated effect, first in certain elementary particles of cosmic radiation. Not until 1971 was the effect convincingly

> demonstrated by accurate “atomic clocks” carried by passenger aircraft around the world. But by then relativity theory had long been a pillar of physics, so that no one expected anything but a confirmation that Einstein had been right in 1905. (261)

So, without any evidence to support it, over the course of more than half a century the Special Theory of Relativity had become legendary, and so when some apparent evidence for time dilation finally appeared everyone simply assumed that Einstein's assumption (his “postulate”) - - - that the speed of light is constant - - - was valid. It apparently never occurred to any physicist that there might be an alternative explanation for the observed behaviour of “atomic clocks.”

We shall now conduct an examination of some of the evidence that has been put forth as proof of the time dilation phenomenon. Remember that we (you the reader and we your author) already know that the fundamental assumption upon which the Special Theory is based is invalid; and that we have already demonstrated that Einstein's analysis of his thought experiment regarding time dilation is incorrect; and that therefore observed phenomenon which have been explained by reference to the Special Theory must have an alternative explanation. Bearing that thought in mind, we will begin our review of the “proofs” of time dilation with a close examination of the 'Trolley Problem.'

By the late 1990's, after a decade and a half of contemplation, we had come to the conclusion that time is an illusion. If this is true, then it is impossible for time to slow down (dilate), or to speed up. Vehicles can slow down or speed up; bicycles can slow down or speed up; runners can slow down or speed up; sub-atomic particles can slow down or speed up. The fundamental prerequisite for each of these things to be able to slow down or speed up is that they exist; they have a phenomenological presence in the universe. If time is merely an illusion and therefore

does not exist, then it does not have a phenomenological presence in the universe, and therefore is not capable of slowing down or speeding up. So we concluded at that time that the Special Theory of Relativity must be invalid, although we were still a very long way from being able to explain in detail precisely why this must be so.

One of the recurring obstacles to our more complete understanding of the situation was the purported demonstration of time dilation which we came to refer to as the 'Trolley Problem.' (This 'Trolley Problem' is not to be confused with the trolley problem created by psychologists to test people's choices when faced with a moral quandary.) Over the years we encountered several versions of this representation of time dilation, and they remained for years a puzzle we could not solve. They all seemed to make logical sense, and yet, if time truly is merely an illusion (as we believed at that time), then these representations must contain a flaw, but we simply could not see it. Then, in late August of 2021, we obtained the university-level physics textbook by Olenick, Apostol, and Goodstein. In addition to their treatment of the Michelson – Morley experiment which we analyzed earlier, the text contains a version of the Trolley Problem, along with a mathematical proof of time dilation based upon this demonstration. After two weeks of intense concentration on their version of the Trolley Problem, the clouds suddenly parted and the factual error contained within the standard version of the Trolley Problem was finally exposed. That, was a good day!

We shall now present to our readers the account of the Trolley Problem as contained in that textbook, including the accompanying diagram and along with some introductory preamble. In 1905 Einstein published a paper entitled “On the Electrodynamics of Moving Bodies,” the theory which was later to become known as the Special Theory of Relativity. We'll let Olenick *et al* pick it up from here. See if you can spot the factual error in their description of the Trolley Problem that took us more than two decades to uncover.

"Einstein's goal was not to explain the null results of the Michelson – Morley experiment - - - by Einstein's own account he had no knowledge of that experiment when he wrote his paper. Instead, his goal was to establish relativity as a fundamental universal principle for all of physics. Although he capitalized boldly on its consequences, Einstein did not attempt to account for the principle itself in terms of other hypotheses. He elevated the principle of relativity to the status of a fundamental postulate *not requiring further explanation* (emphasis added). This is now known as the first postulate of the special theory of relativity, which, in Einstein's own words, is stated as follows:

The same laws of electrodynamics and optics will be valid for all frames of reference for which the equations of mechanics hold good.

Einstein's second postulate concerns the speed of light:

Light is always propagated in empty space with a definite velocity c, which is independent of the state of motion of the emitting body.

"Taken together, these postulates *imply* (emphasis added) that the speed of light (one of the "laws" of electrodynamics) must be independent of the state of motion of the observer. Although Einstein did not realize it at the time, the Michelson – Morley experiment provided experimental verification of those postulates. Einstein proceeded to show that these two

postulates *implied* (emphasis added, again) that the fundamental concepts of length and time must be regarded as relative quantities rather than absolute quantities.

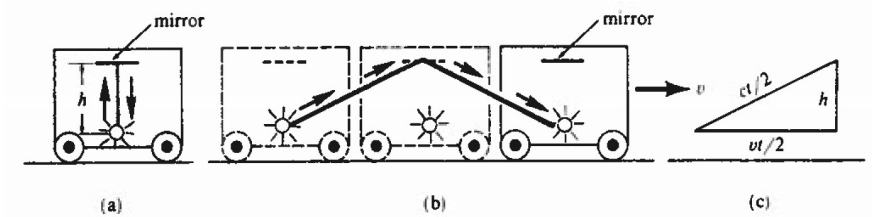

Figure 46.2 A thought experiment with a moving trolley car. (a) Path of light according to an observer in the car. (b) Path according to an observer on the ground. (c) Right triangle used to calculate time *t*.

FIGURE 46.2

"To illustrate the relative nature of time and length we shall describe a thought experiment that is suggested by the Michelson – Morley experiment. Imagine a moving trolley car with an observer in the center of the car, as illustrated in Fig. 46.2a. The observer turns on a light source and measures the time t' it takes for the light to travel vertically upward to a mirror on the ceiling and reflect back down. If the mirror is at height h above the observer, the light travels a total distance 2h with constant speed c, hence 2h = ct' or

$$t' = 2h / c.$$

"Now we ask an observer on the the ground to make the same observation. He sees things differently because the trolley car is moving past him. He sees the light move along the two legs of an isosceles triangle as shown in Fig. 46.2b, a path whose length is greater than 2h. But the speed of light is the same for both observers, so, relative to the ground observer, it takes a greater time to travel the greater distance. Thus we see that Einstein's postulates *imply* (emphasis added, again) that time is a relative quantity, not an absolute quantity. The observer in the moving car would say that the clock of the observer on the ground runs more slowly than the clock on the train.

"It is easy to calculate the exact relationship between the two times. Suppose that the car is moving with a horizontal speed v relative to the ground. Then the base of the isosceles triangle has a length vt, where t is the time measured by the observer on the ground. Applying the theorem of Pythagoras to the triangle in Fig. 46.2c we find

$$(ct / 2)^2 = (vt / 2)^2 + h^2$$

If $v^2 < c^2$ we can solve for t to obtain

$$t = t' / \text{the square root of } 1 - v^2 / c^2$$

The factor multiplying t' is usually denoted by y,

$$y = 1 / \text{the square root of } 1 - v^2 / c^2$$

and is called the time dilation factor. The time

> taken by the light for the back and forth trip in the moving system *appears* (emphasis added) to the stationary observer to be longer than to the moving observer by the factor y. (337)

For the sake of simplicity we have taken the liberty of leaving out two steps in the mathematical derivation of the time dilation factor, but this is of no account. The flaw in this explanation of the Trolley Problem is not in the mathematics; rather, there is a factual error in the reasoning underlying the mathematics. Were you able to spot it? It is quite subtle, but very obvious once it becomes apparent. The authors of the textbook also provide a mathematical 'proof' which purports to explain why length too is a relative quantity, but we need not go into its details. This so-called 'proof' relies upon the same factual error as that which invalidates the derivation of the time dilation factor, and is therefore also erroneous. This 'proof' that length is a relative quantity and the time dilation factor are thus both pieces of mathematical fiction; they are mathematical descriptions of two fictional events (the slowing of time and the shrinkage of objects), events which do not actually occur in nature.

We begin by noting that the textbook's authors, although they do not say so specifically, certainly imply that Einstein raised both conjectures - - - the Principle of Relativity and the Principle of the Constancy of the Speed of Light - - - to the status of fundamental postulates "*not requiring further explanation.*" In other words, Einstein was saying that his two claims about the fundamental nature of the universe should be accepted as articles of faith. But since when did Science accept as valid claims made on the basis of faith? That notion runs counter to the entire ethos of the scientific process. A postulate, no matter how fundamental, is still, fundamentally, an *assumption,* and should therefore, particularly in the realm of Science, be subject to questioning and demands for further explanation.

We also note the textbook's authors' repeated use of the

word “imply” as in: “Taken together, these postulates *imply* (emphasis added) that the speed of light (one of the “laws” of electrodynamics) must be independent of the state of motion of the observer;” and “Einstein proceeded to show that these two postulates *implied* (emphasis added, again) that the fundamental concepts of length and time must be regarded as relative quantities rather than absolute quantities;” as opposed to the use of the word “*require*.” In commenting on Einstein's two postulates, Folsing employs the same language:

> “The “principle of relativity” *implies* (emphasis added) (though it does not explicitly state) that the velocity of light is constant not only for a single observer - - - for instance, one sitting at the light source - - - but for any observer.” (262)

Could it actually be true that for over 100 years physicists have based their understanding of the fundamental nature of the universe upon a mere implication? That certainly appears to be the case.

Furthermore, we must take issue with the textbook's claim that “ . . . the Michelson – Morley experiment provided experimental verification of those postulates.” As our analysis of the Michelson – Morley experiment demonstrated, the implication “. . . that the speed of light . . . must be independent of the state of motion of the observer” is clearly false.

Now it is time to expose the factual error in the standard version of the Trolley Problem as it is delineated in Olenick *et al's* textbook. There are two aspects to this error, one of which we encountered earlier in their analysis of the Michelson – Morley experiment. This error involves the misapprehension that the path a beam of light takes through space depends on the frame of reference of the observer. This is simply false. The path that a beam of light takes through space is completely independent of the frame of reference of any observer. The path that a beam of light takes through space is the path that the beam of light takes; it

doesn't matter who is looking at it, or from what vantage point they are looking. Its path is its path. In the textbook version the observer on the trolley car sees the beam of light rise up to the mirror on the ceiling and be reflected straight down again to the floor. But according to the textbook, because the trolley car is in motion (our trickster friend 'motion' once again making an appearance) the observer on the ground sees that same beam of light "move along the two legs of an isosceles triangle as shown in Fig. 46.2b." But this is impossible because - - - and this is the key insight that allowed us to solve the Trolley Problem - - - *no single beam of light can simultaneously take two different paths through space.* The beam of light the observer on the trolley sees travelling straight up and straight back down through space cannot at the same time be taking a diagonal path through space. So the observer on the ground's observation that the beam of light has taken a diagonal path through space is merely an illusion perpetrated by that trickster 'motion.'

Figure 46.2 which accompanies the textbook's description of the Trolley Problem only serves to add to the confusion. It shows a light source such as a standard light bulb which gives off light in all directions. In that case there would indeed be a light beam which travels diagonally down the length of the trolley car, but it would not be the same beam of light which travels vertically up to the mirror and is reflected straight back down as observed by the observer on the trolley car.

If you are feeling confused, fear not. We shall now conduct our own thought experiment version of the Trolley Problem in which all sources of ambiguity are removed, and in which an accurate picture of these events is demonstrated and easily understood.

We begin with a trolley car which has been purpose-built for this thought experiment. It is 15 metres long, and has no sides and no seats. The distance between the floor and the ceiling is 3 metres. Running down the entire length of the trolley, centred on both the ceiling and the floor, are two mirrored surfaces which are

.5 metres wide and 100% reflective. Both mirrors have corresponding marks upon them every 1 metre down their entire length. In the experiment the trolley will travel from west to east. At the 1 metre mark from the east end of the trolley, a laser is inset into the mirror on the floor so that the edge of the laser is flush with the surface of the mirror. The laser will shoot out pulses of red light which will be clearly visible when they strike the mirrored surfaces. Adjacent to the laser and sitting on top of the mirrored surface is a 6 cm by 15 cm piece of mirror resting on a movable mechanism so that this piece of mirror can either cover up the laser, or be retracted so that the light from the laser can be emitted. This mechanism is designed so that whenever the laser emits a pulse of light, it immediately and automatically moves the small piece of mirror so that it covers up the laser. Both the laser and the mechanism which retracts the small piece of mirror from above the laser are remotely controlled.

So far, all the elements of our experiment are things which could actually be engineered and built and be part of an actual experiment. Now we come to three conditions which can only be carried out in our imaginations. The first of these is that we are going to endow the trolley car with the ability to go instantaneously from being at rest to achieving a velocity of .5 metres / second. That's not too hard to believe. The other two conditions are rather more unattainable, but we have employed them both in an earlier thought experiment. We are going to once again slow the speed of light; on this occasion to a speed of 1.5 metres / second. And once again we are going to halt the motion of the Earth through space and place it at rest, since its actual velocity would interfere with our experiment due to the decreased speed of the light from the laser.

Now we will introduce you to our two observers. Their names are Tim and Katrina. Katrina will be our observer on the trolley and Tim will be our observer on the ground. Positioned at the east end of the trolley, Katrina stands on one side of the floor of the trolley facing south, with the mirrored surface on the floor in front of her. She is straddling the 1 metre mark on the mirror with

which the laser is lined up. She holds in her hands two remote control devices, one which controls the laser and the retraction mechanism, and one which will put the trolley into motion. Tim stands on the ground up close to the trolley directly opposite Katrina and is facing north. In his hand he holds a square piece of cardboard, which he borrowed from Jamie who kept it as a souvenir from his historic ride upon the light beam.

We are now ready to commence the experiment. After ascertaining that the small mirror is in the retracted position and that Tim is paying attention, Katrina says "Fire!" and pushes the button which causes the laser to fire. Since the light is only travelling at 1.5 metres / second and the distance from the floor to the ceiling of the trolley is 3 metres, Tim and Katrina have two full seconds to look up and observe the red light of the laser reflect from the mirror on the ceiling of the trolley. They then have two seconds to look down and see that reflected red light reflect from the movable piece of mirror which has automatically slid into place to cover the laser, and travel back up once again towards the ceiling. Since these mirrored surfaces are 100% reflective, the pulse of red light will continue to bounce up and down between the ceiling and the floor of the trolley for quite some time. After standing there with their heads nodding up and down for a few seconds, Tim reaches into the trolley and places the piece of cardboard into the path of the beam of light, bringing its journey through space to a halt. After Katrina pushes another button on the controller to make the movable piece of mirror retract, they repeat the experiment. They do this several times, until their necks get tired from all the bobbing up and down, at which point they have become convinced that the pulse of light *always* travels straight up and straight back down.

Now they are ready to conduct the action-packed second part of the experiment. This time when Katrina says "Fire!" she simultaneously presses the button which causes the laser to fire and the button which sets the trolley in motion at an instantaneous speed of .5 metres / second. Because it takes the beam of light 2

seconds to travel from the laser to the ceiling, by the time it reaches the ceiling the trolley will have moved 1 metre. This means that the beam of light will strike the ceiling mirror at the two metre mark. It will then reflect off the mirror and travel back down towards the floor, at the rate of 1.5 metres / second. But by the time it reaches the floor, two seconds later, the trolley will have travelled another 1 metre, meaning that the beam of light will therefore strike the floor of the trolley at the 3 metre mark. From there the beam of light will be reflected back towards the ceiling to strike it at the 4 metre mark. This process will continue as the trolley proceeds from west to east at the rate of .5 metres / second until the beam of light runs out of trolley and reflective surfaces to reflect off of.

Now, what have our two observers observed? At first blush you might be tempted to think that Tim has observed the light beam taking a diagonal path through space as it travelled from the 1 metre mark to the 2 metre mark to the 3 metre mark and so on down the length of the trolley, but this is not the case. Tim and Katrina earlier verified, when the trolley was at rest, that the beam of light *always* travels straight up and straight back down. How could the motion of the trolley affect the behaviour of the beam of light? It cannot. The space (or, if you prefer, the aether), the medium through which the beam of laser light is traversing, is at rest. The trolley does not carry any space along with it; it simply passes through it. So from Tim's frame of reference, which has not changed, the beam of light is still bouncing straight up and straight down right in front of him. At any time he could reach out with the piece of cardboard and stop the beam of light in it tracks. As the trolley travels eastward the distance between Katrina and Tim steadily increases. Katrina will have to look to her right in order to see the beam of light reflecting off the mirrors lining the floor and the ceiling, and the distance between her and the reflections will likewise steadily increase.

We have not factored into our analysis the amount of time it would take for the light reflected from either the floor or the ceiling

to reach the eyes of Tim and Katrina which would, since the light is only travelling at 1.5 metres / second, be significant. Because Tim's frame of reference is fixed relative to the path of the beam of light, the amount of time required for the reflected light to reach Tim's eyes, whatever it is, would be constant. Because Katrina is moving steadily away from the reflections, the time required for the reflected light to reach her eyes would steadily increase. But these factors are not germane to the point of the thought experiment, and are therefore extraneous and so may be ignored.

We can now see that the textbook's derivation of the 'time dilation factor' is based upon a false premise. It is based upon what *appears* to happen, not what actually occurs. The point of the experiment is that for both Katrina (the observer on the trolley) and for Tim (the observer on the ground) the light emitted by the laser travels only straight up and straight back down. That particular beam of light *never* moves ". . . along the two legs of an isosceles triangle as shown in Fig. 46.2b" from either observer's frame of reference, negating the claim made by the textbook. Since the calculation of the time dilation factor rests upon that negated claim, it becomes clear that that calculation is without foundation, and that therefore the only logical conclusion is that the time dilation factor is, as we stated previously, a piece of mathematical fiction.

"But wait a minute," we can hear some critic saying. "You are glossing over an important fact. As Katrina moves ever further away from the light beam's reflections, it will take longer and longer for her to have the same experience as Tim. Therefore from Tim's point of view, for Katrina, who is in motion relative to Tim, time will have slowed down, just as the Special Theory predicts."

This line of reasoning is fallacious. The time dilation factor, flawed as it is, is not based on how far Katrina is from Tim, but on how fast she is moving relative to Tim. The fact that Katrina's experience of seeing the light beam reflect off the mirrored surfaces will steadily and increasingly lag behind Tim's experience of the same events is not due to time dilation; rather it is a consequence of the simple and straightforward fact that the

distance between Katrina and the reflections is steadily increasing, while for Tim those distances remain constant.

But our critic does raise an interesting point, and that is the question of the definition of the word "now." To explore this question we must return to Dan Falk and his erroneous explanation for the relativity of simultaneity, the full text of which we have provided beginning on page 489. (It may be advisable for the reader to review that portion of this book before proceeding.) After completing his explanation for the relativity of simultaneity, as an adherent of Einstein's Special Theory, Falk goes on to state:

> "With special relativity we can no longer declare two events to be simultaneous in any absolute sense. Instead, we can only say that they may appear simultaneous from some particular frame of reference . . .
>
> "It gets worse. What do we mean when we say a particular event is happening "now"? When we use the word "now," we are really comparing two events: I can snap my fingers and then ask whether some other event is simultaneous with my finger-snapping or not. If it is, I say that the event is happening "now." In the Newtonian universe, I can legitimately ask, "What events in the universe are happening right now?" The answer would be a unique set of occurrences, scattered throughout space but lying on a single "slice through time." I can snap my fingers at, say, noon Eastern Standard Time on December 1, 2008, and every event, everywhere in the universe, either is simultaneous with my finger-snapping or is not. That was fine for Newton, but not for Einstein. As we have seen, in special relativity there is no universal agreement among observers as to whether two events

> actually are simultaneous or not - - - and thus there can be no universal "now."" (263)

The reasoning laid out in this excerpt is confused and misleading. In it Falk substitutes and prioritizes the illusory world of appearances for the world of actual occurrences. In his discussion of the relativity of simultaneity, Falk's passenger, when positioned in the centre of the train car while it is in motion, experiences the firing of the flash units at the ends of the train car as simultaneous, even though that is not in fact the case. In our thought experiment involving the red and green searchlights, two out of the three observers did not experience the flashing of the searchlights as simultaneous, even though in fact they were. Therefore Falk's statement ". . . that [events] may appear simultaneous [or not] from some particular frame of reference" is accurate, but it is not true that "we can only say that." And Falk's prior statement that "With special relativity we can no longer declare two events to be simultaneous in any absolute sense" is not true at all.

First of all, as we have demonstrated, special relativity, with its focus on relative motion, is completely extraneous to the analysis of any signal/observer problem. Further, Falk's claim that ". . . we can no longer declare two events to be simultaneous in any absolute sense" is simply false. Events may *appear* to be simultaneous or they may *appear* to not be simultaneous, but as Aesop wrote in his fable *The Wolf in Sheep's Clothing,* "Appearances often are deceiving." It is the task of the scientist to peer beneath the surface world of mere appearances in order to discern what has actually occurred.

The Game of Being is governed by the rule that "Everywhere within the boundary of the Game, change shall be unceasing." Thus the Game consists of an ongoing stream of events. At any given moment in the unfolding of the Game, x number of events are occurring. In that moment, everywhere within the Field of Play, all those events are occurring

simultaneously. This fact is completely independent of whether or not some observer is available to observe two or more of those events and declare, from their particular frame of reference, whether or not they occurred simultaneously. Events happen when they happen, and they either happen simultaneously or they do not, regardless of any appearances to the contrary.

Falk's line of reasoning relies on an illegitimate conflation of the occurrence of an event, with the observation of that event, which is, in and of itself, a separate event, which, by reason of logical necessity, must occur after the occurrence of the event so observed. The ultimate consequence of this line of reasoning is the erroneous idea that an event 'happens' when some observer observes it, not when the event actually occurred. This is obviously incorrect. But it is the inevitable consequence of viewing the fundamental operation of the universe through the distorting lens of the Special Theory of Relativity. Furthermore, this way of viewing the world is not consistent with the way in which we humans, as sentient beings, interpret the flow of events which make up our reality on a day-to-day basis.

Consider the following: There are three galaxies, A, B, and C. Latka, an astronomer in galaxy B, is observing galaxy A. He has previously determined that galaxy A is three million light-years from galaxy B. On this particular night Latka discovers a supernova which has exploded in galaxy A. Two million years later we find Cleo, an astronomer in galaxy C who is also observing galaxy A. She has previously determined that galaxy A is five million light-years from galaxy C. On this particular night, two million years after Latka's discovery, Cleo discovers the same supernova exploding in galaxy A. Being well-trained scientists, neither Latka or Cleo believe for a moment that the supernova is exploding in their “now,” in the moment they observe it. They are both perfectly aware that the supernova exploded three million years and five million years, respectively, prior to the moment in which they made their observations. They do not conflate the separate event of the explosion of the supernova with their

observations of it.

Now let's place Dan Falk and his snapping fingers in galaxy B, three million years prior to Latka's discovery. Upon arriving home one evening he realizes that he forgot to stop off to buy milk on the way home. “Damn,” he mutters, snapping his fingers, and decides he'd better make a special trip to get some milk. At the very moment he snaps his fingers, a star in galaxy A goes supernova. Those two things can be said to have happened simultaneously, even though nobody in galaxy B will be aware of the explosion of the star for another three million years.

The point of this thought experiment is to refute Falk's contention that “. . . there can be no universal “now.”” Just because two observers may or may not agree as to whether two events were simultaneous does not warrant the leap to this conclusion. In theory, it is possible, by acquiring the necessary data and through the application of logic, to determine with certainty whether or not any two particular events were or were not simultaneous with one another. For example, the three observers in our red searchlight / green searchlight thought experiment could have got together after the experiment to compare notes, then measured the various distances involved and, using their knowledge of the speed of light (in the thought experiment it was one km/second), would have been able to figure out that the conclusion that two of the observers had reached regarding the timing of when the searchlights flashed on was illusory, and that, despite their individual experiences which appeared to indicate otherwise, the two searchlights did indeed flash on and off simultaneously. Similarly, the passenger situated at the centre of Falk's moving train car could logically analyze the circumstances of his situation and conclude that his experience was an illusion. In practice, this will not always be possible. Nobody in galaxy B would ever be able to verify that Dan Falk snapped his fingers at the precise moment the star in galaxy A went supernova three million years earlier. Nevertheless, that inability to gather the necessary data is insufficient grounds to deny with certainty the

possibility that those two events were in fact simultaneous.

Ultimately, the Game of Being consists of a continuous series of 'nows.' Your reading of this sentence is the event which constitutes your present 'now.' While you read that sentence, everywhere within the Field of Play other events were occurring, all of them simultaneous with your reading of that sentence. Just because you did not observe (or have not yet observed) those events does not mean that they did not share that particular 'now.' Even though it may be impossible for you to ever verify that some specific event occurring elsewhere within the Field of Play occurred simultaneously with your reading of that sentence, you may be confident that many, many, many such events did in fact occur simultaneously in that same "slice through time," without regard to when any of those events may have been 'observed.' In this regard, Newton was correct and Einstein and his Special Theory adherents are mistaken.

This all seems so obvious, so why does any of it matter? It matters because the line of reasoning adhered to by the special relativists has brought them to make conclusions about the nature of time, and ultimately, the nature of being itself, that are confused and erroneous. Presenting the conclusions of the special relativists Dan Falk writes:

> "In four-dimensional spacetime, what are we to make of notions such as past and future, or before and after? . . . . Thanks to the relativity of simultaneity, an event that lies in my past may yet be in your future, and vice versa; all that is required is that the event be far away, and that you and I be moving relative to one another. Many physicists, and quite a few philosophers, have come to see the four-dimensional spacetime of special relativity as evidence that past and future events are just as "real" as present events. Everything seems to be laid out all at once in a

kind of block . . . .

> "The American philosopher Hilary Putnam used the absence of a universal "now" to argue that future events are fully predetermined. . . . This clearly plays havoc with our traditional ideas of free will and the "openness" of the future. And it's not just the future that gets an overhaul: by [Putnam's] line of reasoning, I am obligated to regard as "still real" events that seem to lie in my past but that may be in the present from your perspective.
>
> "The philosopher Michael Lockwood appears to be persuaded by Putnam's argument. "To take the spacetime view seriously," he writes, "is indeed to regard everything that ever exists, or even happens, at any time or place, as being just as real as the contents of the here and now." The "block universe" picture, with its peculiar blurring of past, present, and future, continues to hold sway with both philosophers and physicists. To be sure, each point in spacetime has a past and a future . . . but . . . there is no "overall future" and no "overall past." As physicist and writer Paul Davies has put it, "The very division of time into past, present and future seems to be physically meaningless."" (264)

These ideas are the unfortunate result of the illegitimate conflation of the occurrence of events, with the observation of those events. More fundamentally, this entire line of reasoning is a result of the unwise conflation of space and time into the single entity space-time. As we have stated previously, this is a mistake because it joins together something which exists - - - space - - - with something which does not - - - time.

This mistake is further compounded by conferring the status

of existence upon something else which does not exist: namely, the concept we call the "future." Like the measurement system we call "time," the "future" is a pure concept which has no phenomenological presence in the Field of Play which exists independently of the human Awareness Connectivity System. It is a product of the human imagination, and it appears that this capability to imagine a "future" is a relatively recent evolutionary development on this planet. As far as we can tell, it is only fully developed in the species homo sapiens. Humans can anticipate, plan for, and, to a certain degree, even predict the future; as such our 'futures,' the detailed versions of which are unique to each of us, are a part of our individual realities, which are likewise unique to each of us. But our futures do not exist and are therefore not 'real;' they are, at most, merely *potential* events. Only events which actually occur can be said to be real. A potential event imagined in our future can at some point occur, at which time it becomes real; but in that moment it ceases to be a part of our imagined future and becomes a part of our actualized past.

So the future is nothing more than a figment of our imaginations. The 'future' does not exist. What about the past? Does it exist? This is a much trickier question to answer. But the answer seems to be yes, the past does exist, but only temporarily. This, of course, is consistent with the rule that all beginnings must have an ending. The past can, however, do something which the future cannot, and that is that the past can leave behind it evidence that it once did exist.

To illustrate this idea let us return to the story of our two astronomers, Latka and Cleo. We drop into the story four million years after the star in galaxy A exploded as a supernova. At this point you might be tempted to say that the supernova is one million years in Latka's past and one million years in Cleo's future; but this would be incorrect. If Latka was the Methuselah of astronomers and was still alive one million years after his discovery of the supernova in galaxy A, his initial knowledge of the supernova would be one million years in his past, but the event of the

supernova itself would then be four million years in his past.

As for Cleo, the supernova is certainly not in her future, for she will not be born for another one million years and so the moment when she, as a young student of astronomy imagines, “One day I will discover a supernova,” has not yet arrived. Since the future is merely a figment of the human imagination and Cleo is not yet alive to imagine a future which includes her discovery of a supernova in galaxy A, the event identified as the explosion of a particular star in galaxy A cannot be said to be in Cleo's future. But, even though Cleo is not yet alive at that point in time, the supernova event is nevertheless an event which occurred four million years in the past. A million years later, on that fateful night when Cleo looks through her telescope and 'discovers' the supernova in galaxy A, by virtue of the fact that the supernova is an event which actually occurred in the past, it can become an event in her past, and in the past of anyone else who happens to be observing galaxy A at the appropriate time.

So while the future consists of imaginary events imagined by individual humans which may or may not ever actually occur, the past consists of events that actually have occurred. Therefore the past exists, or at least once did exist, but the future does not exist and never has. This is not to say that the 'future' is not a useful concept. It certainly is. This concept has provided homo sapiens with a very significant evolutionary advantage. It allows us to anticipate and plan for events which have not yet occurred, and thus to shape those events to our benefit. But it is important to remember that like time itself, the future is just a concept and as such has no phenomenological presence in the Field of Play. The future is part of our individual realities, but it itself does not exist and is therefore not real.

This is because our realities do not exist. Our realities arise from, and are made manifest by, that which does exist. We could not experience our realities without the substrate of those entities which do exist: immaterial space and matter. But just as immaterial space is a separate category of being from that of

matter, our realities are a separate category of being from that which exists. Ultimately, our individual realities are individual instances of God experiencing be-ing, and as such constitute a category of phenomena which is separate and unique unto itself.

We have said that the past can do something which the future cannot, and that is that the past can leave behind it evidence that it once did exist. In our story of Latka and Cleo this evidence is the rays of light created by the exploding star which have travelled through space from galaxy A to galaxies B and C. Those rays are proof positive that a star exploded, millions of years in the past; they are proof positive that such a temporary event once occurred, in the past.

Having made it this far, we now must ask the question, "What, then, is the present?" It is commonly believed that the present, the moment we call 'now,' moves relentlessly through time into the future which, by some mysterious process, is transformed moment by moment into our 'nows.' But we now see that this cannot be the case. We now understand that 'time' is merely a human-invented system of measurement, conceived by humans in order to measure change, and as such nothing can be meaningfully said to 'move' through it. Similarly, we now see that the 'future' is purely a construct of the human imagination and as such is entirely non-existent. But the present moment, our stream of 'nows,' definitely does seem to exist. How can something which does not exist - - - the future - - - give birth to something which does at least appear to exist - - - the present? We submit that it cannot. If the present cannot arise from the future, then where does it come from? The only available alternative is: the past.

Earlier in these pages we presented the idea that each moment in the unfolding evolution of the Game of Being is simultaneously both cause and effect. In this context the word 'moment' we define as 'the state of being everywhere within the Field of Play at any given specific point in its evolution.' Each moment is the effect of the moment immediately preceding it, and is simultaneously the cause of the moment immediately following

upon it. If this is true, and we submit that it cannot be otherwise, then it is clear that the present evolves out of the past. This understanding is logically consistent. Something which we have verified does exist (or at least did indeed at one time in fact exist) - - - the past - - - gives birth to something which certainly appears to exist - - - the present.

This conclusion satisfactorily answers the question of where the 'present' comes from, but it does not tell us what the 'present' is. The answer to this question is, at first, rather startling. Given that humans are primarily visual beings, that is, unless we have been deprived of our sight, in order to make our way through life we rely upon our ability to see more than any of our other sensory capabilities, we will base our analysis herein on light signals, but the analysis holds true for signals received by all of our senses.

When we look out our window, it takes some time, although only a nanosecond or two, for the sunlight reflected off the brick building across the street (the signal) to traverse the distance between that building and the retinas of our eyes. It takes a further micro-second or two for our Awareness Connectivity System to process that signal and inform us, "You are looking at a brick building." If we are continuously observing a static object like the facade of a building which is unchanging, the effect we are trying to describe is insignificant and harder to grasp. However, if we are looking down at the street during a busy rush hour where there are many vehicles and people in motion and thus change is apparent, the situation becomes clearer. At any given moment a certain set of visual signals is reflected off the moving objects in your field of vision and begins its (very short in time) journey to your eyes which, after processing by your Awareness Connectivity System, will then inform you of the relative positions in space of all those moving objects at that particular moment in time. But because all those objects are in motion, by the time your Awareness Connectivity System receives and processes the light signals sent to you by those objects, all those moving objects will be in another position in space. The occurrence of an event and our experiencing

of that event are two separate events. In order for us to experience an event, it must have occurred prior to our experiencing of it. Therefore your comprehension of the scene in front of you is consistently behind the times and outdated. Thus the fact is that your 'present' is a reflection of the past.

So what is the 'present?' The 'present' is a concept humans have invented in order to be able to refer to our experience of a particular set of events that have already occurred. Most of the time our 'present' consists of events that are only very slightly in the past, events that have just happened. Such is the case with the street scene described above. But that is not always the case. In Cleo's case, her 'present' consisted of a signal transmitted by an event that had occurred five million years earlier. Therefore, because our 'present' consists of events that have already occurred and are thus in the past, *we actually live in the past.* The 'present,' despite its appearances to the contrary, is actually the past in disguise, and thus is a mirage, an illusion.

So we see that the future is purely imaginary, and the present is an illusion. Thus the startling but unavoidable conclusion is that, by the process of elimination, only the past remains. Only the past is real. Only the past exists.

"Wait a minute!" our critic shouts. "I can see that brick building. I can go and touch it. It is part of my continuous 'nows.' It is part of the state of being I call the 'present' which is not in the past, but which exists in the here and now."

Our friendly critic has missed the point. The experience of our continuous 'nows' is always based upon information which is (at least) slightly stale. Perhaps the following explanation will help him to understand. When our critic reaches out and touches the building, the continued material existence of the brick building is a message sent from the more distant past to our critic's most recent past. The message concerns an event which occurred in the past. The construction of that brick building was an event which occurred in the past. (Actually it was the culmination of a whole series of events, but for the purposes of this discussion that detail

can be ignored). We stated earlier that the past is capable of leaving behind evidence which can be relied upon to prove that a given event occurred in the past. The continued material existence of that brick building is like the light from the supernova detected by Latka and Cleo. It is evidence that in the past a particular event - - - the construction of the building - - - once occurred. One day, that building will be torn down, and the evidence of the event of its construction will be reduced to people's memories and perhaps some old photographs, all of which will eventually be destroyed. But the event which was the creation of that building will forever be a part of the past, a part of the unfolding chain of events which is the essence of this episode of the Game of Being.

For the Creator, the ultimate purpose of the Game is not the creation of material objects; rather, it is the bringing into being events which the Creator experiences. Material objects like the brick building, and you and me, are simply means to that end. Because of this state of affairs, material objects are best understood in and of themselves not as objects, but as events which are, on a temporary basis, continuous over time. This is why we stated earlier that from the perspective of the Creator, your body, dear reader, is an event *in the guise* of a bio-electric device.

With this new understanding of the past, present, and future, let us review the position of the special relativists on these topics as elucidated by Falk. He writes, "Thanks to the relativity of simultaneity, an event that lies in my past may yet be in your future, and vice versa; all that is required is that the event be far away, and that you and I be moving relative to one another. Many physicists, and quite a few philosophers, have come to see the four-dimensional spacetime of special relativity as evidence that past and future events are just as "real" as present events. Everything seems to be laid out all at once in a kind of block . . ."

First of all, we have seen that the relativity of simultaneity is a matter of mere appearances, which may or may not be an accurate reflection of the order in which events actually occurred.

Second, his statement that ". . . an event that lies in my past

may yet be in your future, and vice versa" demonstrates a misunderstanding of the nature of the "future." In the relativists' context the future is 'real' and already exists in some mysterious realm out of which events suddenly materialize when our present bumps into them. But we have seen that the future is purely a product of the human imagination and consists only of potential events which may or may not ever occur, and which therefore do not yet exist. Since the future does not exist, it is not possible for an event to "yet be in your future." The only accurate statement which can be made is that under certain circumstances, I may experience a given event before you do (as in the case of our two astronomers, Latka and Cleo), or vice versa. But in either case, the event experienced has to have already occurred and thus be in the past, prior to our experiencing of it.

Third, Falk's claim that for the relativity of simultaneity to occur requires that the observers "be moving relative to one another" is untrue, as we have previously demonstrated. All that is required is that the observers be at different distances from the source of the signals sent. As always, in signal/observer problems distance is the determinant factor.

According to Falk, a consequence of the interpretation of time held by adherents of Special Relativity is the conclusion reached by some physicists and philosophers that the past, the present, and all the events that will ever occur in the future all exist simultaneously all the time, right from the moment of the creation of the universe, such that "Everything seems to be laid out all at once in a kind of block . . . ." For all the reasons laid out above, we consider this idea to be palpable and pernicious nonsense. This entire notion is completely illogical. If all the events that will ever occur already exist somehow, that would mean that they have already occurred, which would mean that they are not in the future, but in the past. It is meaningless to suggest that an event somehow exists if it has not yet occurred.

On the basis of this idea, the philosopher Hilary Putnam has apparently concluded that "future events are fully predetermined."

Putnam is confused. The Game of Being is fully deterministic, but not because future events are "fully predetermined," as they would be if in fact the future in some manner already existed. As we stated earlier, each moment which comes into being serves as both cause and effect. Because the Game is structured in this way, events are determined on a moment by moment basis. An event that occurs today may or may not influence an event which occurs a year from today, but it does not determine it. Even though the one event occurred prior to the other, the fact that I just sneezed, causing me to reach for a tissue, will have no effect on what food I order the next time I go out for dinner.

Falk goes on to state that "To be sure, each point in spacetime has a past and a future . . . . but . . . . there is no "overall future" and no "overall past."" This is a curious statement which is partially correct and partially erroneous. The curious part is that it seems to argue against the relativist position concerning the simultaneous existence of the past, present, and future in a "block universe." If it were true that all of these states of being did all exist simultaneously, then surely it would be the case that there exists an "overall future" and an "overall past." As for the claim that ". . . each point in spacetime has a past and a future," we have seen that this cannot be true. Although, being the Creator's sensory system, random points in space are aware, they are nevertheless inanimate. Therefore they do not possess an Awareness Connectivity System, and thus cannot conceive of a future. However, it is true that each point in space has a past.

Finally, there is the quote from Paul Davies that "The very division of time into past, present and future seems to be physically meaningless." This statement contains a conceptual error. Time is a system of measurement which is divided into seconds, minutes, hours, days, weeks, months, years and centuries. The past, present, and future are not divisions of time, but are categories of states of being, one of which, the future, is a pure concept which never is physically manifest, and another, the present, is a conceptual disguise for what actually does exist: the past. However, as

concepts they are by no means meaningless. They play a very meaningful and important role in the construction of our day-to-day realities.

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We shall turn next to the so-called "Twins Paradox," another thought experiment which purports to demonstrate the validity of the Special Theory. There are many versions of the Twins Paradox but we shall present to you the version as we first encountered it, contained in Gary Zukav's *The Dancing Wu Li Masters,* because it is simple and concise.

> "Suppose that we are aboard a spacecraft outward bound on an exploration. We have made arrangements to press a button every fifteen minutes to send a signal back to earth. As our speed steadily increases our earthbound colleagues notice that instead of every fifteen minutes, our signals begin to arrive seventeen minutes apart, and then twenty-five minutes apart. After several days, our colleagues, to their distress, find that our signals arrive every two days. As our velocity continues to increase our signals become years apart. Eventually, generations of earthlings come and go between our signals.
>
> "Meanwhile, on the spacecraft, we are entirely unaware of the predicament back on earth. As far as we are concerned, everything is proceeding according to plan, although we are

> becoming bored with the routine of pressing a button every fifteen minutes. When we return to earth, a few years older (our proper time) we may find that we have been gone, according to earth time, for centuries (their relative time). Exactly how long depends upon how fast we have been going.
>
> "This scene is not science fiction. It is based upon a well-known (to physicists) phenomenon called the Twin Paradox of the special theory of relativity. Part of the paradox is that one twin remains on earth while the other goes on a space voyage and returns younger than his brother." (265)

Sigh. This thought experiment is so flawed that it is hard to know where to begin. For starters, let's begin with Zukav's claim that it is not a thought experiment: "This scene is not science fiction," writes Zukav, quite clearly asserting, with confidence, that if such space travel was possible, simply by virtue of the fact that they are in motion, time would pass more slowly for the crew on the spacecraft than it would for the earthbound, and that therefore fewer years would pass for the crew and thus they would return to Earth younger compared to their earthbound compatriots. Zukav includes in this claim the supposition that the greater the velocity of the spacecraft, the larger the time dilation effect would be.

In his book, *About Time,* Professor Paul Davies makes a similar claim, writing ". . . . the twins effect is a real effect, not just a thought experiment." (266) Davies then goes on to supply an elaborate and detailed version of the twins paradox which runs on for several pages which, in Davies' mind, proves that time dilation actually occurs in the universe. But these versions of the twins paradox *prove* nothing of the sort. Davies states:

> "Imagine a pair of twins, Ann and Betty . . .

> Suppose for the sake of argument that Betty leaves [on a rocket ship] in the year 2000 and returns in 2020. Ann will have experienced twenty years during Betty's absence, and will of course have aged twenty years as a result. If Betty were to travel at 240,000 kilometers per hour, then, *according to Einstein's formula,* (emphasis added) the journey will take just twelve years in her frame of reference. Betty will return, having actually experienced twelve years, and having aged just twelve years, to Earth year 2020. She may be surprised that twenty Earth years have elapsed during her twelve years, but her sister's aging will announce it." (267)

However, these narratives are merely fictional demonstrations of how the time dilation effect would be manifest if, and only if, the Special Theory of Relativity is valid. These narratives are not, in and of themselves, proof of the validity of the Special Theory. Both Zukav and Davies are guilty of the sin, in philosophical circles, of "begging the question." One is guilty of begging the question if one assumes the truth of his or her premise in the body of the argument supporting the premise. All versions of the twins paradox are guilty of this. In their explanation of the twins paradox, they all assume that Einstein's time dilation factor is valid. But we have demonstrated conclusively that the theoretical foundation of the mathematical derivation of the time dilation factor (referred to by Davies as "Einstein's formula") contains a fatal flaw, and that therefore the time dilation factor is pure mathematical fiction. Therefore Davies' claim that "If Betty were to travel at 240,000 kilometers per hour, then, *according to Einstein's formula,* (emphasis added) the journey will take just twelve years in her frame of reference," is without any evidentiary basis whatsoever.

(As an aside, we frequently hear news commentators on the

television say that such and such a person's behaviour - - - usually some hapless politician - - - "begs the question" of why such and such an event did or did not occur. This is an abuse of the phrase 'begs the question' which, in philosophy, has a very specific meaning. What they mean to say and the phrase they should use is: "this prompts the question." This kind of thing bugs us. We don't know why. It just does. Anyway . . .)

In his version of the twins paradox, Zukav makes the claim that the amount of time between the signals received from the spacecraft by those on Earth would, over time, as the spacecraft increased its velocity, eventually extend to centuries. This is completely erroneous. While it is true that the amount of time between the signals received on Earth would gradually increase as the velocity of the spacecraft increases, when the spacecraft achieved a velocity equal to the speed of light, the interval between the times the signal was received on Earth would be two times the interval between the signals sent by the spacecraft, as the following thought experiment and its accompanying table demonstrate.

The spacecraft Time Bandit is docked at the inter-stellar outpost Deep Space One. The Time Bandit is equipped with the latest technology, a hyper-drive engine which permits the Time Bandit to instantaneously attain any speed desired by its captain, up to and including the speed of light. The communications officer on board the Time Bandit is named Sean, while Chris is the communications officer on Deep Space One. Sean and Chris agree that, after the Time Bandit launches, Sean will send a signal on a certain radio frequency to Chris every fifteen minutes. The radio signal, being a form of electromagnetic radiation, will of course travel through space at the speed of light. Sean and Chris synchronize their clocks, and the Time Bandit prepares to depart. The table below lays out what will happen if the Time Bandit were to launch from Deep Space One at various percentages of the speed of light.

TABLE #2

Time Bandit Launches @ 10% of Light-speed

Signal #	Time Elapsed since launch	Distance Time Bandit is from Deep Space 1	Time Elapsed on Deep Space 1 from launch to signal reception
1	15 minutes	1.5 light-minutes	16.5 minutes
2	30 minutes	3.0 light-minutes	33.0 minutes
3	45 minutes	4.5 light-minutes	49.5 minutes
4	60 minutes	6.0 light-minutes	66.0 minutes
5	75 minutes	7.5 light-minutes	82.5 minutes
6	90 minutes	9.0 light-minutes	99.0 minutes

Time Bandit Launches @ 25% of Light-speed

Signal #	Time Elapsed since launch	Distance Time Bandit is from Deep Space 1	Time Elapsed on Deep Space 1 from launch to signal reception
1	15 minutes	3.75 light-minutes	18.75 minutes
2	30 minutes	7.5 light-minutes	37.5 minutes
3	45 minutes	11.25 light-minutes	56.25 minutes

4	60 minutes	15.0 light-minutes	75.0 minutes
5	75 minutes	18.75 light-minutes	93.75 minutes
6	90 minutes	22.5 light-minutes	112.5 minutes

Time Bandit Launches @ 50% of Light-speed

Signal #	Time Elapsed since launch	Distance Time Bandit is from Deep Space 1	Time Elapsed on Deep Space 1 from launch to signal reception
1	15 minutes	7.5 light-minutes	22.5 minutes
2	30 minutes	15.0 light-minutes	45.0 minutes
3	45 minutes	22.5 light-minutes	67.5 minutes
4	60 minutes	30.0 light-minutes	90.0 minutes
5	75 minutes	37.5 light-minutes	112.5 minutes
6	90 minutes	45.0 light-minutes	135.0 minutes

Time Bandit Launches @ 100% of Light-speed

Signal #	Time Elapsed since launch	Distance Time Bandit is from Deep Space 1	Time Elapsed on Deep Space 1 from launch to signal reception
1	15 minutes	15 light-minutes	30.0 minutes
2	30 minutes	30 light-minutes	60.0 minutes
3	45 minutes	45 light-minutes	90.0 minutes
4	60 minutes	60 light-minutes	120.0 minutes
5	75 minutes	75 light-minutes	150.0 minutes
6	90 minutes	90 light-minutes	180.0 minutes

Table Two shows a clear pattern relating the time at which the signal is sent by Sean on the Time Bandit to the time at which that signal will be received by Chris on Deep Space One. For any given velocity at which the Time Bandit is travelling through space, the time at which Chris will receive any given signal is equal to the sum of the time elapsed since the launch of the Time Bandit plus the distance in light-minutes Time Bandit is from Deep Space One when the signal is sent. The intervals between the signals received by Chris for any given velocity of Time Bandit will be equal to the sum of the interval between the signals being sent by Sean (15 minutes) plus the distance in light-minutes between Time Bandit and Deep Space One when the first signal was sent. As long as Time Bandit maintains that velocity and as long as Sean sends a signal every fifteen minutes, the intervals between the signals received by Chris will be constant, no matter how great the distance between Time Bandit and Deep Space One becomes. Therefore, Star Trek and other science-fiction scenarios not withstanding, since our current understanding is that nothing can travel faster than the speed of light, the maximum interval for the reception of signals sent every fifteen minutes is thirty minutes, not centuries.

There remains the claim that astronauts who take an extended journey through space at velocities that are significant percentages of the speed of light will, due to the time dilation factor, experience the passage of fewer years than the people they left behind, and thus upon their return would have aged less than their Earth-bound compatriots. The empirical evidence for this claim rests upon the study of particle physics, in particular the study of muons, which are sub-atomic particles which normally quickly decay into electrons. We will let Gary Zukav lay out the case in support of this notion:

> "The most common verification of time dilation comes from high-energy particle physics. A very light elementary particle, called a muon

(pronounced moo'on), is created at the top of the earth's atmosphere by the collision of protons (one form of "cosmic radiation") and air molecules. We know from experiments in which muons are created in accelerators that they live a very short time. By no means do they live long enough to reach the earth from the upper atmosphere. Long before the time it takes to traverse this distance, they should decay spontaneously into other types of particles. Yet this does not happen because we detect them in abundance here at the earth's surface.

"Why do the muons created by cosmic radiation live longer, in fact, seven time longer than those muons created in the laboratory. The answer is that the muons produced by collisions of cosmic radiation and air molecules travel much faster than any muons that we can create experimentally. [As we shall see, Zukav was mistaken on this latter point.] Their velocity is approximately 99 percent of the speed of light. At that speed, time dilation is quite noticeable. They do not live longer than usual from their point of view, but from our point of view they live seven times longer than they would at slower velocities. . . .

"The special theory of relativity tells us that the intrinsic lifetime of these high-speed particles does not increase, but that their relative rate of time flow slows down." (268)

So, we have sub-atomic particles that, when they move at very high velocities, last longer than when they are at rest or moving slowly. Special Relativity says this is because when they are moving at high velocities "their relative rate of time flow slows

down," that is, from our point of view, the muons' time dilates. But we know that Einstein's time dilation factor is merely a piece of mathematical fiction, and that it therefore cannot be the explanation for this phenomenon. So what is the explanation?

"Muons are inherently unstable, and decay with a half-life of about two microseconds." (269) So after a very brief existence muons decay, or change, into some other sub-atomic particle, usually electrons. When a muon is at rest, its rest mass equals its inertial mass, which is 207 times the rest mass of an electron. We have earlier defined mass as "the quantity of matter in an object, measured by its resistance to a change in its motion." Motion is one particular type of change. Transformation is another type of change. As we have seen earlier, when an object increases its velocity its inertial mass increases. For a sub-atomic particle that increase in its inertial mass increases the particle's resistance to change of all types. Thus when muons are accelerated to near light-speed, their resistance to changing into electrons is substantially increased, and so they last longer. Therefore, contrary to what Zukav stated, the intrinsic lifetime of the high-energy muons does in fact increase at high velocities. This conclusion is supported by empirical evidence.

> "In 1966, a group of physicists at the European particle-accelerator laboratory near Geneva, known as CERN, produced some muons artificially and injected them into a ring-shaped vacuum tube where they circulated at 99.7 percent of the speed of light. This had the effect of stretching the muons' time by a factor of twelve or so relative to the lab, so they lived about twelve times as long as they would have done at rest. . . . In 1978, an improved version of the experiment was performed with muons moving still closer to the speed of light, their lifetime being stretched by a factor of twenty-nine." (270)

So there is no doubt the effect is real. Muons that travel faster live longer. But physicists, seduced and confused by the fictional mathematics of the time dilation factor, have simply misinterpreted the results of their experiments. High velocity muons last longer not because of time dilation, but because of an increase in their inertial mass, which causes an increase in their resistance to change of all types, including the transformation (change) into electrons.

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So far we have examined two of the narratives relied upon by physicists to demonstrate the validity of the idea of time dilation, and we have found them both to be wanting. The Twins Paradox is revealed to be just an unsubstantiated story which, in and of itself, proves nothing. As for muons, their behaviour is explicable by other, more logical means than time dilation. We now turn to the third line of evidence used to support the notion of time dilation, and that is the behaviour of atomic clocks.

Before we dive into the evidence, we should acquaint the reader with how atomic clocks function. Atomic clocks work by shining microwaves onto atoms of cesium or rubidium, which makes their electrons flip from one quantum state to another at regular intervals. Because the electrons steadily oscillate at a rate of billions of times per second, they allow for a very reliable and precise measurement of time. Each oscillation of the electrons is a 'tick' of the clock. Another type of atomic clock is known as a hydrogen maser clock, which are even more accurate and precise. More recently, the physicist Jun Ye of the JILA research institute in Boulder, Colorado, has invented a clock which works by shining laser light onto strontium atoms. In 2015 Ye calculated that his

clock would be precise to within one second over 14 billion years, the current commonly accepted age of the universe. These capabilities in precision make these clocks extremely sensitive to the circumstances in which they are situated.

Now for the 'evidence.' In his informative book, *About Time, Einstein's Unfinished Revolution,* theoretical physicist Paul Davies recounts the following experiment:

> "In October 1971, J. C. Hafele, of Washington University in St. Louis, and Richard Keating arranged to borrow four atomic clocks from the U.S. Naval Observatory, where Keating worked. These were cesium-beam clocks made by Hewlett-Packard, of the sort that are used to create our daily time signals . . . Hafele and Keating loaded the clocks onto commercial airliners, and gamely flew with them around the world, first towards the east, then towards the west. As airliners travel at less than one-millionth of the speed of light, the timewarp on board was very small indeed - - about a microsecond per day's flying. Nevertheless, this level of change was well within the capabilities of the atomic clocks, and the experiment . . . yielded the following results. On the eastward journey, the four clocks came back to America an average of 59 nanoseconds (billionths of a second) slow relative to a set of standard atomic clocks kept at the Observatory. On the westward journey, the clocks were on average 273 nanoseconds fast. The reason for the east-west difference is that, as Einstein noted in his original paper, the rotation of the Earth produces a time dilation too. When the effect of the Earth's rotation was removed, the time dilation produced by the airliners' motion

confirmed Einstein's formula." (271)

Davies then goes on to state the view commonly held by physicists concerning the matter of clocks. He writes:

> "Experiments leave no shadow of doubt: clocks are affected by motion. But why do physicists insist on concluding that time is stretched? The simple answer is: time (for the physicist at least) is that which is measured by clocks. Of course, to be consistent, we must suppose that *all* clocks are effected by motion in exactly the same way; otherwise we would be more inclined *to attribute the effect to the clocks rather than to time itself.* (emphasis added) Well, *as far as we can tell,* (emphasis added) all clocks are equally affected (including the brain activity and hence temporal judgment of human observers). This must be so if the principle of relativity is to hold, or we would not have means of determining whether certain clocks are moving or not - - - because clocks that are affected differently by motion would get out of synchrony. If you want to drop that principle, then all bets are off." (272)

Davies begins by referring to our old trickster friend "motion," who, as usual, is doing its best to lead us astray. As we shall see, it is not motion *per se* which affects the behaviour of atomic clocks. He then states that for a physicist "time is that which is measured by clocks." This implies that time - - - the "that which" in this sentence - - - is a thing which exists. But this is not the case. Time is merely a concept which has no existence outside of the human mind. It is just a system of measurement, and humans have invented devices we call 'clocks' with which we carry

out those measurements. And what is it that we are actually measuring? Relative amounts of change.

Davies goes on to say that *"as far as we can tell"* (emphasis added) all clocks are equally affected by motion. However, there is absolutely zero evidence to support this contention. There is no evidence at all to support the idea that pre-quartz crystal era wristwatches, which were powered by the daily winding up of a main spring, would have experienced time dilation under any set of circumstances. Physicists will be quick to point out that this is because such wristwatches never travelled fast enough, or experienced a gravitational field strong enough, for this effect to become apparent. To which we reply that physicists are making a totally unsupported and, in our view, completely unwarranted, assumption.

Davies then writes that "This must be so if the principle of relativity is to hold." But our readers already know that the principle of relativity in fact does not hold. He then states: ". . . or we would not have means of determining whether certain clocks are moving or not." But all clocks are in fact moving. Everything in the Field of Play is in motion, so there are no clocks which are not moving. Finally he states that if clocks were affected differently by motion they "would get out of synchrony." But, as we shall see, atomic clocks do get out of synchrony on a daily basis.

Now we must deal with the crux of Davies' comments. He states: "we must suppose that *all* (his italics) clocks are effected by motion in exactly the same way; otherwise we would be more inclined *to attribute the effect to the clocks rather than to time itself."*(italics added) We are of the opinion, and in fact have no doubt whatsoever, that the "time dilation effects" observed in the Hafele and Keating experiment are due entirely to characteristics which are peculiar to the functioning of atomic clocks, and that therefore we should indeed "attribute the effect to the clocks rather than to time itself."

We shall now argue that there are three factors at work

which affect the rate at which the electrons in atomic clocks oscillate, and that none of these factors affect mechanical clocks in any way, and that therefore physicists' assumption that all clocks are equally affected by motion is invalid. These three factors are:

1) The degree of stress being experienced by the space through which an atomic clock is moving.
2) The velocity of the atomic clock through that stressed space.
3) Whether or not the atomic clock is moving in the same direction as, or in opposition to, a rotating magnetic field.

As it moves through space, a gravitating body like the Earth creates a spherical-shaped 'valley' in space that travels along with it. This valley is created because the matter of which the Earth is made pulls on the space surrounding it, warping the affected space so that it curves into a valley in space, the bottom of which is at the centre of the Earth. This warping of space by the Earth causes the space to experience stress. The closer to the bottom of the valley, the more warped the space becomes. The more warped the space becomes, the higher is the degree of stress which it experiences. In other words, the deeper one goes into a gravitational field, the more stressed the space of which that gravitational field consists will be.

The fact that the rate at which the electrons in atomic clocks oscillate is affected by the distance they are from the centre of the Earth is well documented. This effect is known by physicists as "gravitational time dilation," based upon the idea that time slows down in a gravitational field, a prediction made by Einstein's General Theory of Relativity. "For example, an atomic clock in a U.S. Lab in Boulder, Colorado - - - some 1,600 metres above sea level - - - has been measured to gain about 5 microseconds each year compared with an identical clock in Greenwich, England, which is just 25 metres above sea level." (273) In 2010, physicist Dave Wineland placed one atomic clock 33 centimetres below another identical atomic clock, and found that the lower clock

'ticked' more slowly. More recently, using his strontium clock, Jun Ye was able to detect a difference in the rate at which the clock 'ticked' over a difference in height of as little as a few hundred microns (millionths of a metre).

However, contrary to what physicists currently believe, these experiments are not evidence of time slowing down or 'dilating' as one goes deeper into a gravitational field. Rather, they are evidence that the deeper one goes into a gravitational field, the more stressed the space that constitutes that gravitational field becomes, and the more stressed that the space is, the more it suppresses the oscillations of the electrons of the atomic clocks, making it appear as if time is passing more slowly. These experiments, particularly those of Jun Ye, clearly demonstrate that the increase in stress experienced by space as one goes deeper into a gravitational field is smooth and continuous, and varies over minute distances. These experiments are yet more direct evidence that immaterial space (known formerly in these pages as the aether or space-time) is a phenomenological presence in the universe, which interacts with and affects matter at the most fundamental levels.

We have seen that as space passes through seemingly solid bodies, it exerts pressure on the atoms which comprise those bodies. Here on Earth this effect is demonstrated by the so-called 'radioactive decay' of certain elements. The pressure of the flow of space through these elements literally erodes them at a steady rate, depending on how tightly bound are the nuclei of those elements. How much pressure is exerted upon the atoms by the flow of space past them depends upon two factors: the degree of stress the space is experiencing, and the velocity of matter through the space (or the velocity of the space through the matter, these being the same).

The degree to which a gravitating body distorts the space through which it is travelling depends upon its mass. As a body's mass increases so too does the distortion of the space around the gravitating body, which means that the amount of stress experienced by the surrounding space also increases. The more

stressed space is, the greater is its ability to erode atomic and molecular bonds. The space surrounding a massive planet like Jupiter will be more highly stressed than the space surrounding Earth, stressed enough to tear apart some types of bodies which venture too close to its surface. In 1992, the Shoemaker-Levy comet passed too close to the gas giant and was torn into at least 21 fragments, which impacted Jupiter in 1994. The standard explanation for this occurrence is that the comet was 'pulled apart' by Jupiter's gravity. But gravity is not a force which pulls on material objects; it is the distortion of space by massive bodies. Acting like the blade of an axe, what tore Shoemaker-Levy apart was the stressed space through which it travelled.

As we have previously discussed, the ultimate in stressed space is that which occurs around neutron stars of a certain minimum mass. In these circumstances the surrounding space is so highly stressed and is stretched so taut that it loses all flexibility and is no longer able to permit the passage of electromagnetic radiation through it; hence these bodies have become known as 'black holes' from which no light can escape; or, to be more precise, through which no light can travel. The space around a black hole is so stressed that it would completely shred any solid body that tried to pass through it, even to the point of tearing apart the nuclei of atoms of iron. The only massive body which can enter such stressed space and avoid total destruction is another neutron star, the constituents of which are so tightly bound together that only the force of a collision with another neutron star can momentarily break them apart. Neutron stars are impervious to the effects of highly stressed space because in neutron stars the neutrons are packed so tightly together that space, no matter how stressed it might be, cannot pass through such bodies.

The previous paragraphs establish the first of our three factors which affect the behaviour of atomic clocks. Stressed space suppresses the oscillation of electrons within atoms; the greater the degree of stress, the greater the suppression. If the degree of stress is great enough, space can not only suppress the oscillation of

electrons within atoms; it can literally rip apart atomic nuclei. The second factor which affects the behaviour of atomic clocks is their velocity. Every atomic clock is in motion and therefore has some given velocity. The movement of an atomic clock through space also has the effect of suppressing the oscillations of the clock's electrons. The greater the clock's velocity, the greater the suppression of the oscillations of the clock's electrons.

Consider the behaviour of the atomic clocks aboard the Global Positioning System (GPS) satellites orbiting the Earth at an altitude of 20,200 kilometres. Since the space at this altitude is less stressed than the space at the surface of the Earth, the experiments referred to above would indicate that the atomic clocks on board these satellites should 'tick' more rapidly than similar clocks situated on the ground; that is, they should gain time relative to their ground-based counterparts. But in fact the atomic clocks on these satellites run slow at a rate of 4 micro-seconds per day. Why is this?

To answer this question we must first have a more detailed understanding of how atomic clocks work. A June 19, 2019, nasa.gov article titled “What Is an Atomic Clock?” provides the following explanation:

> “Most modern clocks, from wristwatches to those used on satellites, keep time using a quartz crystal oscillator. These devices take advantage of the fact that quartz crystals vibrate at a precise frequency when voltage is applied to them. The vibrations of the crystal act like the pendulum of a grandfather clock, ticking off how much time has passed. To know [a] spacecraft's position within a meter, navigators need clocks with precision time resolution - - - clocks that measure billionths of a second. Navigators also need clocks that are extremely stable. “Stability” refers to how consistently a clock measures a unit

of time; its measurement of the length of a second, for example, needs to be the same (to better than a billionth of a second) over days and weeks.

"By space navigation standards, quartz crystal clocks aren't very stable. After only an hour, even the best-performing quartz oscillators can be off by a nanosecond (one billionth of a second) . . . Atomic clocks combine a quartz crystal oscillator with an ensemble of atoms to achieve greater stability . . .

"In an atomic clock, the frequency of the quartz oscillator is transformed into a frequency that is applied to a collection of atoms. If the derived frequency is correct, it will cause many electrons in the atoms to change energy levels. If the frequency is incorrect, far fewer electrons will jump. This will determine if the quartz oscillator is off-frequency and by how much. A "correction" determined by the atoms can then be applied to the quartz oscillator to steer it back to the correct frequency . . .

"Atomic clocks are used onboard GPS satellites that orbit the Earth, but even they must be sent updates two times per day *to correct the clocks' natural drift* (emphasis added). Those updates come from more stable atomic clocks on the ground that are large (often the size of a refrigerator) and not designed to survive the physical demands of going to space."

Now, all the atomic clocks on the Earth are travelling through space at the rate of 30 kilometres per second, the velocity of the Earth's orbit around the sun. Relative to the Earth, the GPS satellites are travelling through space at an additional 3.9

kilometres per second. Even though the space at the altitude of 20,200 kilometres is significantly less stressed than the space at the Earth's surface, because the pressure exerted on atoms by space increases as the velocity of the atoms through space increases, the 3.9 kilometres per second boost in the satellites' velocity more than compensates for the less-stressed space effect, so that the atomic clocks on board the satellites actually 'tick' more slowly than their Earth-bound counterparts, rather than more quickly as one might at first expect. This effect - - - the “natural drift” referred to at the end of the article above - - - is due entirely to the interaction of the atoms within the clocks with the space through which the clocks are travelling, and has nothing whatsoever to do with the notion of time slowing down. 'Time' is merely a concept and does not actually exist, so it cannot slow down. The atoms in the GPS clocks exist. The electrons that belong to those atoms exist. Immaterial space exists. The electrons in the atomic clocks onboard GPS satellites oscillate more slowly than the electrons in the atomic clocks on the ground because they are travelling through space faster, and therefore space exerts more pressure on the GPS electrons than on the ground-based electrons, causing the GPS electrons to vibrate at a slightly slower rate.

It would be relatively (pun intended) easy to experimentally verify this supposition. Take two identical atomic clocks and place one at sea level on the equator, and one at sea level at, say, Halifax. Both clocks would be travelling through space that is equally gravitationally stressed. Because the clock placed on the equator would be rotating through space more rapidly than the clock in Halifax, it should 'lose time' in comparison, that is, it should 'tick' more slowly at a rate which is significant enough to be detectable.

We can also say that an atomic clock placed on board the International Space Station (ISS) will 'lose more time' per day than the clocks aboard the GPS satellites. Since the ISS orbits the Earth at a much lower altitude (408 kilometres) than the GPS satellites, the space through which it travels will be more highly stressed. More significantly, its orbital velocity is higher. Both of these

factors will add to the suppression of the oscillations of the electrons in an atomic clock on board the ISS compared to an atomic clock on board a GPS satellite.

Thus we see that it is not motion *per se* which causes changes in the behaviour of atomic clocks as stated in the Special Theory of Relativity. Rather, it is the rate of motion of the clocks *through space,* which is itself experiencing various degrees of stress, which is responsible for the observed changes in the clocks' behaviour.

This brings us to the third factor which affects the rate at which the electrons in atomic clocks oscillate, this being whether or not the atomic clock is moving in the same direction as, or in opposition to, a rotating magnetic field. In his description of the Hafele-Keating atomic clocks experiment Paul Davies wrote:

> "On the eastward journey, the four clocks came back to America an average of 59 nanoseconds (billionths of a second) slow relative to a set of standard atomic clocks kept at the Observatory. On the westward journey, the clocks were on average 273 nanoseconds fast. The reason for the east-west difference is that, as Einstein noted in his original paper, the rotation of the Earth produces a time dilation too." (274)

There is a puzzle here. In order to make an attempt to solve this puzzle, we will have to make four assumptions. First, we will assume the airliners used in this experiment flew at roughly the same altitude for roughly the same amount of time during both the eastward and westward journeys that the clocks took. Second, we will assume that the average speed of the airliners was the same in both directions. Third, we will assume that the airports at which the planes landed were all roughly at the same altitude; and fourth, that the stopover times were the same in both directions. These last two assumptions in particular are quite likely to be invalid. We

have seen that altitude and velocity affect the behaviour of atomic clocks. We make these assumptions in an effort to isolate the cause of the difference recorded by the clocks between the eastward and westward trips. Now, it is entirely possible that Hafele and Keating kept track of the details of flight altitudes and velocities, and the altitudes of the various airports they landed at, and the length of time of the stopovers at each, and included these factors in their calculations. Davies' account of the experiment does not include such details. If they did, and the variations in the rate at which the electrons in the clocks would oscillate as a result of these variable factors were taken into account, so much the better, and we can dispense with our set of assumptions. In that case we are left with the bare facts that clocks on the eastward journey 'lost time,' that is, the electrons oscillated more slowly than the electrons in the 'control' clocks; while during their westward journey the clocks 'gained time', that is, the electrons oscillated more rapidly than the electrons in the clocks that remained on the ground. This puzzle demands an explanation.

The explanation supplied by Davies is that "The reason for the east-west difference is that, as Einstein noted in his original paper, the rotation of the Earth produces a time dilation too." But we know by now that "time dilation" is not an actual phenomenon in the universe, so it cannot be "the reason for the east-west difference." Still, is the rotation of the Earth a factor? We have made the supposition in our atomic clock situated at sea level in Halifax versus an atomic clock situated at sea level on the equator scenario, that the rotation of the Earth will indeed affect the rate at which the electrons in those atomic clocks will oscillate. But in that scenario the atomic clocks are attached to the Earth and are rotating as it rotates. How can the rotation of the Earth reach 12 kilometres up into the sky to affect the oscillation rate of atomic clocks aboard airliners; and furthermore, airliners which are travelling in a direction which is in opposition to the direction of the Earth's rotation? We say that unless you believe in magic there is no way that the rotation of the Earth *per se* could possibly affect

those clocks.

However, there is something which does reach up into the sky from Earth, rotates as the Earth rotates, and furthermore is known to affect the behaviour of electrons, and that something is the Earth's magnetic field. Earth's magnetic field is believed to be generated by a liquid outer core some 2,000 kilometres thick, composed mostly of iron with some nickel. It rotates, as does the Earth, from west to east.

It is well established that electrons are affected by the Earth's magnetic field. The Aurora Borealis and the Aurora Australis are the result of high-energy ions and electrons from the solar wind being accelerated by the Earth's magnetic field into the Earth's atmosphere. We submit that the reason the atomic clocks in the Hafele-Keating experiment 'gained time' when they were flown in a westward direction is that they were in motion in opposition to the rotation of the Earth's magnetic field, which caused a slight excitation of the electrons of the clocks, resulting in, on average, a very slight increase in the rate at which the electrons oscillated. Why this effect is more pronounced when travelling west rather than east is less clear, but we suspect that it may be as simple as the difference between driving into a wind-driven rain storm compared to driving in the same direction as the wind. In the former, the rain drops hit your windshield with more force than in the latter.

Thus we see that the results of the Hafele-Keating experiment are completely explainable in terms of the effects of space and the Earth's magnetic field on the behaviour of the atomic clocks used in the experiment. The evidence of so-called 'time dilation' has completely evaporated. The experiment's results are entirely attributable to behaviour which is specific to atomic clocks only, not to all clocks, and 'time,' which has no phenomenological presence in the universe, has nothing to do with it.

Before we move on, we shall examine one more situation which also currently relies upon the idea of 'time dilation' to explain observed phenomenon. Once again we will rely upon Dr. Paul Davies to set the scene:

"Engineering handy timewarps has become a commercial operation in several countries. The machine that does it for you is called a "synchrotron." It works by whirling electrons around an evacuated circular tube at very close to the speed of light. Because the electrons are forced along a curved path, they emit intense electromagnetic radiation, concentrated into a narrow beam . . . When it was first encountered, synchrotron radiation was a nuisance. Synchrotrons were originally designed to accelerate subatomic particles, not to make radiation. Radiation costs energy, hence money. One reason that particle accelerators are so big is to reduce the curvature of the particles' paths to minimize radiation losses . . . Synchrotron radiation is very intense, continuously spans a wide range of frequencies from visible light upwards, and is easily manipulated.

"The big advantage stems from the very high frequencies that can be achieved - - - well into the X-ray region of the spectrum. Synchrotron X-rays are used to great effect to elucidate the atomic structure of complicated materials, such as glasses, or large biological molecules . . .

"Synchrotron electrons typically travel at 99.99999 percent of the speed of light, and the secret behind their success lies with the time-dilation factor, which is as high as several thousand. This enormously boosts the frequency of the radiation as observed in the reference frame of the laboratory. At low speeds, when relativistic effects can be neglected, electrons in a synchrotron emit radiation at a frequency equal to

> the circulation frequency around the machine. At high speeds, however, the time-dilation and related relativistic effects make a dramatic difference. The Daresbury synchrotron [in Cheshire, England] is ninety-six meters in circumference, and the electrons complete three circuits every microsecond in the laboratory frame: this is in the megahertz frequency range, corresponding to the radio-wave region of the electromagnetic spectrum. A source at this frequency would be useless for studying the atomic structure of materials. But in the reference frame of the electrons, the journey is completed very much faster, because of time dilation, and it is radiation at this higher frequency which is emitted. All told, the effects of relativity increase the frequency of the radiation as observed in the lab to as much as a trillion megahertz." (275)

There is a problem with the 'time dilation' explanation for the behaviour of electrons in a synchrotron in that it requires the electrons to simultaneously travel at two different velocities. According to Davies, "Synchrotron electrons typically travel at 99.99999 percent of the speed of light." He goes on to say that in the Daresbury synchrotron "the electrons complete three circuits every microsecond in the laboratory frame." This means that the Daresbury electrons have a velocity of 288,000 km/second, which is equal to 96 percent of the speed of light. We saw in Tim and Katrina's trolley car thought experiment that it is impossible for any single beam of light to simultaneously take two different paths through space. Similarly, it is impossible for a single electron to simultaneously travel through space at both 96 and 99.99999 percent of the speed of light. The electron can do one or the other, but it cannot do both at the same time.

Special Relativity attempts to circumvent this objection with the claim that there exists more than one frame of reference in this situation. This is not untrue, but its introduction into the argument does not resolve the objection. Davies states that "the electrons complete three circuits every microsecond in the laboratory frame" [of reference.] He then goes on to say: "But in the reference frame of the electrons, the journey is completed very much faster, because of time dilation. . ." So there is the frame of reference of the synchrotron technicians in the laboratory who are presumed to be at rest with respect to the synchrotron, and there is the frame of reference of the electrons, which are not at rest with respect to the synchrotron. But claiming that from the frame of reference of the electrons their journey is completed very much faster runs completely counter to our everyday experience. Returning to our example of a train passing a station platform at speed, there are two frames of reference there as well. But observers from both frames of reference, the people standing on the platform and the passengers on the train, are able to agree on the velocity of the train. A devotee of special relativity will be quick to point out that the time-dilation effect is not apparent at the velocities at which trains travel. But Davies acknowledges that from the frame of reference of the lab technicians the electrons circle the synchrotron at a velocity of 96 percent of the speed of light, while specifically claiming that from the frame of reference of the electrons, the electrons achieve a velocity of 99.99999 percent of the speed of light. So the "different frames of reference" argument does not resolve the original objection: an object cannot simultaneously travel at two different velocities.

Furthermore, even if we ignore this logical contradiction and accept the "two frames of reference" explanation, the time-dilation argument still does not stand up to careful scrutiny. Davies states that in the frame of reference of the laboratory "the electrons complete three circuits every microsecond." This means that in the frame of reference of the laboratory, in which the electron is travelling at 96% of the speed of light, it takes the electron

.00000033 seconds to complete one circuit of the synchrotron. Davies then goes on to state: "[I]n the reference frame of the electrons, the journey is completed very much faster, because of time dilation, and it is radiation at this higher frequency which is emitted." "The journey" clearly refers to the cycles of the electrons around the synchrotron. But, time-dilation or no time-dilation, the journey cannot be "completed very much faster" because there is not a lot of "faster" left. Let's assume, for the sake of computational convenience, that in the electron's frame of reference its velocity has been increased to the universal speed limit of 100% of the speed of light. In that case the electron would take .00000032 seconds to make one circuit of the synchrotron, a mere one one hundred-millionth of a second less than the time required for the electron to make one circuit of the synchrotron in the laboratory frame of reference. Clearly, this minute change in the time required for the electron to make a single trip around the synchrotron is insufficient to account for an increase in the frequency of the radiation emitted by the electron from the megahertz (one million hertz) range to that of up to one trillion megahertz.

Quite apart from these objections, the truth is that the statement "All told, the effects of relativity increase the frequency of the radiation as observed in the lab to as much as a trillion megahertz" does not in any way provide a physical explanation for why electrons which are taking a curved path through space and travelling at very high percentages of the speed of light, be it 96% or 99.99999%, continuously emit a very intense beam of radiation across a wide range of frequencies. This waving of the magic wand of time-dilation does not advance our knowledge of how this phenomenon occurs one iota. And of course, we know that the time-dilation factor is merely a mathematical fiction, and that its so-called effects are nothing more than "special nonsense."

As an alternative to the time-dilation explanation for the phenomenon observed in synchrotrons, we suggest that the frequency of the electromagnetic radiation is not due to the number

of cycles per second made by the electrons around the synchrotron, although that clearly is a factor - - - a certain minimum velocity of the electrons is required; rather, the electromagnetic radiation emitted is due to the large increase in the inertial mass of the electrons.

When you are driving your car along a road, the car's inertial mass exerts a force which works to keep the car travelling in a straight line. The higher the velocity of the car, the greater is its inertial mass, and the greater is the force working to keep you travelling in a straight line. For the purposes of this discussion, that force can be considered to be more or less evenly distributed over the four wheels of the car. If you drive around a curve in the road, that force gets shifted so that more force is applied to the wheels that are on the outside of the curve. Modern vehicles have suspension systems which act to absorb some of this increased force and dampen the tendency of the vehicle to continue travelling in a straight line. Still, some of that increased force is applied to the tires on those outside wheels, increasing the pressure on the tires which in turn increases the pressure of those tires on the surface of the road. This increased pressure results in greater friction between the tire and the road. This increase in friction increases the wear on the outer rim of the tire, which is why it is a good idea to rotate the tires on your car every so often. Now, the faster you go around a curve, the greater are the forces and pressures which come into play. If you go around a curve at a high enough velocity, the tires will become so stressed by the pressure being applied to them and the resulting increase in friction between the tires and road surface, that they will make a 'squealing' sound. All this occurs because the vehicle's inertial mass, which constantly increases as the vehicle's velocity increases, wants the vehicle to travel in a straight line.

This scenario is a good analogy for what is happening to the electrons whirling around inside of a synchrotron. Synchrotrons are designed to accelerate electrons to velocities that approach the speed of light. At these velocities there is a significant increase in

the inertial mass of the electrons. That increased inertial mass exerts a force on the electrons that tries to keep them going in a straight line. But the magnetic field of the synchrotron forces the electrons into a continuous curved path. This tug of war between the electron's inertial mass and the synchroton's magnetic field causes the electron to vibrate violently as it tries to go in two directions at once. This vibration results in a steady 'squeal' of highly energetic electromagnetic radiation. As we shall see, the vibration of electrons is one of the ways in which electromagnetic radiation is produced.

Significantly, this phenomenon does not occur when electrons are accelerated along a path which is insufficiently curved. As Davies noted, "One reason that particle accelerators are so big is to reduce the curvature of the particles' paths to minimize radiation losses." In those cases, even though the particles are still accelerated to near light-speed, the tug of war between the particles' inertial masses and the magnetic field of the accelerators is insufficient to bring about the emission of highly energetic electromagnetic radiation. Until recently it has only been when electrons have been forced to take a sufficiently curved path at near light-speed that the 'synchroton effect' has become apparent.

However, there now exists convincing evidence for the idea that the emission of X-rays by the electrons whirling around in synchrotrons is due not to time dilation, but, rather, is caused by the vibration of the electrons. In December, 2022, New Scientist magazine reported that:

> ". . . record-breaking X-rays will be produced at the SLAC National Accelerator Laboratory, which has upgraded its Linac Coherent Light Source (LCLS) X-ray to be the fastest and brightest in the world. While the LCLS produced about 100 X-ray pulses each second, LCLS-II will increase that number to 1 million, with X-rays that are about 10,000 times

brighter.

> "At the heart of the machine are electrons moving through a 3-kilometre-long metal tube. The SLAC researchers knock them out of a copper plate with ultraviolet light, then use devices that emit intense microwave pulses to push the electrons to near the speed of light.
>
> "Once up to speed, the electrons pass through thousands of magnets in rows a few millimetres apart that are arranged with alternating magnetic poles. These alternating poles *wiggle electrons back and forth,* (emphasis added) producing X-rays in predictable, narrow pulses with controllable energies 1 million times every second. The pulses can be used to image inside materials, just like a medical X-ray, but 1 trillion trillion times brighter." (276)

This new technology clearly relies upon rapidly vibrating electrons to produce powerful X-rays. We are certain that the X-rays produced in the Daresbury synchrotron are the result of the same phenomenon, and that the 'time-dilation' explanation is completely erroneous.

This suggestion that electromagnetic radiation is caused by the vibration of electrons could possibly bring about a reappraisal of our understanding of the auroras observed at our planet's northern and southern polar regions. It is currently believed that these phenomena are the result of high-energy ions and electrons from the solar wind being accelerated by the Earth's magnetic field into the Earth's upper atmosphere, where their collisions with the molecules of gas there result in the famous dancing lights. However, rather than collisions being the source of this phenomenon, it may be that, if the Earth's magnetic field is powerful enough to accelerate the electrons to near light-speed, the observed electromagnetic radiation could be the result of the

electrons taking a tightly curved path through space as they wrap themselves around the magnetic lines of force on their downwards journey, causing them to vibrate and thereby giving off colourful electromagnetic radiation in the process.

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There is one more instance of the application of the Special Theory of Relativity to explain natural phenomena which we referenced earlier and to which we now must attend. Previously, we quoted Lord Martin Rees concerning Type 1A supernovae. Rees wrote that Type 1A supernovae

> ". . . display another trend that relates directly to their redshift: the remotest and most redshifted ones appear to flare up and fade more slowly than closer ones of the same type. This is exactly what we would expect: *a clock on a receding object should run slow.* (emphasis added) If it sends out periodic 'beeps', the later ones have further to travel, and so the intervals between arrival are lengthened.
>
> "The brightening and fading of a supernova is itself like a clock, so a slowdown in the 'light curves', proportional to the redshift, is just what we would expect if they are receding. It would have no explanation in a static universe. This is the best counter to any suspicion that the redshift is due to some kind of 'tired light' effect." (277)

The idea that “a clock on a receding object should run slow” is a supposed consequence of the Special Theory. But we have demonstrated that the Special Theory is based upon an invalid assumption and is therefore fatally flawed. Therefore the explanation for why “the remotest and most redshifted [supernovae] appear to flare up and fade more slowly than closer ones of the same type” must lie elsewhere.

Also, the statement that if a clock on a receding object “sends out periodic 'beeps', the later ones have further to travel, and so the intervals between arrival are lengthened” is incorrect. First, the light emitted by supernovae is a continuous, rather than a periodic, process. There are no 'intervals' in the signal to be lengthened.. Second, as our thought experiment involving the Time Bandit and Deep Space One demonstrated, if the object is receding at a constant velocity, the interval between the arrival of the signals depends upon the velocity of the sender of the signal, and not the distance between the sender and the receiver of the signal, however great the distance separating the two may become. However, we must acknowledge that this condition does not apply to the standard 'the universe is expanding' model, because in that model distant objects are assumed to be receding from us at an accelerating rate, not at a constant velocity. But, of course, we do not believe that the universe is expanding.

This brings to a close our examination of the flawed Special Theory of Relativity. We have shown that the various phenomena which supposedly demonstrate the validity of the Special Theory all have alternative explanations which do not require the invocation of time-dilation. Our 'Jamie and Joyce' thought experiment makes it clear that the speed of light is not constant in relative terms, that is, it is not constant for all observers regardless of the velocity of those observers as the theory claims, and that light's behaviour is fully in accord with the Galilean transformations.

Chapter Forty

THE INCONSTANT

SPEED OF LIGHT

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Having established that the speed of light is not constant in relative terms, we shall now argue that the speed of light is also not constant in absolute terms. We suggest that the speed of light in the vacuum of space depends upon three factors:

1) the temperature of the space through which the electromagnetic radiation is travelling;
2) the degree of stress experienced by the space through which the light waves are travelling; and
3) the frequency of the waves of light.

The first of these suggestions is purely conjectural. With it we suggest that the cooler the space through which light travels, the slower is its pace. This would mean that over the age of the universe, the speed of light will have gradually but steadily declined as the temperature of the bubble of space of which the

Field of Play consists has decreased. As we noted earlier, astrophysicists have calculated that the temperature of the universe has decreased by 1 degree Kelvin over the last 4 billion years. This conjecture would mean that when the Field of Play was very young, immediately following the era of Cosmic Inflation and when the temperature of the bubble of space was still exceedingly high, the transfer of heat from the Field of Play to the Realm of the Mind of God could have proceeded at a rate which was very much higher than that which is occurring in the present epoch, thus hastening the cooling of the Field of Play to the point where stable atoms could form, and the playing of the Game of Being could begin in earnest.

Regarding the second of our three factors, that the degree of stress which any given volume of space is experiencing affects the velocity of the light which is passing through it, there exists experimental evidence to support this theory. However, due to the misunderstood results of the Michelson – Morley experiment, and physicists' adherence to Einstein's mistaken idea of time-dilation, this evidence has been misinterpreted. In a section of his book titled *The Echo That Arrived Late,* Paul Davies describes the currently accepted explanation for this experimental evidence and the reasoning behind it. According to Einstein's General Theory of Relatively, which also posits the idea of time-dilation,

> "Time on the sun's surface runs about two parts in a million slower than on Earth, because of the sun's much higher gravity. The spectral lines of the sun should therefore be shifted in frequency by the same factor. In practice, the effect, which should be readily detectable, is muddled up with other processes and is not very convincing on its own. However, the sun's timewarp shows up very clearly in another way, where it can be accurately measured. As the Earth and planets go around

the sun, the positions of the planets viewed from Earth change in the sky. Sometimes a planet appears to be very close to the sun (where it can't normally be seen). If the planet lies on the far side of the sun, a beam of light traveling from the planet to Earth must then pass close to the sun's surface, where time runs a bit slower. The light will therefore arrive on Earth a little bit later than it would have done had the sun been in some other part of the sky . . .

"Einstein himself was aware of this time delay already in 1911, but did not follow up on its consequences. This had to await the inspiration of a young American physicist, Irwin Shapiro, who in 1961 calculated that the solar time delay would be measurable using radar rather than light. Radar waves can be bounced off other planets and returned to Earth in the form of a faint echo - - - in the same manner used to detect aircraft, but on a grander scale. If a planet is suitably located in the sky near the sun, the radar beam makes a double pass close to the solar surface, and according to Einstein's theory its echo should be delayed by a few hundred microseconds.

"In 1959, Shapiro had been involved with the first recorded radar echo from the planet Venus. However, it was not until 1964 that the possibility of measuring the relativistic time delay would become feasible. In that year, the Haystack radar antenna in Westford, Massachusetts, became operational, with a power output of four hundred kilowatts . . . [In] 1966 . . . the Haystack antenna was turned on Venus, then Mercury, during favourable conjunctions. Hundreds of echos were recorded and carefully

> analyzed by computer. Shapiro and colleagues found that the echoes were indeed delayed, and they were able to confirm the prediction of Einstein's theory to within 20 percent.
>
> "Errors in the radar-ranging experiment come from the rough topography of the target planet's surface, from uncertainties in the positions of the planets, and from distortions produced by the sun's corona. The technique can be considerably improved by using a spacecraft to return the signal. In 1977, NASA landed two Viking spacecraft on the surface of Mars, and this enabled much more accurate ranging data to be obtained. By 1978, Shapiro was able to confirm Einstein's time delay to one part in a thousand." (278)

The velocity at which electromagnetic radiation - - - of which radar is a particular range of frequencies - - - propagates depends in part upon the medium through which it is travelling. The speed at which light travels through the Earth's atmosphere, or through water, or through glass, all differ from the speed at which it travels through the vacuum of space. However, as we have seen from the experiments involving atomic clocks positioned at different altitudes, space itself is not uniform. Space in the presence of matter is warped or curved; where it is warped it is under stress; we are suggesting that the more stressed space is, the slower is the velocity of any electromagnetic radiation passing through it. The sun, being a massive body, warps and stresses the space around it. Any electromagnetic radiation passing close to the surface of the sun must pass through this stressed space. Thus the results of Irwin Shapiro's experiment are not due to a 'timewarp' - - - this cannot be: time does not exist and therefore cannot 'warp' - - - but, rather, are explained by the fact that when passing close to the surface of the sun electromagnetic radiation is literally slowed

down by its passage through that portion of stressed space, resulting in the measurable delay in the echo of the radar signal.

We come now to the third factor which affects the speed of light: the frequency of the electromagnetic radiation, frequency being defined as the number of vibrations, oscillations, or cycles per unit of time. We have seen that when sub-atomic particles such as gold ions are accelerated to near light-speed, they are affected by their passage through space. At those velocities space resists their passage through it, resulting in the 'pancaking' of the gold ions due to the pressure space exerts upon them at those velocities.

Space also has an effect on the electromagnetic radiation which passes through it. Thomas Young's double-slit experiment and Alain Aspect's anticorrelation experiment demonstrate conclusively that natural light is a wave phenomenon. We suggest that as each wave-crest of light passes through the medium of space (or, if you prefer, the aether) it creates what is in most circumstances an immeasurably tiny amount of turbulence, which is left behind in its wake. Furthermore, the more stressed is the space through which the beam of light is travelling, the greater is the amount of turbulence created by the passage of each individual wave-crest. This turbulence has the effect of imperceptibly slowing the passage of the wave-crest immediately following upon it, which results in a gradual increase in the distance between the two wave-crests. Thus, in any sustained beam of light, each wave-crest travels at an ever-so slightly slower velocity than the wave-crest immediately preceding it. Therefore the speed of light is not constant.

This effect is incredibly tiny and is, at most frequencies, utterly undetectable over short distances. However, over very great distances, such as the millions or billions of light-years which separate galaxies, the effect becomes quite noticeable as the distance between successive wave-crests grows ever larger. This effect, and not an expanding universe as believed by astrophysicists and cosmologists since the time of Edwin Hubble, is the primary cause of the red-shifting of light from distant galaxies. Although

the Doppler effect caused by the motion of a galaxy away from an observer will be a contributing factor to the total amount of red-shift observed in many cases, the major source of the red-shifting of the light from distant galaxies is due to the turbulence caused by the passage of individual electromagnetic waves through space. Obviously, the greater the distance between any two galaxies, the greater will be the amount of red-shift experienced by the light passing between them. Hence, there is absolutely no reason to believe that the universe as a whole is expanding.

All forms of electromagnetic radiation begin their journey through space at the same velocity, irrespective of their frequency. The leading wave-crest of a beam of visible light travels through space at the same velocity as the leading wave-crest of a beam of gamma rays. We know this from observations of gamma ray bursts. These observations reveal the detection of visible light within seconds of the detection of gamma ray frequency radiation, even when that light has travelled across billions of light years from its source to our telescopes.

We also suggest that the rate at which any particular beam of electromagnetic radiation undergoes red-shifting depends on the frequency of that particular beam. The higher the frequency of the beam, the greater the amount of turbulence created by each wave-crest of that beam, and so it follows that the higher the frequency of a beam of light, which means that the wave-crests are closer together, the greater will be the amount of turbulence experienced by each successive individual wave-crest. Thus electromagnetic radiation of the highest frequencies, gamma radiation, will create and experience the greatest effects of turbulence.

The effects of turbulence in gamma radiation has been demonstrated experimentally, but once again the results of the experiment have been mistakenly ascribed to 'time-dilation.' Here is Paul Davies' description of the experiment:

> "Remarkably, the first accurate test of the effect of gravitation on time was actually carried

out on Earth, entirely within the confines of Harvard University! In 1959, Robert Pound and Glen Rebka decided to measure the gravitational red shift using not visible light but gamma rays. Like light and radio waves, gamma rays are electromagnetic waves, and can also serve as a clock. In this case, the frequency is millions of times greater, promising higher accuracy . . . The experiment was limited to demonstrating that a gamma ray emitted by an excited nucleus at the bottom of a tower could not be reabsorbed by an identical nucleus at the top, on account of its lower frequency. The tower chosen for the experiment was twenty-two and a half meters high and located in the Jefferson Physical Laboratory.

"The tricky part was to make sure that the gamma rays started out with a very precise energy, hence frequency, as the shift effect is truly tiny (a mere two and a half parts in a thousand trillion). Normally when a nucleus emits a gamma-ray photon, the energy of the photon varies a lot, because the nucleus recoils and grabs some of the energy. To circumvent this complication, Pound and Rebka used a crystal of radioactive iron. In a crystal, the atom of interest is locked firmly into the lattice, so the ejected photon is able to brace itself against the whole mass of the crystal. The recoil is therefore negligible, and the gamma ray sets out with a very sharply defined frequency.

"The experiment was readily able to show that, on moving to the top of the tower, the photon was too weak to excite any iron nuclei in a similar crystal there. To clinch the matter, Pound

> and Rebka wiggled the crystal at the top of the tower up and down. In the reference frame of the crystal, the wiggling motion creates a varying Doppler shift in the upcoming photon. By carefully arranging for the Doppler blue shift caused by the crystal going down to cancel the gravitational red shift due to the photon going up, the experimenters could induce nuclear excitation. The speed of the wiggle that brought about this state of affairs then gave a value for the gravitational timewarp. Pound and Rebka were thereby able to confirm Einstein's prediction to 1 percent." (279)

It is important to note that Davies' description of the Pound - Rebka experiment is incomplete. Davies refers only to the portion of the experiment which tested the red-shifting of the frequency of the gamma rays when the beam of gamma rays was pointed up the tower, that is, when the beam was travelling upwards through the Earth's gravitational field. However, the experiment also tested the effect on the frequency of the gamma rays of their being pointed down the tower, in order to test for any blue-shifting of the frequency of the gamma rays as they travelled downwards through Earth's gravitational field. As the Wikipedia article on the Pound – Rebka experiment explains:

> "The Pound – Rebka experiment monitored frequency shifts in gamma rays as they rose and fell in the gravitational field of the Earth. The experiment tested Einstein's 1907 and 1911 predictions, based on the equivalence principle, that photons *would gain energy* (emphasis added) when descending a gravitational potential, and *would lose energy* (emphasis added) when rising through a gravitational potential."

It is at this juncture that we run head-on into the problem with the employment of the concept of 'energy.' As we shall see, 'energy' is not 'real,' and cannot, in any actual sense, be gained or lost. It is merely a human concept created for the purpose of measuring change, but 'energy' itself has no phenomenological presence in the universe. According to conventional thinking, the higher the frequency of any particular beam of electromagnetic radiation, the higher is its 'energy.' Thus, if a beam of light undergoes a blue-shift, that is, if its frequency increases, then it is considered to have increased its 'energy.' However, we will demonstrate that the individual wave-crests of a beam of light descending through a gravitational field will actually experience a decrease in their velocity, and that it is this decrease in their velocity which is the cause of the blue-shifting of their frequency. Furthermore, we will demonstrate that the individual wave-crests of a beam of light rising through a gravitational field will actually experience an increase in their velocity, and that it is this increase in their velocity which is the cause of the red-shifting of their frequency. The introduction of the concept of 'energy' into this analysis serves only to muddy the waters.

So the question then becomes: what caused the changes in the frequency of the gamma radiation? Pound, Rebka, and Davies all ascribe the changes in the frequency of the gamma radiation to 'time-dilation.' Note the first sentence of Davies' description of the experiment: “Remarkably, the first accurate test of the effect of gravitation on time was actually carried out on Earth . . .” Pound, Rebka, Davies, and all of physics simply assumed that what was being tested was the effect of a gravitational field on time dilation. But this is impossible. Time does not exist and so therefore cannot 'dilate.' But the effect (the changes in the frequency of the gamma rays) was observed and measured, and was therefore real. So what was its cause?

In both cases - - - the red-shifting and the blue-shifting of the frequency of the gamma rays - - - the processes that worked to change the frequency of the gamma radiation in the Pound - Rebka

experiment were due to the second and third factors which we maintain affect the *velocity* of electromagnetic radiation: the degree of stress which the space through which the gamma rays were passing was experiencing (the more stressed is the space through which the beam of light is travelling, the greater is the amount of turbulence created by the passage of each individual wave-crest); and the frequency of the electromagnetic radiation (the higher the frequency the greater the amount of turbulence created). These two factors work in tandem to determine the amount of turbulence created and experienced by the passage of electromagnetic waves through space. It is important to remember that from our analysis of the behaviour of atomic clocks in a gravitational field, we know that the amount of stress experienced by space declines steadily and smoothly as we rise upwards through a gravitational field.

We will deal first with that portion of the experiment when the beam of gamma rays was pointed up the tower, resulting in a red-shifting of the beam's frequency. Two processes are at work in this situation, each reinforcing the effect of the other. First, as they travelled up the tower each gamma ray wave-crest was constantly moving into less stressed space. This means that each wave-crest was constantly increasing its velocity relative to the wave-crest immediately following upon it. Second, each wave-crest passing through space creates turbulence which slows the passage of the wave-crest succeeding it. Because the space close to the surface of the Earth is relatively stressed, and because high frequency gamma rays were used in the experiment, the amount of turbulence created by each individual gamma ray wave-crest was relatively large, resulting in an enhanced slowing of each succeeding wave-crest. Both of these two processes operated to increase the distance between each pair of wave-crests, thereby resulting in a red-shifting of the beam's frequency as it travelled upwards through the tower.

Dealing now with that portion of the experiment in which the beam of gamma rays was pointed down the tower we find the

similar processes at work, but in this situation they work in opposition to one another. We have learned from Ira Shapiro's experiment that when light travels from less stressed space into more highly stressed space its velocity decreases. Therefore, since when the gamma rays in the Pound – Rebka experiment were travelling down the tower they were steadily passing into increasingly stressed space, the velocity of each wave-crest relative to the wave-crest immediately following upon it was decreasing, allowing the following wave-crest to 'gain ground' upon the wave-crest preceding it, reducing the distance between them, resulting in a blue-shifting of the beam's frequency. However, at the same time as this blue-shifting process was taking place, the turbulence factor, which would be increasing as the beam went deeper into the Earth's gravitational field, was working to increase the distance between each pair of wave-crests, thereby limiting the total amount of blue-shifting which could occur.

This analysis of the two different situations (beam pointed up and beam pointed down) is supported by the data obtained from the experiment. The weighted average fractional frequency shift between source and absorber which occurred when the beam was pointed up [- (19.7+/-0.8) x 10^-15] - - - when the two processes were reinforcing one another - - - was larger than the weighted average fractional frequency shift between source and absorber which occurred when the beam was pointed down [- (15.5+/-0.8) x 10^-15] - - - when the two processes were working in opposition to one another.

Because they were unaware of the existence of immaterial space and the role it plays in the propagation of electromagnetic radiation, Pound and Rebka failed to grasp the significance of the difference between the two frequency shifts. The net effect of these two processes was extremely tiny: a mere two and a half parts in a thousand trillion. That this effect could be detected and measured over such a short distance - - - only twenty-two and a half metres - - - is nothing short of astounding, but there it is. The design of the experiment was absolutely brilliant, but the results

were completely misinterpreted. Pound and Rebka thought they were demonstrating the effect of a gravitational field on time dilation. But our analysis shows that 'time-dilation' had nothing to do with it. It cannot have. Time does not exist and therefore cannot dilate. The results of the experiment are readily explained by the existence and behaviour of immaterial space, and its effects on the frequency of the electromagnetic radiation passing through it.

Because the Pound – Rebka experiment was carried out in the stressed space which surrounds the Earth, the turbulence factor was somewhat enhanced. In inter-galactic space, where space is uniform and much less stressed than it is in the vicinity of a gravitating body, the contribution of the condition of the space being travelled through by any electromagnetic radiation to the turbulence factor decreases, and since the amount of turbulence created decreases as wavelength increases, the amount of the increase in wavelength due to the turbulence factor per unit of space will decrease over large distances. Thus the amount of red-shift which occurs per light-year decreases as a beam of light travels over ever-greater distances.

The application of these factors to the behaviour of electromagnetic radiation permits a deeper understanding of light as it is both outgoing from, and incoming to, galaxies. The light which is most affected by these factors is the light coming from quasars. Quasars, you will recall, are the hugely energetic jets of electromagnetic radiation and sub-atomic particles which are intermittently blasted out from the poles of super-massive 'black holes.' Quasars are birthed on the peripheries of those entities, which produce the most highly stressed regions of space in the entire universe. The region of space immediately surrounding the massive neutron stars which lurk at the centres of these 'black holes' (that is, the volume of space inside the 'event horizon') is so stressed that it has completely lost its flexibility, and can no longer permit the passage of electromagnetic radiation. That is why 'black holes' are black. The regions of space which surround and are

adjacent to these 'blacked-out' portions of space retain their ability to permit the passage of electromagnetic radiation, but this volume of space is also under extreme stress, and therefore the wavelengths of any electromagnetic radiation which starts out from within these regions as x-rays or even gamma rays is rapidly red-shifted to longer wavelengths, albeit wavelengths which are still within the x-ray or gamma ray range of frequencies. The more stressed space is, the greater is the amount of turbulence created by the passage of electromagnetic radiation through it. The greater the amount of turbulence so created, the greater is the rate of loss of velocity of each light wave-crest relative to the velocity of the light wave-crest immediately preceding it. Acting in concert with the turbulence factor is the fact that each light wave-crest increases in velocity as it travels from stressed space into less stressed space, which increases the rate at which red-shifting occurs. Ultimately, the best way to understand these processes is to say: as a beam of light rises up out of a gravitational field each wave-crest minutely but steadily increases its velocity, but the rate of increase in its velocity is always slightly less than the rate of increase in the velocity of the wave-crest immediately preceding it. These combined processes are greatly reduced once the beam of light has passed beyond the gravitating body's gravitational rim, and exits the stressed space of the gravitational field. Together these processes mean that the rate at which red-shifting of light occurs is greater in the regions of space surrounding super-massive 'black holes' than anywhere else in the universe. This accounts for the fact that the light from quasars is among the most red-shifted light ever observed.

The same process applies to all the light emitted by galaxies generally. Each star in a galaxy emits light which is sent out across the universe. In each case the space immediately surrounding the star is more stressed than the space further out from it. Therefore the amount of red-shift that the light from any given star experiences decreases with every light-minute (the distance light travels in one minute) that the light traverses. The greater the mass of the star, the more red-shifting per light-minute will occur; the

rate at which red-shifting occurs steadily diminishing as the distance of the light beam from the star increases. For ordinary stars this red-shifting process is much less pronounced than what occurs in the case of quasars, because stars are so much less massive than super-massive neutron stars and thus the space around them is not stressed to the same extremes. However, all the outward bound light from a galaxy continues to experience 'enhanced' red-shifting (due to travelling through stressed space) until it passes beyond the galaxy's gravitational rim, the point in space where the presence of the super-massive neutron star at the galaxy's centre ceases to warp the space around it, and thus 'enhanced' stressing of space no longer occurs. Once the light beam passes beyond its originating galaxy's gravitational rim out into the (relatively) unstressed space which is present in inter-galactic regions, the rate of red-shifting experienced by the beam of light steadily diminishes as the wavelength of the light increases and its frequency decreases. During light beams' travel through the huge voids in the cosmic web, although red-shifting is still occurring because each wave-crest is still creating turbulence, they experience their lowest rates of red-shifting, as the space in those regions is not stressed at all.

What is the effect of these processes on light which is incoming to a galaxy? We know from Irwin Shapiro's experiment that when light travels from less-stressed space to more-stressed space it slows down. Once an in-bound beam of light crosses a galaxy's gravitational rim, it is steadily travelling into ever-increasingly stressed space, and is thus constantly reducing its velocity. This means that each wave-crest in a train of wave-crests will be gradually gaining on the wave-crest immediately preceding it, increasing the frequency of the beam of light, resulting in the light being blue-shifted. However, the tendency of each wave-crest to gain 'ground' on the wave-crest in front of it because that wave--crest is slowing down, is offset by the fact that since the leading wave-crest of the pair is travelling into increasingly stressed space, it is creating steadily increasing amounts of turbulence, which acts

to slow down the wave-crest following behind it. As the Pound – Rebka experiment demonstrated, these two opposing processes do not entirely cancel each other out, and therefore any beam of light which is incoming into a galaxy will experience some degree of blue-shifting. The frequency of any particular beam of light at the moment it crosses a galaxy's gravitational rim will also have an effect on the rate at which the blue-shifting of the beam's frequency will occur, since higher frequency beams inherently create more turbulence than lower frequency beams.

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Our new understanding of light's behaviour necessitates a review of the photoelectric effect, which we explored earlier. Recall that the photoelectric effect is the name given to the phenomenon wherein electromagnetic radiation was observed to blast electrons out of the surface of certain metals. Philippe Lenard discovered that the occurrence of this phenomenon depended not on the intensity of the light, as supposed by Maxwell's theory, but on the frequency of the light. Below a threshold frequency no electrons (named 'photoelectrons') were ejected, no matter how bright the light. Further, when the light shone upon the surface was of sufficient frequency, the ejected photoelectrons carried the same amount of energy no matter how dim the light, and, furthermore, were ejected from the metal immediately, which was also contrary to the predictions of the wave theory of light.

This review must begin with a clear understanding of the idea of 'energy,' of what it is, and of what it is not. Unlike space, matter, electromagnetic radiation, and change, 'energy' is not a fundamental aspect of the universe. Rather, it is a concept, an abstraction, invented by humans, to help them understand the

workings of the universe. As such, it has no phenomenological presence within the Field of Play which is independent of the mind of humans. It is a very useful concept, and has been used to explain a wide range of phenomena, but it is just a mental tool, invented by humans for that purpose. It does not *exist.* What is this tool used for? Like time, it is a tool of measurement; it is used to quantify change.

At the turn of the 20th Century the idea that energy is a concept, a tool to be used to analyze the behaviour of objects, began to blur into the idea that energy is, in and of itself, something that has a phenomenological presence in the universe, that it exists. This shift in perspective was initiated by the work of the German physicist, Max Planck.

At the macro level of existence, change is continuous. When a car drives down the street, unless the driver steps on the brake pedal and brings the car to a halt, its motion down the street is continuous. It does not travel 10 metres then spontaneously stop, then travel another 10 metres and spontaneously stop, and so on. The change in its position in space is continuous over time. In the late 19th Century physicists who were studying the behaviour of heated bodies, theorized that the 'oscillators' (what soon would become known as 'electrons') in the heated matter both absorbed and emitted the radiant heat in a process that was smooth and continuous: that the change in energy levels increased and decreased in a smooth and continuous fashion. But their theories could not account for the data their experiments produced.

In 1900, Max Planck developed a theory that was able to account for the observed data. He proposed that instead of changing in a continuous process, the oscillators absorbed and emitted the heat energy, that is, *they underwent change*, in a set of very tiny but discrete steps. In other words, at the level of the individual oscillator, the absorption and emission of heat is a *discontinuous* process. Planck calculated the size of each of these tiny steps and came up with a number (6.626 070 15 x 10^-34 joule per hertz) that was to become known as Planck's constant, and he

called the individual steps 'quanta,' and thus gave birth to the field of quantum mechanics.

That was the first stage in the evolution of the notion of 'energy' from being a mere concept, to its acquisition of the status of possessing a phenomenological presence in the universe. The second stage was brought about by Albert Einstein's explanation for the photoelectric effect.

The Wikipedia article entitled “Planck Constant” states that “The photoelectric effect is the emission of electrons (called 'photoelectrons') from [the surface of a metal] when light is shone upon it. The article goes on to explain the photoelectric effect this way:

> “The “photoelectrons” emitted as a result of the photoelectric effect have a certain kinetic energy, which can measured. This kinetic energy (for each photoelectron) is independent of the intensity of the light, but depends linearly on the frequency . . .
>
> “Einstein's explanation for [the photoelectric effect] was that light itself is quantized; that the energy of light is not transferred continuously as in a classical wave, but only in small “packets” or quanta. The size of these “packets” of energy, which would later be named photons, was to be the same as [what Planck had referred to as] the “energy element.””

In what came to be known as the “Planck-Einstein relation” Einstein expressed this idea with the equation:

$$E = hf \qquad (1)$$

where E is the kinetic energy of the 'photon,' h is Planck's constant,

and f is the frequency of the light. Thus were two subtly erroneous ideas simultaneously introduced into the physics canon by Albert Einstein: one, that natural light is made up of individual 'photons;' and two, that 'energy' has a phenomenological presence in the universe.

However, we now know with certainty that the first of these ideas is not true. As we have previously recounted, in their 'anti-correlation' experiments conducted in the mid-1980's, Alain Aspect and his colleagues demonstrated conclusively that classical light, no matter how attenuated, is not composed of photons. Therefore light itself is not quantized.

Einstein's second error involves a terminological sleight of hand. He explained the photoelectric effect by erroneously equating two disparate things: 'energy,' which does *not* exist, and is merely a system for the measurement of change, with 'light,' which *does* exist, and is a serial wave-crest displacement of the ether (space).

As a bus drives down the road, its position in space constantly changes. Humans have concluded that it is useful to think that while the bus travels down the road and undergoes that change in its position in space, it possesses (or carries with it) a certain amount of so-called 'kinetic energy.' That kinetic energy can be calculated with the formula:

$$E = 1/2mv^2 \qquad (2)$$

where m is the mass of the bus and v is its velocity. That energy is considered to be *a property of the bus* for as long as it is in motion. But we do not conflate that energy with the bus itself. We do not say that the bus and its kinetic energy are the same thing. The bus is a bus, and its kinetic energy is merely an aspect of the bus's travel through space over time.

Like the bus, light, which is always in motion, can also be said to possess kinetic energy. When Einstein erroneously quantized light into what were to become known as 'photons,' he

mis-characterized the nature of electromagnetic radiation as a stream of little bullets of energy, while at the same time mistakenly endowing the concept of energy with the status of something that possesses a phenomenological presence in the universe.

Yet the Planck-Einstein relation, E = hf, was demonstrated by Robert Andrews Millikan to be mathematically accurate. If that equation is based on two erroneous ideas, as we claim, how can that be? It can be so because Planck's constant, h, is an accurate measurement of the manner in which discontinuous change occurs at the sub-atomic (quantum) level of existence; and because frequency, f, is an accurate measurement of an aspect of the serial wave-crest displacement of the ether, which we call light. So, at the quantum level, change (which 'energy' is a measurement of) *is* quantized, but light itself *is not*.

Now, in the photoelectric effect, the energy of the ejected photoelectrons can be calculated with the equation:

$$KE_e = hf - BE \qquad (3)$$

where KE_e is the kinetic energy of the photoelectron, h is Planck's constant, f is the frequency of the incident light, and BE is the binding energy (or 'work function') of the material. So, the energy of the ejected photoelectron is directly proportional to the frequency, f, of the light-waves impinging on the surface of the metal. The higher the frequency of the incident light, the greater the energy of the ejected photoelectron. How did Einstein go from this observation to the erroneous conclusion that light is a quantized form of energy?

At first blush, this can be difficult to understand. According to Einstein, each 'photon' is an individual 'particle' of light, and it is the energy of that *individual particle* of light which is responsible for ejecting the photoelectron from the surface of the metal. But, by definition, individual particles do not possess a frequency. Frequency is defined as the number of vibrations, oscillations, or cycles per unit of time. Frequency requires a repetitive process,

and in Einstein's schema the ejection of the photoelectron by an individual particle of light is not the result of a repetitious process, but is a singular event. Yet Equation 1, in which the energy of the 'photon' is directly proportional to its frequency, has been proven by experiment to be accurate. But the equation includes a term (the frequency) which, in this situation, does not apply. How can that be?

We can begin to answer this question by analyzing the situation as if it were a type of 'signal-observer' problem. We learned from our Max and Luna thought experiment that there are three factors to consider in signal-observer problems: distance (the determinant factor), speed of the signal (the variable factor), and time (the derivative factor). When considering light, wavelength (the *distance* between any two successive waves) is the determinant factor; the speed of light, c, is the variable speed factor; and frequency (the measure of *how often* a recurring event occurs) is the derivative time factor. By basing his analysis of the photoelectric effect on the frequency of the incident light, that is, on the derivative time factor, Einstein made the same mistake he made in his development of the Special Theory of Relativity, and this mistake similarly led him to another erroneous conclusion: this time that light is a quantized form of energy.

When applied to a repetitive and continuous process such as a light wave, frequency is defined as the number of vibrations, oscillations, or cycles per unit of time. But it is also possible to apply the concept of frequency to processes which are repetitive but discontinuous, as long as the intervals between the events comprising the process are constant. Einstein's decision to rely on the frequency of the light waves (the derivative *time* factor in this signal-observer problem) in his equation for determining the energy of the incident light (Equation (1)) led him to conclude that light is a repetitive but discontinuous process, despite the accumulated evidence that light is a continuous wave-like phenomenon, which Aspect and his colleagues demonstrated conclusively with their anti-correlation experiment.

Let us be clear: the Planck-Einstein relation, E = hf, is not incorrect. It is simply misleading. When considering light *waves*, it is wavelength (the *distance* between any two successive waves) which is the determinant factor. It is wavelength which determines frequency, not the other way around. While it is not mathematically incorrect to define wavelength in terms of frequency:

$$\lambda = c/f \qquad (4)$$

where λ (the Greek letter lambda) represents the wavelength of light in metres, c is the speed of light, and f is frequency, it is conceptually misleading. It is wavelength which is fundamental to a correct understanding of the nature of light, not frequency. If Einstein had written Equation (1) in terms of wavelength (the determinant *distance* factor in this signal-observer problem) in the mathematically equivalent form of:

$$E = hc/\lambda \qquad (5)$$

thereby maintaining the priority of wavelength to our understanding of light, he would not have come to the conclusion that light is a discontinuous stream of particles of energy, and 100-plus years of confusion concerning the nature of light, confusion which is very much in evidence today, would have been avoided.

We can clear up this confusion by taking into consideration another equation which can also be used to calculate the energy of a 'photon:'

$$E = pc \qquad (6)$$

where p is the momentum of the 'photon' and c is the speed of light.

What is 'momentum?' Momentum is a measure of the amount of 'motion' an object possesses, and for macro objects like our bus momentum is calculated by multiplying the bus's mass by

its velocity.

$$p = mv \qquad (7)$$

Thus an object which has more mass or a higher velocity will possess more momentum. Since electromagnetic radiation does not possess mass, the momentum of a beam of light is calculated by the equation:

$$p = h/\lambda \qquad (8)$$

In this equation we see that once again wavelength (the determinant distance factor) plays a pivotal role. In this case momentum is inversely proportional to wavelength: as wavelength becomes smaller, momentum grows larger. To understand why this is so, imagine a series of waves that have a wavelength of 1 metre. Now superimpose upon that image a series of waves that have a wavelength of 1 centimetre. For every time that the 1 metre wavelength waves goes up and down once, the 1 centimetre wavelength waves go up and down 100 times. Over the same distance the 1 centimetre wavelength waves experience 100 times the 'motion' experienced by the 1 metre wavelength waves, and thus possess 100 times the momentum.

We can see from Equation (8) that the value of p is thus quite small and therefore the 'photon's' momentum plays only a small, but still significant, role in the determination of the 'photon's' energy. The vast proportion of each 'photon's' energy thus arises from its high velocity: 300,000 km per second, the speed of light. Nevertheless, since c is (at least over short distances) a constant, we see from Equation (6) that E increases in direct proportion to p. This means that, for the photoelectric electric effect to occur, there is a cut-off point, just as there is for frequency (and which in fact occurs at the same *wavelength* as does the cut-off for frequency), below which the contribution of the 'photon's' momentum to the total energy of the 'photon' is too small to eject the photoelectron

from the surface of the metal. (We have used the word 'photon' in this analysis because that is the word commonly associated with the photoelectric effect. We have placed it in single quotation marks to indicate that natural light is not actually composed of individual 'bullets' of energy, but is in fact a wave phenomenon, as Alain Aspect and his colleagues demonstrated.)

Now, velocity is calculated by multiplying distance by time, so the speed of light is calculated by the equation:

$$c = \lambda f \qquad (9)$$

Therefore frequency is calculated by the equation:

$$f = c/\lambda \qquad (10)$$

So energy is directly proportional to both frequency (Equation (1)) and momentum (Equation (6)). Is there some connection between frequency and momentum which will help us to understand the photoelectric effect? Yes, there is. Both frequency (Equation (10)) and momentum (Equation (8)) are inversely proportional to wavelength, and thus we see that it is wavelength (once again, distance: the *determinant* factor) which is crucial to our understanding of the photoelectric effect which, of course, implies that light is a wave, not a particle, phenomenon.

So we see that both the energy of the 'photon' (Equation (1)) and the velocity of the 'photon' (Equation (9)) are directly proportional to frequency. The commonality of the frequency term to both equations explains how the Planck-Einstein relation can be mathematically accurate while at the same time being conceptually flawed.

The Planck-Einstein relation, which purports to explain the photoelectric effect, is conceptually flawed because frequency is just a number. It is nothing more than a head-count of the number of waves passing a given point in a given amount of time. While it provides a mathematically correct *description* of the photoelectric

effect, it in no way provides an *explanation* for the photoelectric effect. The Planck-Einstein relation establishes that there is a *correlation* between frequency and the energy of the 'photon,' but it does not establish *causation.* As a mere number, frequency does not explain how energy is transferred from the light wave to the electron in the metal, thereby creating a photoelectron. It is just a tally of the number of light waves that are passing by. Frequency does not carry any energy. It cannot transfer any energy. Momentum, on the other hand, is a measure of the amount of 'motion' apparent in a moving object, and can be transferred from one object to another.

Frequency is just a number, which is to say that it is an abstraction, a creation of the human intellect. As such it possesses no phenomenological presence in the universe which is independent of the mind of humans, as opposed to light waves which are manifestations of something which actually does possess an independent phenomenological presence in the universe: immaterial space. Because of these differences, Einstein's usage of frequency as a term in the equation describing the photoelectric effect has led to confusion and misunderstanding**.**

Using Equation (6) instead of Equation (1) to calculate the energy of the 'photon' allows us to sidestep this confusion. Substituting Equation (6) into Equation (3) gives us:

$$KE_e = pc - BE \qquad (11)$$

for the energy of the photoelectron, allowing us to dispense entirely with the frequency term, which allows us to conclude that it is the momentum of the incident 'photon,' not its frequency, which determines the photoelectron's total kinetic energy. The consensus among physicists is that most of the incident 'photon's' momentum is absorbed by the atom from which the photoelectron is ejected. However, Equation (11) makes it clear that some critical portion of the incident 'photon's' momentum is necessarily transferred to the electron in order for it to overcome the atom's binding energy and

take flight as a photoelectron. And Equation (8) makes it clear that the amount of momentum available to perform this work is dependent on the wavelength of the 'photon.' The problem is that 'photons,' being particles, do not and can not, have a wavelength.

If we now substitute Equation (8) into Equation (11) we get:

$$KE_e = hc/\lambda - BE \qquad (12)$$

which gives us the energy of the ejected photoelectron as being the product of the two relevant constants (Planck's constant and the speed of light) divided by the determinant distance factor, wavelength. Thus we can conclude that while *the energy carried by light* is quantized (indicated by the presence of Planck's constant in Equation (12)), *light itself is not* (indicated by the presence of the term representing wavelength in Equation (12)). Electromagnetic radiation is composed of waves, not particles. Einstein's "bullets of energy" do not exist outside of a laboratory setting.

There remains the problem of the prompt emission of photoelectrons which was observed during the experiments demonstrating the photoelectric effect. The mathematical treatment of the wave theory of light could not account for this, and it was to get around this difficulty that prompted Einstein to invent what later came to be called 'photons.' But because of the work of Alain Aspect, we know for certain that classical light, including the light used in the experiments demonstrating the photoelectric effect, is not composed of photons. Furthermore, the concepts used by Einstein and others to explain the photoelectric effect, like 'frequency' and 'wavelength,' are concepts that arose from the study of waves. The Planck-Einstein relation is $E = hf$, with the f term representing the frequency of the 'photons.' The equation for determining the momentum of a 'photon' is $p = h/\lambda$, where lambda represents the the wavelength of the 'photon.' But Einstein theorized that photons are individual particles, and individual particles do not have a 'wavelength.' So the only logical conclusion is that light is a wave, not a particle, phenomenon, and that the

mathematical treatment of this phenomenon, which could not account for the prompt emission of photoelectrons, was in some way flawed, and needs correcting.

The evolution of the idea of 'energy,' from being a *concept* used to measure change, to being something that has a *phenomenological presence* in the universe, is illustrated by the development in Planck's own thinking on the matter. In his 1918 Nobel Prize acceptance speech Planck referred to his constant as the "quantum of action," indicating that at that time he still thought of energy as being a measurement of change. However, in his book, *The Philosophy of Physics,* published in 1936, Planck referred to Einstein's photons as "drops of energy," clearly demonstrating the shift in energy's status from that of a concept, a mere system of measurement, to that of something which actually exists.

This mistaken notion has now become widespread. Around the world humans now believe that 'energy' fuels their car, heats their home, and powers their television. Physicists believe that 'dark energy' drives the expansion of the universe. But 'energy' does none of these things. It cannot do any of these things, for it does not exist. It is merely a conceptual tool invented by humans to facilitate the measurement of change. The widespread belief that energy exists is a kind of mass delusion, and it is all thanks to Albert Einstein and his non-existent 'photons.'

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We shall return now to remarks made by Lord Martin Rees in his book *Just Six Numbers* which we have quoted previously. Discussing Type 1A supernovae Rees wrote:

> The brightening and fading of a supernova is itself like a clock, so a slowdown in the 'light curves', proportional to the redshift, is just what we would expect if they are receding. It would have no explanation in a static universe. *This is the best counter to any suspicion that the redshift is due to some kind of 'tired light' effect."* (emphasis added) (280)

The idea here is that the observed "slowdown in the 'light curves' " of very distant Type 1A supernovae is a relativistic effect due to the motion of the supernovae away from us. Remember that in the universe-is-expanding model, the further away from us an object is, the more rapid is its rate of recession, and that the supernovae under discussion here are among the most distant objects ever observed, and are therefore *presumed* to be moving fast enough that relativistic effects, that is, time-dilation, will be apparent. As for Rees' statement that the "slowdown in the 'light curves' . . .would have no explanation in a static universe," we have noted earlier that Rees himself suggested an alternative explanation for the observed slowdowns which is entirely consistent with a static universe: that the stellar composition of the stars that explode as Type 1A supernovae varies and that this factor could result in different light curves. In the intervening years since Rees made this statement, astrophysicists have indeed discovered that not all Type 1A supernovae arise from identical circumstances, calling into question their use as 'standard candles.'

However, our main point here is that Rees' statement that the slowdown in the light curves "is the best counter to any suspicion that the redshift is due to some kind of 'tired light' effect" is based upon the supposed relativistic effect of 'time-dilation.' But time does not exist and therefore cannot 'dilate;' we have shown, repeatedly, that 'time-dilation' is a non-existent phenomenon. Therefore "the best counter to any suspicion that the redshift is due to some kind of 'tired light' effect" has evaporated. Our theory that

red-shift is caused by the turbulence created by the passage of electromagnetic radiation through space would be classified by some as a 'tired light' effect. Now the “best counter” to 'tired light' theories has been shown to be without any evidentiary basis.

Chapter Forty-one

LIGHT AND THE STRUCTURE OF ATOMS PART 1

* * * * * *

We have stated earlier that the theoretical understanding of how stars function is in need of some revision, and it is to this topic we now turn. Stars are element-making machines which transmute one element into another. The proton-proton chain, which we examined earlier, is a logical explanation for how that transmutation process is carried out in the cores of stars although, as we shall see, we disagree with the current theory's understanding of how that process is initiated. The electromagnetic radiation that stars emit is a by-product of this transmutation process, and it is the theoretical understanding of the creation of this by-product which is fundamentally flawed. This flaw has arisen due to the conceptual error that something referred to as 'energy' actually exists.

It is at this point that your author needs to confess to perpetuating yet another conceptual and terminological error. At the very beginning of this narrative we stated that the universe was

created by the manifestation of the Mind of God as 'space-time' and 'energy-matter.' We chose to use these hyphenated terms because of the likelihood that most readers would be familiar and comfortable with them. We have since done away with the term 'space-time,' having demonstrated that time is merely a concept, a system of measurement, which possesses no independent phenomenological presence in the Field of Play outside of the Awareness Connectivity Systems of some lifeforms. It is now time for us to deliberately divest ourselves of the idea that 'energy' exists, and to henceforth swear off the use of the term 'energy-matter.' Like time, 'energy' is merely a concept, a system of measurement, albeit, like time, a useful one, but it possesses no phenomenological presence which is independent of the human mind. The ancient Greek philosopher, Democritus, was close to the truth when he stated that all that actually exists is space and matter.

Our knowledge of the structure of matter has allowed us to take this maxim of Democritus one step further. Earlier we stated (using the hyphenated terminology we have now forsworn) that the Field of Play consists of undifferentiated space, and differentiated perturbations of that undifferentiated space, which we now refer to simply as 'matter.' Thus, at the most fundamental level there is only space, presented in its various manifestations. Fundamentally, there is only the Mind of God made manifest.

Having made our position on the matter (pun intended) of energy clear, we will now explore how the concept of energy has been employed to arrive at the current theoretical model of the emission of light. The basic problem is that since 1905, when Albert Einstein theorized that the explanation of the photoelectric effect was to be found with the idea that light is made up of little “bullets,” which came in the 1920's to be known as 'photons,' physicists have laboured under the misconception that light is (somehow) both a particle and a wave phenomenon. According to current theory, which aspect of the character of light is made apparent depends on how an observer interacts with it. This belief is reminiscent of the flawed logic of the Trolley Car problem,

wherein it has been erroneously believed that the path taken through space by any given beam of light is dependent upon the positioning of individual observers. So ingrained in the physics community is this belief in the dual nature of light that when Alain Aspect and his colleagues demonstrated conclusively in the 1980's that natural light does not consist of photons but is a wave phenomenon, physicists did not then conclude that Einstein must have been mistaken - - - after all, this is Albert Einstein we're talking about here - - - instead they viewed that inconvenient fact, which was in conflict with their *belief system*, not as a fundamental truth about the nature of the universe, but as an obstacle to be overcome in order to perpetuate the prevailing dogma that light consists of photons, and so they used the technology available to them to create something they called 'photons' in their laboratories, thus preserving the claim that light consists of *particles of energy,* which, to put it as plainly as possible, is quite simply not the case. It cannot be the case, for the simple reason that 'energy' does not exist.

We must admit that we proceed from this point on with no small amount of trepidation. What we are about to propose will upset the apple cart of physics to an even greater extent than our invalidation of the Special Theory of Relativity. But there simply is no way around it; this step must be taken. The revelation that something we have been calling 'energy' does not actually exist, and that therefore tiny bundles of 'energy' called 'photons' cannot exist, will reverberate through the entire field of physics, for it means that our basic understanding of the structure of atoms and of how they function are both fundamentally flawed. It is far, far beyond the scope of this book, as well as being very much beyond the capabilities of its author, to correct all the erroneous conclusions concerning natural phenomena which have, over the years, crept into physics as a result of this misunderstanding regarding the theoretical nature of atoms. That is a task which we must leave to others. Therefore, of necessity, we will restrict the presentation of our alternate theory of behaviour on the atomic

scale to how it affects our understanding of our star, the Sun.

We must begin by clearly defining what electromagnetic radiation (EMR) is. EMR is what occurs when space is vibrated. As we shall see, there are two ways in which space can be induced to vibrate. Now we will state what EMR is not. Current theory states that EMR is what occurs when an electron moves from a higher energy level surrounding an atom to a lower energy level, releasing a packet of energy - - - the 'photon' - - - which is equivalent to the difference in energy between the two levels. But this theoretical model cannot be correct, because as we have seen, energy is merely a concept and does not actually exist, so there cannot actually be different 'levels' of it; and Aspect and his collaborators demonstrated conclusively, as did Thomas Young before them, that natural light, and therefore all forms of EMR, does not consist of photons. EMR, the vibration of immaterial space, is strictly a wave phenomenon.

We will start by presenting for the reader who is unfamiliar with the topic a picture of the atom as it is popularly understood. The basic model of the atom is known as the Bohr model, named for the Danish physicist Niels Bohr who first developed it. Bohr's basic model is simplicity itself and thus has much to commend it. It consists of a tiny nucleus comprised of protons and neutrons squeezed tightly together. The nucleus of an atom may consist of only a single proton, which is the case for an atom of hydrogen, or it may consist of dozens of protons and neutrons as is the case for uranium, the nucleus of which is made up of 92 protons and 146 neutrons. Orbiting around the nucleus are a certain number of electrons. Remember that protons are said to carry a positive electrical charge, electrons carry a negative electrical charge, and neutrons carry no charge and are thus said to be neutral. In an atom of any given element, the number of protons in the nucleus is equal to the number of electrons orbiting around the nucleus, and thus atoms are said to be electrically neutral. An 'ion' is created whenever there is an imbalance in the number of protons and electrons present in an atom. If there are more protons than

electrons, the ion is considered to be a positive ion; if there are more electrons than protons, the result is a negative ion.

An important fact to bear in mind is that the negatively charged electrons are attracted to the positively charged protons. As we shall see, the answer to the question of why the electrons do not crash into the nucleus will be key to the correct understanding of how atoms function. In the Bohr model the electrons orbit around the nucleus at various distances from the nucleus. These orbits have come to be called 'shells.' But when physicists use that term, they only use it metaphorically. In modern physics these shells are merely mathematical representations of the 'energy level' of the electrons which reside in them. Physicists do not believe that something named a 'shell' is actually physically manifest as a part of the atom.

According to Bohr, the greater the radius of any orbit (or shell) from the nucleus, the more electrons that shell may contain. This of course makes perfect sense. The greater the radius, the larger is the circumference of the orbit, and the more room there will be for electrons to reside within that particular shell. Remember that electrons repel one another and cannot be crowded too closely together. According to the Bohr model in the first four shells of an atom (for those atoms which are composed of four or more shells), the maximum number of electrons in each shell beginning with the innermost shell is 2, 8, 18, and 18 electrons respectively. As each shell fills up with electrons, the next shell out from it is populated. The total number of electrons depends on the number of protons in the atom's nucleus. In Bohr's model, the further out the orbit of an electron is, the higher is its level of 'energy.'

We are now ready to grasp how Bohr's model explains the 'photon' theory of the emission of light. In this model, when an electron residing in, say, the second shell encounters an in-coming 'photon,' it absorbs the 'energy' of that 'photon' and is thereby boosted into a higher orbit. Then, because of its attraction to the protons in the nucleus, it is drawn back towards the lowest orbit

whose shell has room for it. It may make this return journey one shell at a time, or it may 'quantum leap' over one or more orbits at once to arrive back at its 'ground' state. As it drops down from higher to lower orbits, so the theory goes, the electron emits a 'photon,' dispensing the 'energy' it had previously gained. The 'energy' of any given 'photon' emitted depends on the size of the quantum leap made by the electron. The larger the leap, the greater is the emitted 'photon's' 'energy' and, (here is where it gets interesting) the shorter is the 'photon's' wavelength. How can a 'photon,' which is supposedly a particle, have a wavelength? And how can a larger leap generate a shorter wavelength? For more than 100 years physicists, convinced of the validity of Einstein's "bullet" theory of light, have blithely ignored these questions and built up a theoretical structure which is wholly based on these logical contradictions.

In the ancient world, when it was generally believed that the Earth is at the centre of the universe and that the Sun and the other planets revolve around it, an Egyptian astronomer, mathematician, and geographer of Greek descent named Ptolemy came up with the idea that each heavenly body was attached to a crystalline sphere which revolved around the Earth. He explained the movements of the Sun, moon, planets, and stars by creating a system of what he called 'epicycles.' For 1400 years astronomers used Ptolemy's system to predict the appearance and disappearance of the objects in the night sky. However, the trouble was that as more data was collected and the body of astronomical knowledge grew, the more epicycles had to be added to the system in order to make sense of the data. The system became very complicated and unwieldy.

The physicists of the 20th century have fallen prey to a similar conceptual error. In order to make sense of the data they have collected, they have imagined a very Ptolemaic-like system of shells of different 'energy levels' around the nucleus of atoms. Electron shells are thought to consist of one or more subshells, and subshells are believed to consist of one or more atomic orbitals. In a slightly different but related context Gary Zukav noted that:

> "The present state of high-energy theory is similar to Ptolemaic astronomy before its collapse under the pressure of the new Copernican world view. The discovery of new particles and new quantum numbers . . . is analogous to the addition of epicycles piled on an already unwieldy theoretical structure." (281)

The current theory of the structure of atoms, with its shells, subshells and orbitals, and with electrons jumping madly up and down like a bowl full of frenzied Mexican jumping beans, is likewise complicated and cumbersome. Also like the astronomers of Ptolemy's day, modern day physicists have been forced to develop this very complicated model of the atom to account for their observations because they are mistaken about one fundamental fact. For the ancient astronomers that fundamental error was their belief that the Sun and other planets revolve around the Earth. For modern-day physicists, the fundamental error is their stubborn belief in the existence of 'photons.' But the discovery by Aspect and his collaborators that natural light does not consist of 'photons' renders the entire theory that EMR is the result of electrons jumping up and down the ladders of 'energy levels' surrounding atoms without any empirical evidence to support it. A new understanding is therefore required.

Before we can undertake the task of developing this new understanding we must first acquaint the reader with the notions of emission and absorption spectra, and what they represent. And before we do that, we must first insure that our readers are familiar with the phenomenon of interference.

In our recounting of the history of humanity's efforts to understand the nature of light we mentioned the famous 1803 experiment of Thomas Young, which provided very convincing evidence that light is a wave phenomenon, but we neglected at that point to describe Young's experiment in detail. It is now time to make amends for that oversight. As we have so often, we will rely

once more on Gary Zukav's *The Dancing Wu Li Masters* to provide an account of Young's experiment:

> "In 1803, Thomas Young settled once and for all (he thought) the question of the nature of light. He used an experiment that was both simple and dramatic. In front of a light source (Young used sunlight coming through a hole in a screen) he placed a screen with two vertical slits in it. Each slit could be covered over with a piece of material. On the other side of the double-slit screen was a wall against which the light coming through the double slits could shine. [See Figure #7 top image] When the light source was turned on and one of the slits was covered up, the wall was illuminated like [Figure #7 middle image].
>
> "When both slits were uncovered, however, Young made history. The projection on the wall should have been the sum of the light from the two slits, but it wasn't. Instead, the wall was illuminated with alternating bands of light and darkness! The center band was the brightest. On both sides of the center band of light were bands of darkness, then bands of light, but less intense than the center band; then bands of darkness, etc. [Figure #7 bottom image].
>
> "How could this happen?
>
> "The simplicity of the answer is what makes this experiment a great one. The alternating light and dark bands are a well-known phenomenon of wave mechanics called interference. Interference results when the waves of light diffracting from the two slits

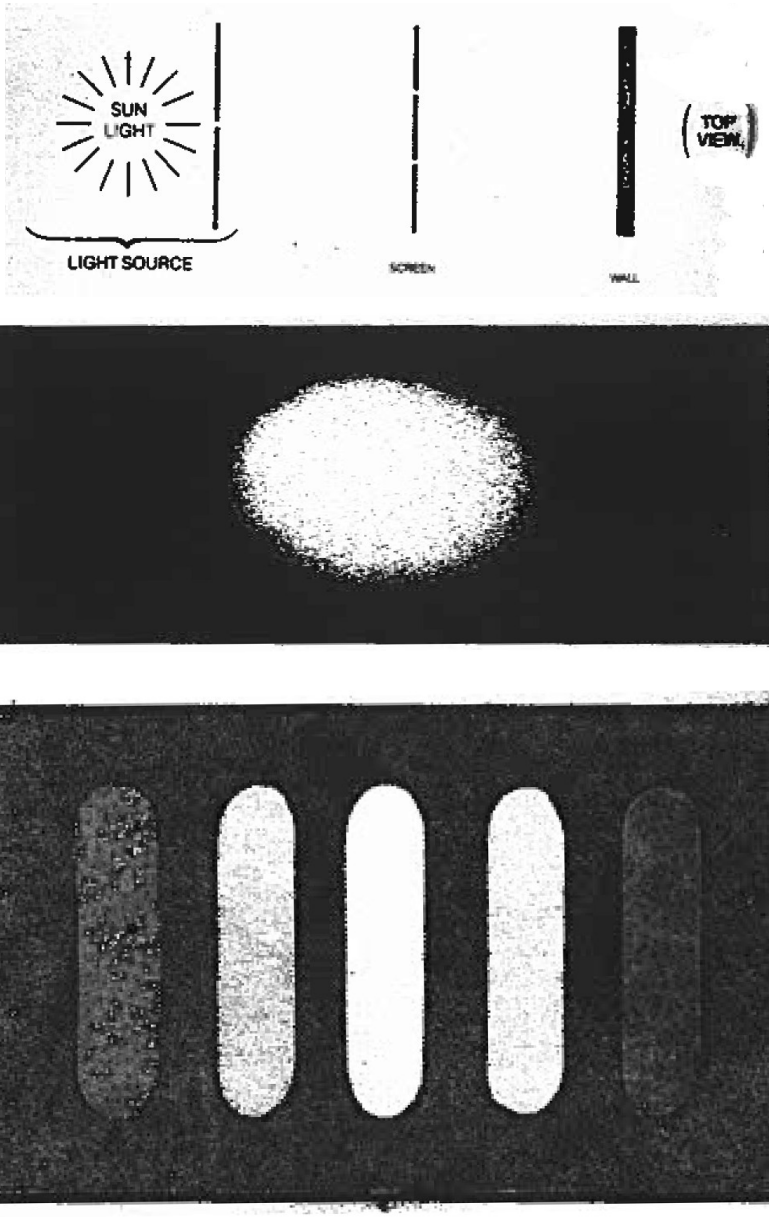

FIGURE 7

> interfere with each other. In some places these waves overlap and reinforce one another. In other places they cancel each other.
>
> "In areas where one wave crest overlaps another wave crest, the result is an intensification of light (the light bands). In areas where a crest meets a trough, they cancel each other and no light reaches the wall (the dark bands). . . .
>
> "In short, Young's double-slit experiment showed that light must be wave-like because only waves can create interference patterns." (282)

A thorough grasp of the concept of interference is essential. Where one wave-crest overlaps another wave-crest the result is 'constructive' interference. Where one wave-crest meets a trough the result is 'destructive' interference. The phenomenon of interference plays a key role in the understanding of topics to come.

We are now ready to tackle the topic of emission and absorption lines in the spectra of light. If you take light from a source such as an ordinary light bulb and pass it through a slit in a divider of some sort, and then place a prism in the path of the resulting beam, the light exiting from the prism will display all the colours of the rainbow. Projected onto a screen, the revealed colours from red to orange to yellow to green to blue to violet will be a continuous full-colour spectrum with no gaps as the colours change from one to another.

If, however, you pass the light from the light bulb through a cool diffuse gas, (the use of the term 'cool' here is relative; for any element to be in a gaseous state its atoms must be at some minimal temperature which is different for each element), then through a narrow slit, and then through a prism, the spectrum projected onto the screen will no longer be continuous. The spectrum will then be divided into sections by a series of dark lines. These lines are known as 'absorption' lines, and each is the result of a particular

wavelength of light being blocked by the atoms of the gas through which the light has passed. These lines were discovered in the light from the Sun by the English physicist William Hyde Wollaston in 1802, but they are known as Fraunhofer lines in honour of the German physicist Joseph von Fraunhofer, who catalogued more than 500 of them. It is these lines which are red-shifted by the passage of light through gravitational fields and the depths of space.

Finally, if the light that is emitted by a volume of hot gas is focused so that it passes through a prism, what will be projected on the screen is a series of bright lines of various colours. Which colours and where they appear on the spectrum depends on which elements are present in the sample of hot gas. Each element on the periodic table of elements when in gaseous form projects a series of bright lines which are unique to it. These 'emission' lines are each element's unique 'fingerprint.'

It is important to note that each element is capable of producing emission lines over a wide range of wavelengths. For example, the range of emission lines for the element sodium runs from 30.0 nm to 2337.9 nm. In comparison, the range of wavelengths which the human eye can detect is quite narrow, and is what is known as 'visible' light. These wavelengths range from 380 to 700 nanometres (nm), a nanometre being one one-billionth of a metre. As we shall see, the explanation for the capability of every element to produce emission lines over a wide range of wavelengths lies at the very basis of our alternate theory concerning the behaviour of atoms on the sub-atomic scale. Now we are ready to begin.

Our path to a new understanding of sub-atomic phenomena begins with two simple bar magnets placed side by side on a table, with their 'north poles' both facing in the same direction. Magnets create magnetic fields around themselves because all of the electrons in the magnet are spinning - - - quite literally spinning - - - in the same direction. Physicists say that all of their axes of rotation are aligned. The combined effect of all those electrons

spinning in the same direction generates a 'magnetic field.' But what is a magnetic field made of? It has to consist of something. Unless you believe in magical apparitions, everything in the universe has to consist of something. Physicists would say that magnetic fields consist of 'lines of force,' but what does that mean? Of what does a 'line of force' consist? A more satisfying, and a more logical, answer is that a magnetic field is the circular flow of space around the magnet, which has been induced by the rotation of the electrons within the magnet.

It is easy to demonstrate that this circular flow of space exists. For the sake of argument we will assume that the circular flow of space around both of the magnets sitting on the table is such that it is in a counterclockwise direction. If we take the magnets in our hands and hold the 'north pole' of one of them close to the 'south pole' of the other, we will feel a 'force' which tries to draw the two ends of the magnets together. However, if we then hold the 'north pole' of one magnet close to the 'north pole' of the other, we will find that some 'force' prevents us from placing the two magnets in contact with each other. Why is this?

The rotation of the electrons in the magnets induces a circular counterclockwise swirling vortex of space around the magnets. When we place the 'north pole' of one magnet next to the 'south pole' of the other, the two vortices are spinning in the same direction and thus are drawn towards one another, pulling the magnets themselves together. But when we turn one of the magnets around so that 'north pole' is facing 'north pole,' the vortices are now spinning in opposite directions. Because of this the vortices shun one another and cannot be combined, forcing the magnets apart. When we try to bring the two 'north poles' together we find that we can bring them so close, but no closer. In the gap between the ends of the magnets are two vortices of swirling space spinning in opposite directions, unable to be joined together. If we move the ends of the magnets around a little bit, we can feel the vortices move as well, maintaining the gap between the magnets. What physicists call a 'repelling force' that keeps the two magnets

apart, is actually two swirling vortices of space refusing to be combined. This little demonstration, which allows us to *directly feel the presence of space,* is conclusive evidence of the existence of the 'ether,' the standard interpretation of the results of the Michelson – Morley experiment be damned!

This insight necessitates the revision of a statement we made earlier. Back when we were still calling space 'space-time,' we stated that space bends or warps, and vibrates, but that it does not move from place to place. That statement can now be seen as clearly incorrect. So-called 'magnetic fields' are in fact rotating vortices of space induced by the spinning electrons within the magnets whose axes of spin are in alignment. Thus as the Earth moves through space as it orbits around the Sun, not only does it temporarily warp and then release the space which it traverses creating the phenomenon we call gravity in the process, it simultaneously spins the space through which it travels as well, creating the Earth's magnetic field.

In terms of our development of a new understanding of the structure and behaviour of atoms, the primary conclusion to be drawn from our experiment with the two bar magnets is that spinning particles induce spinning vortices in the space which surrounds them. Having established this important principle, we will now explore the overall structure of the Sun before delving any deeper into the structure and behaviour of matter on the atomic and subatomic scale.

Chapter Forty-two

THE COMPOSITION AND BEHAVIOUR OF OUR STAR

PART 1

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We will begin, as usual, by presenting the currently accepted theory concerning the topic. Like a layer cake and like the Earth, the Sun is composed of various and distinct layers of matter. At the centre lies the core where hydrogen is transmuted into helium. The mean radius of the Sun is some 696,000 km and the core is thought to account for about 25-30% of that distance. As a result of all the matter above the core pressing down upon it, the density of the core is some 10 times the density of iron or silver, and its temperature is extreme at some 15,000,000 degrees K. The proton – proton chain, which we examined earlier, takes place in the core during which hydrogen is turned into helium, emitting a 'photon' in the form of a gamma ray in the process. The

core fuses about 600 million tons of hydrogen into helium every second. Above the core sits the so-called radiative zone. It extends out to about 70% of the Sun's radius, and its temperature decreases rapidly as the radius increases, ranging from about 7 million K at the bottom to 2 million K at the top. The density of this zone decreases rapidly as we move outwards towards its surface. Atop the radiative zone we find the convection zone, which accounts for the remaining 30% of the Sun's radius. The temperature continues to drop dramatically going towards the surface of the Sun, and is about 5700 K at the top of the convection zone.

Above the convection zone begins the Sun's atmosphere. The lowest layer of this atmosphere is called the photosphere. This is the layer of the Sun which we can see, and it has a depth of some 500 km. In the photosphere the temperatures are low enough for atoms to form, and the temperature continues to drop as we rise through it. According to NASA the temperature of the photosphere is roughly 6500 K at the bottom, gradually decreasing to about 4000 K at the top. Note the difference in the stated temperatures between the top of the convection zone and the bottom of the photosphere. That difference exists because these are the estimated temperatures. Nobody has stuck a thermometer into the Sun. Below the photosphere the temperatures are too high for the nuclei of atoms to hold onto electrons, and all matter in those layers is in the form of ions. When passed through a prism the light from the photosphere exhibits an absorption spectrum, with many dark lines appearing in it. This fact is very significant.

As with the Earth's atmosphere, the density of the gases in the Sun's atmosphere decreases with height. The layer above the photosphere is called the chromosphere. Interestingly, the temperature of the chromosphere rises with height instead of dropping as we might expect, increasing from about 4000 K at the bottom to some 8000 K at its top. When light from the chromosphere is passed through a prism, it exhibits an emission spectrum of brightly coloured lines. Another very significant fact!

The top layer of the Sun's atmosphere is called the corona.

The density of matter in the corona is very low, but the temperature is currently believed to be at least 2,000,000 K. Because the densities of the chromosphere and the corona are so low we cannot normally see them. However, they can be observed during a full eclipse of the Sun when the moon blocks out the light coming from the photosphere. Astrophysicists have invented a device called a coronagraph which blocks out the photosphere's light and allows them to study the chromosphere and corona in detail. When passed through a prism, the light from the corona also exhibits an emission spectrum.

The final point we need to relate about the currently accepted model of the Sun regards the manner in which it emits its 'energy.' In accordance with the 'photon' model of the emission of light, the fusion process in the Sun's core emits a gamma ray 'photon' as it converts hydrogen to helium. Then, according to currently accepted theory, that gamma ray 'photon' takes what astrophysicists call 'a random walk,' which supposedly is a result of the gamma ray's multiple interactions with the many, many particles contained within the hundreds of thousands of kilometres of ionized plasma that stand between it and the Sun's surface. Estimates for how long that random walk takes vary widely: anywhere from 30,000 to 50,000,000 years!

The foregoing is a 'bare-bones' version of astrophysics' current understanding of the layered structure of our star. It is bare-bones because it makes no mention of the Sun's varied and powerful magnetic fields, which play an important role in the Sun's behaviour but which, for the purposes of our present discussion, can for the most part be ignored.

Because it is based on the 'photon' theory of the emission of EMR, we believe that the current understanding of the fusion process in the core of the Sun is flawed in several respects. We will present an alternative comprehensive theoretical model, based upon the idea that EMR is the vibration of immaterial space. Our model is based upon the idea of the pervasive presence of immaterial space, a non-substance which surrounds and penetrates

all the material bodies in the universe, except neutron stars. Being everywhere and in everything, immaterial space is present in the core of the Sun. Although this core is very dense, it is not so dense that it cannot be penetrated by space. EMR is the vibration of space, and we stated earlier that there are two ways in which space can be induced to produce EMR. One of those mechanisms resides in the core of the Sun (and all other stars).

According to the current understanding of the proton-proton chain, two hydrogen ions (two protons) are fused together to produce a positron, a neutrino, and a deuteron. The positron quickly annihilates with one of the free electrons in the core. The collision of these two particles results in the emission of two gamma rays. A deuteron is an isotope of hydrogen, consisting of one proton and one neutron fused together. The deuteron is quickly used up - - - within about one second - - - in the next step of the proton-proton chain. The neutrino immediately exits the core at or around the speed of light. Neutrinos are able to rapidly pass out of the Sun's core, even as dense as it is, because neutrinos do not interact with matter. They pass through solid bodies as if they were not there. As you read this sentence billions of neutrinos are passing through your body. Some physicists have theorized that neutrinos actually exceed the speed of light. Whatever the velocity of neutrinos may actually be, it is of no great import to the details of our model. This is not to say that neutrinos are unimportant. They are now thought to play a key role in supernova explosions, which make possible the distribution of the elements required to create planets and lifeforms. The Game of Being has been designed in such a manner that all of the truly fundamental particles to be found within the Field of Play fulfill a particular and necessary purpose.

The next step in the proton-proton chain involves the fusing of the deuterium isotope (the deuteron) with another proton. According to currently accepted theory, it is at this step that a gamma ray 'photon' is emitted, alongside the creation of the stable isotope Helium-3, which consists of two protons and a neutron.

Our model does not question the emission of EMR at this point in the process, but we do disagree with the idea that the EMR produced is in the form of a 'photon,' a 'particle of energy.' Rather, our model states that the collision of the deuterium isotope with another proton causes a vibration in space at the location of the collision. Because the collisions between deuterium isotopes and other protons are continuous, the resulting vibrations of space are constant and flow throughout the core in great multitudes with the wavelengths - - - the distances between successive vibrations - - - we associate with gamma rays.

Each vibration, a wave-crest travelling through the medium of space, then proceeds to travel some short distance within the core before it is absorbed by the dense plasma. As we mentioned previously, the core of the Sun is estimated to be about 10 times the density of silver or iron. Just as gamma rays cannot penetrate any great distance through a block of iron, neither can they travel far within the core. A gamma ray with the 'energy' (the penetrating power) of one million electron-volts (1MeV) can penetrate a piece of iron to a depth of 2.12 cm. The gamma rays produced in the Sun's core will have 'energy levels' several times higher than this, so have greater penetrating power. However, the much greater density of the core means that that vibration will be more rapidly absorbed than is the case with iron, so it is clear that the gamma ray radiation produced in the core does not travel very far before it is dissipated. Thus the lifetime of any individual vibration of gamma ray wavelength in the core's interior is very short, probably less than a second. On this point, our model stands in stark contrast to the current widely accepted theory in which 'photons' take a leisurely multi-thousands year-long jaunt through the core before escaping from the Sun. We believe that idea to be clearly nonsensical. A final point to be made here is that the passage of these gamma ray vibrations throughout the core moves the particles making up the plasma around, creating friction as those particles bump into and rub against one another. This friction is the primary source of the core's heat.

The last step in the currently accepted proton-proton chain theory involves the fusion of two Helium-3 isotopes, which results in the creation of a helium nucleus consisting of two protons and two neutrons, and the release of two other protons, which are then available to begin the process anew.

Now, we suspect that it is not only the collisions between deuterium isotopes and protons, the second step in the proton-proton chain, which produces EMR in the form of gamma rays, as is currently believed. We suspect, although we cannot prove, that gamma rays - - - vibrations of space - - - are the result of the collisions at each of the first two steps in the chain: proton-proton and deuterium isotope-proton. There is no logical reason why one type of collision would result in the production of EMR, and other collisions would not. Logically, all such collisions will result in the vibration of the space around the location of the collision. According to current theory, each step in the chain releases a certain amount of 'energy.' We suggest that this 'energy' is actually a measure of the amount of vibration induced in the medium of space surrounding the location of any particular individual collision.

(As we shall eventually see, our model of the fusion process in the Sun's core calls into question some of the details of the currently accepted proton-proton chain theory. We believe that the idea that the fusion process in the core is initiated by the coming together of two protons is incorrect, but the explanation for our disagreement must wait until after we have explored the phenomenon of 'beta decay'.)

It is important to bear in mind that the entirety of the Sun which lies beneath its atmosphere is made of the same stuff: a plasma of ions and free electrons. The only differences between the three main regions are those of pressure, density, and temperature; the substance which is experiencing those differences is the same. It is important to understand that within the Sun's core, which is somewhere between 280,000 and 340,000 km in diameter, the process of fusing hydrogen into helium is happening

everywhere within that region. As we look deeper into the core the rate of fusion increases, due to increases in pressure, density, and temperature, but the fusion process is evident throughout. This fact has a significant bearing on our understanding of the Sun's behaviour, for it means that only the outer extremities of the Sun's core are the source of all of the core-sourced EMR which the Sun pours out into the solar system.

We have seen that the gamma rays produced by the proton-proton chain do not travel very far before they are dissipated. But as we move outwards from the centre of the core towards its outer layers, the density of the core material gradually decreases. This means that the gamma rays produced in the outer regions of the core can travel further before dissipation occurs. Thus there will be a region in the outer core where fusion is still taking place, but which will be close enough to the surface of the core to allow those gamma rays to escape. But when those vibrations of immaterial space do escape the core, only the EMR emitted by the very outer surface of the core will still be of gamma ray wavelengths.

So EMR, in the form of gamma rays, is the vibration of space which results from the collisions of sub-atomic particles in the core of the Sun. This form of EMR is a direct result of such collisions, and is one of the two ways in which EMR is produced. If this theory is correct, then why is EMR not generated in other locations such as the Earth's or the Sun's atmosphere where there also are particles present which are constantly colliding with one another? In the case of the Earth's atmosphere, the answer is two-fold: one, because the pressure, density and temperature to be found in the Earth's atmosphere is too low to create collisions of sufficient violence between the particles to induce vibrations in space, the direct method of producing EMR is closed off; and two, the second method of producing EMR, via the vibration of electrons, is unavailable because the electrons necessary for that mode of production of EMR are bound up in the molecular form of nitrogen and oxygen. However, in the case of the Sun's atmosphere, we find that the collisions between particles play a

significant role in the production of EMR.

As we mentioned earlier, the region of the Sun which surrounds the core is known as the 'radiative' zone. Christopher De Pree provides a tidy summation of what, according to current theory, takes place there:

> "Atoms in this region transfer energy by radiation - - - a photon of light is emitted by one atom, and that photon is quickly absorbed by another nearby atom. This region is so dense that the transfer of radiation proceeds very slowly. In fact, photons emitted in the core can take 100,000 years to find their way out of the radiative zone." (283)

We contend that virtually everything in the above statements is incorrect, beginning with the notion that there are 'atoms' residing within the radiative zone. 'Atoms' consist of a nucleus surrounded by a number of electrons which orbit around the nucleus. In the radiative zone there are only 'ions,' atomic nuclei which have been stripped of their cloud of electrons by the violence of the collisions between those nuclei. The 'photon' theory of the emission of EMR states that a 'photon' is emitted when an electron jumps from a higher energy shell down to a lower energy shell. But in the hot plasma 'ocean' of ions in the radiative zone there are no electrons attached to nuclei in stable shells. By definition, that is what plasma is. Therefore, in a plasma, the conditions necessary for the 'photon' theory of EMR to operate - - - the jumping up and down of electrons between stable shells as they supposedly absorb and emit 'energy' - - - simply do not exist.

De Pree writes of the transfer of 'energy.' But there is no such thing as 'energy,' and so, as always, the magical concept of energy is just a mathematical proxy employed by physicists in lieu of a comprehensive understanding of what is actually occurring. The concept of 'energy' is magical because, like unicorns, it does not actually exist. De Pree speaks of 'photons,' but we know from

the experiments of Thomas Young and Alain Aspect that natural light does not consist of individual 'particles of energy,' otherwise known as 'photons.' De Pree refers to the density of the radiative zone, and states that it can take 100,000 years for a 'photon' to escape. This is nonsense. However, a critical change in the density of the Sun's plasma does occur at the boundary between the core and the radiative zone. Current estimates state that at the core / radiative zone boundary the temperature of the plasma, which will have been steadily declining as we proceed outwards from the centre of the core, is about 7 million degrees K. Whatever the temperature at this boundary may actually be, the key point is that the density of the plasma beyond that boundary drops below the level where fusion can occur and below the level where the plasma is opaque to the transmission of EMR, and thus the EMR which is produced in the very outer layers of the core can free itself from the clutches of the core and escape out into the solar system.

Recall now our theory of the red-shifting of EMR. We stated that red-shifting - - - the lengthening of the distance between one wave-crest (one vibration of immaterial space) and the next occurs because each wave-crest creates an incredibly tiny and undetectable amount of turbulence in the 'ocean' of space as it travels through it, and that over time this turbulence causes the following wave-crest to slightly slow so that the distance between the two wave-crests gradually increases. We stated further that the greater the degree of stress being experienced by the space through which any particular train of wave-crests is travelling, the greater is the amount of turbulence generated by each wave-crest. The amount of stress experienced by any given region of space is determined by the amount by which that region of space is curved. The amount of curvature depends on the strength of the gravitational field in which the region of space is situated. Thus the deeper into any gravitational field we go, the more highly stressed will be the space we encounter.

Compared to the level of stress experienced by the space through which the Earth travels, the space at the core / radiative

zone boundary within the Sun is relatively highly stressed. The EMR produced by the fusion process in the very outer layer of the Sun's core - - - the core's 'skin' if you will - - - escapes the core with the very small wavelength of a gamma ray. However, because the space through which those gamma rays are travelling is highly stressed, the turbulence created by each individual wave-crest is relatively significant, and thus an increase in the wavelength of the EMR occurs quite rapidly. By the time the EMR emitted as gamma rays from the skin of the core reaches the region of the corona in the Sun's outer atmosphere, having travelled a distance of some 536,000 km through increasingly less-stressed space, the wavelength of most, but as we shall see not all, of that EMR has been increased from that of gamma rays to that of x-rays.

This lengthening process applies to all of the EMR emitted by the fusion process within the outer, say, for the sake of argument only, 1% of the layers of the Sun's core. All of the EMR starts out with a gamma ray wavelength. The deeper into the core's skin is the gamma ray's point of origin, the greater will be its exposure to the lengthening process, and the longer will be its wavelength when it finally emerges from the corona. Thus most of the gamma rays emitted very close to the surface of the core emerge from the Sun's atmosphere as x-rays. The gamma rays emitted from just a little deeper in the core's skin emerge from the Sun as ultra-violet light. Just a little deeper and the EMR emerges in the visible portion of the spectrum as violet light. Just a little deeper still and blue light emerges, and so on, down into the infrared and the shorter radio-wave wavelengths of the spectrum. The mass of the Sun, which determines the strength of its gravitational field and thus the extent of its EMR lengthening process, is such that most of the Sun's EMR which escapes out into the solar system is within the ultra-violet, visible light, and infrared portions of the spectrum.

The temperature at the boundary of the radiative and convection zones is estimated to be some 2 million K. The convection zone is some 200,000 km thick and the temperature in this zone drops rapidly as we approach its surface, from 2,000,000

K at its base to 5700 K at the top. Because there is much less material pressing down on it, the plasma at the bottom of the convection zone is not compacted like it is at the bottom of the radiative zone, and is thus free to flow. A curious thing happens in the convection zone. As we move outward through the core and the radiative zone the density of the plasma decreases, but as we move outwards through the convection zone the density of the plasma actually increases. According to De Pree:

> "In the convection zone, energy is transferred out to the Sun's surface by the motions of material. Thermal cells of hot material at the base of the convection zone rise to the surface, where they cool, increase in density, and then sink back to the bottom of the convective zone." (284)

It has been estimated that it takes about three months for the 2 million K plasma at the bottom of the convection zone to rise to the 5700 K bottom of the photosphere, which is the surface of the Sun which we can normally see. When seen through a telescope, the surface of the photosphere is shown to be covered with bright irregularly-shaped areas separated by darker areas. This pattern is known as 'granulation' and it changes about every five minutes. The bright areas are newly-arrived still hot thermal cells, while the dark areas have already cooled and started to sink back down into the depths of the convective zone.

Significantly, as we pass out of the convection zone and rise through the photosphere the temperature of the plasma cools to the point where the ions are able to retain electrons in stable orbits around themselves, and become fully-fledged atoms.

Chapter Forty-three

LIGHT AND THE STRUCTURE OF ATOMS PART 2

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It is at this juncture that we must return to the conclusions we reached as a result of our experiment with the two simple bar magnets. Back then we concluded that when their axes of spin are properly aligned, spinning electrons project a rotating vortex in space, what is commonly called a magnetic field. We will now use this idea to reach a new understanding of behaviour on the sub-atomic scale.

We will use this idea to investigate the behaviour of the most simple of atoms: an atom of hydrogen, consisting of a single proton in its nucleus with one solitary electron orbiting around it. We propose that, like electrons, protons also spin around an axis. Because the mass of a proton is 1836 times as massive as an electron, a single proton is capable of projecting a spherical rotating vortex of space around itself. We shall refer to this rotating vortex as a 'force field.' This force field is the structure

which prevents electrons from crashing into the proton. By virtue of their negative electrical charge, electrons are attracted towards the positively charged protons but, under most circumstances, the proton's projected force field prevents such a union from occurring. The electron's attraction to the proton keeps it attached to the force field but it is not fixed in place. Because the electron is rotating about its axis, it rolls around the surface of the force field like a wheel on a curved surface, constantly looking for a way in so that it can unite with the proton. When the temperature of the proton's environment is too high - - - temperature being defined as the rate at which particles in any given volume collide - - - the electron is constantly being dislodged from its attachment to the force field by the force of the collisions, and the resulting material is in a plasma state. However, when the temperature drops below about 5700 degrees K as it does in the Sun's photosphere, stable hydrogen atoms can form and survive.

We know from our investigation of the synchrotron phenomenon that when electrons are spun in a circle they vibrate, and that this vibration results in the emission of EMR. We thus come to a second way in which space is induced to vibrate and to emit EMR. You can conduct a simple experiment in your home to demonstrate how this second way in which space is induced to vibrate and to emit EMR works.

Take a large bowl or pot and fill it at least half-way with water. The water represents space. Now extend your fore-finger and dip it into the centre of the container. Your finger represents an electron. Now slowly wiggle your finger back and forth. This motion represents the vibration of the electron. Each time you move your finger back and forth, two waves will be generated in the water, heading off in opposite directions. The faster you wiggle your finger back and forth, the more waves will be generated and the closer together will be their crests. Thus the speed at which you wiggle your finger determines both the frequency (how many waves per second are generated) and the wavelength (the distance between two successive waves) of the waves. The pattern of waves

on the surface of the container will quickly become very complex because the waves will reflect off the sides of the container and return towards your finger, resulting in a pattern of constructive and destructive interference with the waves still being produced by the movement of your finger. In space, of course, there is no container with sides for the vibrations in space to reflect off of. But you get the general idea. The rate at which electrons vibrate determines the original frequency and wavelength of the EMR passing through the 'bowl' full of immaterial space (the Field of Play). Now, what is it that determines the rate at which electrons vibrate in atoms?

We learned from our discussion concerning synchroton radiation that spinning electrons around in a circle causes them to vibrate. They vibrate in those situations because they are under stress. The electrons' inertial mass wants the electrons to travel in a straight line, but the magnetic field created by the synchrotron forces them to go in circles. That tug of war between their inertial mass and the magnetic field stresses the electrons out, causing them to vibrate as they try to go in two different directions at once. As a consequence of this, the faster the electrons go (because their inertial mass increases as their velocity increases) the more highly stressed they become, and hence the more rapidly they vibrate. The more rapidly they vibrate, the higher is the frequency and the shorter is the wavelength of the EMR they emit.

So we see now that a second way in which EMR is produced (the first being the collision of sub-atomic particles in the high temperature high pressure core of the Sun) is via the vibration of electrons. But there is more than one way to make electrons vibrate. One way is to whirl them around in tight circles at high velocities, as in a synchrotron. Another way is to strike them with a 'hammer' and make them 'ring' like a bell. When the clapper on a church bell strikes the body of the bell, it makes the bell vibrate. Those vibrations cause the air around the bell to vibrate. Those vibrations are the sound waves which enter our ears. An important point is that the bell continues to ring for some period of time after

being struck as the vibrations gradually dissipate, or until the clapper strikes the bell again, setting off a new set of vibrations.

This is similar to what happens in the atmosphere of the Sun, except that the vibrations produced are vibrations of space rather than vibrations of an atmosphere, creating electromagnetic waves as opposed to sound waves. Each hydrogen atom in the Sun's atmosphere is made up of a spinning proton, a rotating force field spinning around the proton, and an electron rolling around the outer surface of the force field. The electrons are the bells, but they are very special bells. These bells will only ring when struck by one of a very specific set of 'hammers.' The hammers are specific frequencies (or wavelengths) of the EMR produced in the core of the Sun.

Contrary to currently accepted theory, we suggest that the velocity of any particular frequency (or any particular wavelength) of the EMR produced by the core of the Sun is unique to that frequency; in other words, the speed of light is not constant. The higher the frequency of the EMR, the greater is its velocity. Thus the velocity of high frequency, short wavelength gamma radiation is greater than the velocity of lower frequency, longer wavelength visible light, which itself is greater than the velocity of still lower frequency and longer wavelength radio waves. The difference in velocities of any two sequential frequencies is minuscule, immeasurably minute, but the electrons (the bells) rolling around the force fields of the hydrogen atoms in the Sun's photosphere are extremely sensitive to these minute differences. Those bells will only ring, that is, be induced to vibrate, when struck with a specific amount of force. The amount of force wielded depends upon the velocity of any particular frequency of the core-sourced EMR.

Because the numbers are smaller, we prefer to think in terms of wavelengths rather than frequencies. Remember that the lower the frequency, the larger the wavelength. Thus EMR with a wavelength of 300 nanometres (nm) will have a greater velocity than EMR with a wavelength of 600 nm, and the former will therefore strike the electron-bells with more force than the latter.

There are approximately 30 different sized EMR hammers which can induce the electron attached to an atom of hydrogen to ring. The Physical Measurements Laboratory of the U.S. National Institute of Standards and Technology has compiled a table of the strong emission lines of hydrogen, which contains 30 different wavelengths at which hydrogen will emit EMR. They range in wavelength from 92.6 nm to 12368.5 nm. According to currently accepted theory, these are the wavelengths at which hydrogen atoms can 'emit energy in the form of a photon' as the electrons jump down from higher to lower shells which orbit the nucleus. We believe that neither 'energy' nor 'photons' nor numerous 'shells' exist, and that therefore electrons do not emit 'photons' as they leap from one shell to another. Rather, we suggest that the core-sourced EMR of these particular wavelengths travels at the specific velocities required to exert the 'just right' amount of force to induce the hydrogen atoms' electrons to ring (vibrate) like a bell.

Now let's apply these ideas to what happens in the atmosphere of the Sun. Recall that the spectrum of light observed from the Sun's photosphere is characterized by a series of dark 'absorption' lines, which are evidence of the absence of EMR at those specific wavelengths. Recall also that higher in the Sun's atmosphere, the spectrum of EMR in the chromosphere and corona are characterized by bright 'emission' lines, and, importantly, that the wavelengths of these emission lines correspond precisely to the wavelengths of the absorption lines observed in the photosphere. The atoms of hydrogen in the photosphere are exactly the same as the atoms of hydrogen in the chromosphere and the corona. Why do they 'absorb' light in the former, but 'emit' light in the latter?

Let's say that some core-sourced EMR with a wavelength of 656.2 nm strikes an electron of a hydrogen atom in the photosphere. EMR of this wavelength is light that humans experience as the colour red, and it is one of the 30 wavelengths which is capable of causing a hydrogen atom's electron to ring, or vibrate; it is a 656.2 nm 'hammer.' Imagine a series of wave-crests separated by a distance of 656.2 nm and all travelling at the same

velocity. Now imagine this series of wave-crests encountering the electron of a hydrogen atom. Each of the wave-crests will 'hammer' the electron-bell with the specific force associated with the velocity of EMR with a wavelength of 656.2 nm. To be clear: it is the velocity of each wave-crest which determines whether or not the 'hammer' will be able to exert the required amount of force to make the electron vibrate. When these hammers strike the electron-bell, they cause the electron to vibrate at a rate which produces EMR with that same wavelength of 656.2 nm. Now for a key point: like a bell, the electron continues to vibrate for some period of time after being struck by the hammer(s). It will continue to do so until the vibrations naturally dissipate or until it is struck once again by another suitably sized hammer. During this time the electron will continue to produce EMR with a wavelength of 656.2 nm.

Remember Thomas Young's 'interference' experiment? This is where the dynamics of constructive and destructive interference come into play. Some of the 656.2 nm EMR produced by the electron will interfere with core-sourced EMR of that same wavelength constructively. That light is lost in the general glare of the photosphere. But some of the 656.2 nm EMR produced by the electron will interfere with core-sourced EMR of that same wavelength destructively. This destructive interference results in the dark 'absorption' line observed in the spectrum of the photosphere at the wavelength of 656.2 nm. Thus the 'absorption' line observed at the wavelength of 656.2 nm in the spectrum of the photosphere is not the result of the absorption of a 'photon' with that wavelength. A 'photon' is supposedly a singular particle; how can a single particle have a wavelength? The so-called 656.2 nm 'absorption' line is actually the consequence of an electron's emission of EMR of that wavelength, which then goes on to interfere destructively with core-sourced EMR of that same wavelength, resulting in an absence of light being propagated at that wavelength.

This process applies to all the other suitable 'hammers'

which are capable of striking the electron 'bells' of a hydrogen atom with just the right amount of force to make them 'ring.' In the part of the spectrum that humans experience as visible light, in addition to the 656.2 nm hammer (red light), there exists a 486.1 nm hammer (green light), a 434.0 nm hammer (blue light), and a 410.1 nm hammer (violet light). In addition to these are hammers that cause the electrons to ring with wavelengths in the ultraviolet and infrared regions of the spectrum, which we cannot directly perceive.

Imagine that you are observing a particular electron rolling around the force field of a hydrogen atom in the Sun's photosphere. EMR with a variety of wavelengths (and therefore with different velocities) which was produced in the core of the Sun is constantly flowing around the electron. A train of wave-crests with a wavelength of 690 nm washes over the electron to no effect. That set of wave-crests simply keeps on going, at the velocity associated with EMR of that wavelength. Those wave-crests (those 'hammers') are not the required size to make the electron vibrate. Then a train of wave-crests with a wavelength of 600 nm washes over the electron, once again to no effect. Those wave-crests also do not strike the electron with the particular amount of force required to make it vibrate. Then a train of wave-crests with a wavelength of 656.2 nm, travelling at the particular velocity associated with that wavelength, strikes the electron. Each of these wave-crests strikes the electron with just the right amount of force required to make the electron vibrate. In so doing, each of these wave-crests is destroyed or, we could say, 'absorbed' by the electron. Like a bell, the electron continues to vibrate for some period of time after being struck. The EMR emitted by these vibrations will be of the same wavelength as that of the wave-crest(s) which induced the electron to ring, in this example a wavelength of 656.2 nm.

Some of this EMR emitted by the electron will travel on a path which is towards the core, directly into the path of the EMR produced by the core. Some of this electron-sourced EMR of 656.2

nm wavelength will interfere destructively with outward bound core-sourced EMR of that same wavelength. The photosphere is thought to be approximately 500 km thick and 92% of the atoms there are hydrogen atoms. This process of destructive interference is cumulative. By the time the core-sourced EMR reaches the top of the photosphere, which is the surface that we can observe, all of the core-sourced EMR with a wavelength of 656.2 nm has undergone destructive interference, resulting in the dark 'absorption' line in that portion of the spectrum.

This same process produces the dark 'absorption' lines at 486.1 nm, 434.0 nm, and 410.1 nm portions of the photosphere's spectrum. This occurs because in each case the velocity of the core-sourced EMR of those four wavelengths carries the specific amount of force, different in each case, required to cause the electrons of the atoms of hydrogen in the photosphere to vibrate.

Which particular set of hammers (which wavelengths/frequencies) that will be able to 'ring' the electrons of any particular element is unique to that element. This is why every element has an emissions 'fingerprint' that is unique to it. What determines the various wavelengths at which the electrons of any particular element will vibrate? This is determined by the size of the force field surrounding the nucleus around which the electrons roll. The size of the force field is determined by the structure of the atomic nucleus; specifically the number of protons present in the nucleus. The addition or subtraction of a single proton in the nucleus changes the atom of one element into an atom of another element, giving it a completely different fingerprint. In general, the more spinning protons residing in the nucleus, the greater will be the radius of the spherical force field. The size of the force field determines the paths of the electrons moving about on its surface. The addition or subtraction of a proton in the nucleus completely alters the paths the electrons are allowed to take. These paths, unique to the atoms of each element, determine which core-sourced EMR 'hammers' will be able to make the electrons of those particular atoms vibrate, causing themselves to emit EMR.

Naturally, the greater the number of protons in the nucleus of the atom the larger will be the atom's force field and the more electrons are able to be present on its surface. As a consequence of this more dark lines will be evident in its spectral fingerprint. For example, iron, which has 26 protons in its nucleus and hence 26 electrons roaming around the surface of its force field, has more than 325 dark 'absorption' lines in its fingerprint, approximately 50 of which are in the visible light portion of the Sun's spectrum. This means that there are more than 325 different frequencies of core-sourced EMR which are capable of making the electrons of an atom of iron 'ring.'

In addition to being forced to travel in a circle at high velocities, and to being 'hammered' by wave-crests of EMR moving at particular velocities, there is a third way in which electrons can be induced to vibrate and emit EMR. The third way is to raise the temperature of a gas. Remember that the 'temperature' of a gas is a measurement of the rate at which the particles which make up the gas collide with one another. The higher the temperature the more often and the more violently do the particles collide. These collisions impact the electrons of the atoms making up the gas with a certain amount of force. When the amount of force applied as a result of these collisions is 'just right' the electrons will vibrate at certain specific frequencies, just as if they had been struck with an acceptably sized EMR 'hammer.'

This phenomenon can be observed with a hydrogen-filled gas discharge tube:

> "A hydrogen discharge tube is a slim tube containing hydrogen gas at low pressure with an electrode at each end. If a high voltage (5000 volts) is applied, the tube lights up with a pink glow. If the light is passed through a prism or diffraction grating, it is split into its various colors." (285)

The high voltage applied to the gas raises its temperature. Interestingly, when the light from a hydrogen discharge tube is passed through a prism there is no emission line at the 486 nm (green) wavelength. This means that at the range of temperatures of the gas in the tube there are no collisions taking place between the atoms of hydrogen with the specific amount of force required to make the electrons of the atoms vibrate at that wavelength. The three other emission lines of hydrogen in the visible light portion of the spectrum, red, blue, and violet are all in evidence.

The behaviour of hydrogen in a gas discharge tube helps us to understand the spectrum observed in the chromosphere and corona regions of the Sun's atmosphere. The spectrum observed in these regions is characterized not by dark 'absorption' lines as in the photosphere, but by bright light emission lines of the same precise wavelengths as displayed by the photosphere's 'absorption' lines. The dark lines in the Sun's spectrum observed at the top of the photosphere demonstrate that no core-sourced EMR of those particular wavelengths escapes the photosphere. In each case those wavelengths have been erased through the process of destructive interference which takes place in the photosphere. In the photosphere it was the presence of core-sourced EMR which prompted the electrons of the hydrogen atoms in that region to produce the EMR which made possible the observed destructive interference. But none of that core-sourced EMR reaches the chromosphere or corona, so by what means are the electrons of the hydrogen atoms in those regions induced to emit the observed bright line spectrum? The behaviour of hydrogen in a high temperature gas discharge tube provides the answer to this question. The collisions between the hydrogen atoms in the chromosphere and corona provide the necessary range of forces required to induce their electrons to vibrate at the specific wavelengths required to produce the observed bright line spectrum.

The key to understanding the different spectral phenomena observed in the atmosphere of the Sun is the realization that the hydrogen atoms in the photoshpere, chromosphere, and corona are

all doing the exact same thing: they are all emitting light at various different wavelengths. In the photosphere, this light undergoes destructive interference with core-sourced EMR of the same wavelength, resulting in the Fraunhofer lines observed in the photosphere. Because of that process of destructive interference none of the core-sourced EMR of those particular wavelengths reaches the chromosphere and corona, so the same wavelength light emitted by the electrons attached to the hydrogen atoms in those regions, which is the result of collisions between those atoms, shines brightly against the dark background of space.

Now that we have a firm grasp on what EMR is - - - it is the vibration of immaterial space, and a clear idea of the ways in which space can be induced to vibrate, we can answer the question of what a 'photon' actually is. It cannot be a 'bundle of energy,' for energy does not exist and therefore cannot be bundled. Like time, the notion of energy is merely a system of measurement created by humans, and it has no phenomenological presence in the universe which is independent of the human intellect. Ultimately there are only two possibilities. 'Photons' either consist of matter, or they consist of space. Clearly they do not consist of matter. 'Photons' possess no mass, and all matter possesses mass. Therefore they must consist of space; but in what form precisely? What accounts for their sometimes particle-like, sometimes wave-like behaviour?

The answer is that 'photons' are single wave-crest displacements of the ether. Recall that in the Sun, when an electron is struck by an appropriately sized 'hammer' it continues to 'ring' for some period of time, emitting a continuous series of vibrations of a particular wavelength which are equal to the wavelength of the 'hammer' which induced the vibrations. This results in a beam of light made up of connected wave-crests separated by that particular wavelength. In the late 1970's and early 1980's, physicists discovered how to make an electron vibrate once and then stop. They developed the technological equivalent of you sticking your finger into the pot of water and then moving it back and forth once and then pausing, and then back and forth once and then pausing,

and so on. This technology has allowed the creation of single discrete wave-crests; individual wave-crests which are not part of a connected train of wave-crests. But just as the motion of your finger produces a displacement of the water in the pot, individual 'photons' are singular vibrational displacements of space. Therefore, even though physicists have managed to create something which passes Alain Aspect's anticorrelation test, in its essence EMR in the form of a 'photon' remains a wave phenomenon even though, because it is created as one wave-crest at a time, it may at times appear to behave as if it is a particle.

So we have now established two ways in which EMR - - - EMR being the vibration of immaterial space - - - is produced. One way is through the collisions of sub-atomic particles in the cores of stars like the Sun, which result in a vibration being induced in the immaterial space surrounding the site of the collision with the very short wavelengths we call gamma rays. The second way is via the vibrations of electrons as they orbit around the nucleus of the atom to which they are attached. In both cases the generation of EMR is entirely a wave phenomenon; there are no “little bullets” or 'bundles of energy' or 'particles' of light involved in any way whatsoever.

In the 'photon' theory of the emission of EMR each atom has a series of shells, sub-shells and orbitals upon which the atom's electrons leap about, emitting 'photons' of various wavelengths as they do so. But how can a single 'particle' have a wavelength? It can't. By definition, wavelength is the measured distance between two successive waves. And what is the cause of all those shells, sub-shells and orbitals? For every effect there must be a cause, but in the 'photon' theory of EMR emission those shells are just assumed to exist. There is no explanation for their existence, other than the idea that these shells are manifestations of the 'energy' level of the electron. And how does the 'energy' level of the electron change? Well, by the absorption and emission of 'photons' of course! This is circular reasoning at its finest.

Our theory of the emission of EMR, in accordance with the

principle of Occam's Razor, is much simpler and more logically straightforward. We say that atoms have but one 'shell,' that being the 'force field' that is projected out into the space around the nucleus by the spinning of the protons within the atom's nucleus. As the circumference of the force field, which in our model has a very real phenomenological presence, varies, so too do the paths of the electrons vary, which varies the electron 'bells" sensitivities to which 'hammers' can make them ring, which determines the rate at which the electrons vibrate, which in turn determines the wavelength of the EMR emitted.

Chapter Forty-four

THE COMPOSITION AND BEHAVIOUR OF OUR STAR

PART 2

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Let us return now to our study of the Sun and the EMR which it radiates. Spectral analysis has allowed astrophysicists to determine the elemental makeup of the Sun and there are two ways of expressing it: by the percentage of the number of atoms of any given element; or by the percentage of the total mass of the Sun present in the form of any particular element. For example, 92% of the atoms of the Sun are hydrogen, but these atoms only make up about 73.4% of the Sun's total mass. By percentage of the number of atoms helium makes up 7.8%, oxygen and carbon together account for .09%, nitrogen and neon together account for .017%, and in descending order the elements silicon, iron, magnesium, sulphur, argon, aluminum, calcium, sodium, and nickel are all present in concentrations of .004% or less. All of these elements

are present, of course, in their gaseous form.

These figures have been calculated by studying the absorption lines in spectra obtained in the observation of the Sun's photosphere. Recall that the photosphere is only about 500 km thick, and that at its lower boundary with the convection zone it has a temperature of about 5700 K which decreases to about 4000 K at its upper boundary with the chromosphere. In this range of temperatures free electrons can latch onto ions to form stable atoms. As we have moved out from the centre of the Sun's core the temperature has steadily decreased. However, as we rise through the chromosphere this trend reverses. At its lower boundary with the photosphere the temperature of the chromosphere, which is some 2500 km thick, is 4000 K, but at its upper boundary with the corona its temperature has doubled to 8000 K. The current belief held by solar physicists is that above that boundary the temperature of the corona soars to over 1.1 million K. Why that is the case is a long-standing mystery, to which we propose the following solution.

The solution is quite simple: in fact the temperatures in the corona are nowhere near those levels. How did this confusion arise? The roots of this confusion can be traced to a solar eclipse in 1869 during which the sun's corona was observed - - - this being before the invention of the coronagraph and thus the only opportunity to observe the corona - - - and a green emission line was observed in the corona's spectrum. Scientists of the day were unable to match this emission line with the emission line of any known element on the Earth, and for awhile they thought they had discovered a new element. They even gave it a name: coronium. But in the 1930's Walter Grotrian and Bengt Edlen calculated that the green spectral line at 530.3 nm was due to highly ionized iron xiv; iron (Fe) atoms that have lost 13 of their electrons. Based upon this calculation, since it would take a lot of kinetic 'energy' to remove that many electrons from an iron atom, it was concluded that the temperature required to create these ions would have to be at least 1.1 million K.

The question then became: by what means is the corona

being heated to such extreme temperatures? Over the years a number of theories have been put forth but, since we are convinced that the temperature of the corona is actually under 10000 degrees K, we will not delve into any of their details. As we studied the problem, in addition to the question regarding the actual temperature of the corona, we were confronted with the puzzle of how to explain the 530.3 nm green emission line observed in the corona. Fortunately, during our research into the topic we stumbled upon two clues which have neatly resolved the conundrum.

We begin with the explanation for the appearance of the 530.3 nm green line first observed in 1869. Recall that in our theory regarding absorption and emission spectra the bright line emissions observed in the chromosphere, for example the red hydrogen alpha line at 656.3 nm, are made possible because all of the core-sourced EMR of that wavelength has undergone destructive interference during its passage through the photosphere, leaving the hydrogen atoms' emissions in the chromosphere undisturbed. If this theory is correct, it means that the Fe xiv's bright line emission at 530.3 nm in the corona can only be observable if all the core-sourced EMR of that wavelength has undergone destructive interference lower down in the Sun's atmosphere. Thus our theory requires that Fe xiv be present in the lower portions of the Sun's atmosphere. But according to the currently accepted theory, the ionization of the neutral iron (Fe I) atoms in the corona is due to the corona being at a temperature in excess of 1.1 million K, much higher than the well-established estimates of the temperatures of the photosphere and the chromosphere. So here was the puzzle: either there is no Fe xiv in the photosphere and chromosphere (and our theory is incorrect,) or there is some mechanism other than extreme temperature by which the iron is being ionized. We had no idea what that mechanism might be, and we had to struggle to suppress a rising tide of panic.

And then the Internet came to our rescue with what was, in the order in which we uncovered them, our second clue. Quite by

chance we came upon an article titled *"Visible Emission Line Spectroscopy of the Solar Corona During the 2019 Total Solar Eclipse"* by Gabriel D. Muro, Matt Gunn, Stephen Fearn, Tomos Fearn, and Huw Morgan, which was published on link.springer.com on June 12, 2023, less than three months earlier. In the conclusion of their article these authors state:

> "Upon close inspection, the [magnetic] field lines extending above the solar limb cross over each other and intersect all of the faint coronal loops from Earth's point of view. This intertwined loop structure implies that ionization [of the iron atoms present in the corona] is a result of reconnection or 'snapping' of magnetic fieldlines and *thus induces ionization, rather than the kinetic temperature alone."* (emphasis added)

Here is an alternative mechanism for the ionization of iron atoms in the Sun's atmosphere. Here's how it might work: the solar wind lifts portions of the plasma from the convection zone / photosphere boundary (more on this process later) into the upper reaches of the Sun's atmosphere, forming loops which remain connected to that boundary in two places. Because the loops consist of electrically charged particles, a magnetic field, which itself consists of a volume of space which is in motion, is created within the boundaries of the loops. The boundaries of the loops are the magnetic field lines. The rotation of the Sun causes these magnetic field lines to cross over one another and intersect. These intersections result in a 'shorting out' of the magnetic field lines and a subsequent collapse of the magnetic field contained within those lines. The magnetic field, which is a portion of space which is in motion, is then released, suddenly flooding the surrounding region of the atmosphere with a moving volume of space itself. This flood washes over the atoms in those regions, stripping them of some of

their electrons. The closer an atom is to the contained magnetic field when the magnetic field lines collapse, the more likely the atom is to have more of its electrons washed away in the ensuing flood.

In their study of the corona during the 2019 total solar eclipse, Muro and his colleagues observed three emission lines, thought to be evidence of three different Fe ions: Fe xiv (530.3 nm), Fe x (637.4 nm), and Fe xi (789.2 nm). The process outlined above explains how those different Fe ions were created. The iron atoms that became Fe xiv ions were closer to a magnetic field line collapse than were the iron atoms which became Fe x and Fe xi ions, and thus had more of their electrons washed away. Since the loops extend from the convection zone / photosphere boundary out to the far reaches of the corona, in other words throughout the Sun's entire atmosphere, the collapse of the magnetic fields have the potential to ionize atoms at all levels of the atmosphere, from the photosphere to the chromosphere to the corona.

So we now have a mechanism by which Fe xiv ions could be created in the photosphere. The question then becomes: is there evidence of the presence of Fe xiv in the photosphere in the form of a 530.3 nm absorption line? The answer to this question is not straight-forward. According to Wikipedia, "Modern observations of sunlight can detect many thousands of Fraunhofer lines." The project of identifying these lines is a process of constant refinement, and not all of the lines have been identified. In some cases, certain elements that were associated with particular absorption line wavelengths in earlier compilations have been dropped from more recent surveys. A 1976 listing showed at least five elements that produced absorption lines very close to 530.3 nm (cerium, europium (530.385 nm), lanthanum (530.355 nm), neodymium (530.321 nm), and samarium (530.323 nm)). Of these five, only the neodymium line has been included in the much more recent Interactive Database of Spectral Star Atlases which, intriguingly, lists an absorption line for Fe I at 530.3431 nm, as well as a line identified as vanadium at 530.3255 nm, which were

not included in the earlier listing. Many Fraunhofer lines are so close to one another that they blend together, making positive identification difficult. We have been unable to find any reference to the 530.3 line observed in the corona which has been measured to more than one decimal place. The possibility of misidentification cannot be ignored. Most significantly, it is possible that a Fe xiv 530.3 nm absorption line has not been identified in the photosphere simply because no one expects it to be there due to the, in our view mistaken, belief that the creation of Fe xiv requires temperatures in excess of 1.1 million K, which is much higher than the temperatures of the photosphere in which absorption lines are observed. Given the very real possibilities of misidentification or missed identification, and given the confidence we have in our theory of absorption and emission spectra and the role played by destructive interference in that theory, we encourage solar spectroscopy specialists to conduct a thorough search and analysis of the photospheric absorption lines in the 530.3 nm region of the Sun's spectrum to ascertain whether or not such a line does in fact exist.

Alternatively, if no evidence for the existence of Fe xiv in the photosphere can be found, it may be because the collapse of magnetic fields in that region of the Sun's atmosphere are not powerful enough to strip electrons from the iron atoms situated there. Perhaps that process only occurs in the chromosphere and corona. If Fe xiv is present in the chromosphere - - - and we believe that it is - - - and is producing EMR that is undergoing destructive interference with core-sourced EMR with a wavelength of 530.3 nm, the dark absorption line created by this process would not be observable because the chromosphere is silhouetted against the blackness of space.

There is one more question to be considered: why is it only in the corona that the Fe xiv 530.3 nm green emission line is observed? If extreme temperatures above 1.1 million K are not required to produce Fe xiv, then why do we not observe that green line in the chromosphere? The answer to this question is that this is

the case because of the relative scarcity of iron in the Sun's atmosphere, and thus the relative scarcity of Fe xiv. This means that the core-sourced EMR of that 530.3 nm wavelength has to travel further through the Sun's atmosphere, through the entire chromosphere, before it completely undergoes destructive interference, and so it is only in the heights of the corona where the emissions of the Fe xiv ions are not affected by that process, and thus can shine brightly.

We come now to the second clue which has allowed us to potentially solve the riddle of the temperature of the corona. In their article Muro and his colleagues put forth the possibility that "[T]his intertwined loop structure implies that ionization is a result of reconnection or 'snapping' of magnetic fieldlines . . . *rather than the kinetic temperature alone"* (emphasis added). We suggest that the ionization of iron atoms in the corona is due entirely to the "reconnection or 'snapping' of magnetic fieldlines," and that the kinetic temperature of the corona does not factor into the ionization process in any way whatsoever.

So what is the temperature of the corona? Like the temperatures of the two layers below it, it varies. But we now have evidence that, in general, its temperature must be below 10,000 K. What is this evidence? The ionization temperature of hydrogen has been calculated to be approximately 10,000 K. For almost one hundred years, due to the incorrect conclusion that the temperature of the corona is at least 1.1 million K, it has been assumed by astrophysicists that all the hydrogen in the corona has been completely ionized, meaning that there should be no hydrogen emission lines evident in the corona. However, in July, 2020, astronomers with NASA announced that NASA's sounding rocket "HERSCHEL" had obtained global images of helium and hydrogen emission from within the Sun's corona. If this data is confirmed, and if the calculation of the ionization temperature of hydrogen is accurate, this means that the temperature of the corona must be under 10,000 K, nowhere near the currently theorized level of 1.1 million K, and this is a temperature which is entirely consistent

with the estimated temperatures of the other levels of the Sun's atmosphere.

This new understanding of the cause of the ionization of iron atoms in the Sun's atmosphere also has consequences for the supposition that the corona is the source of the Sun's x-ray emissions. The reasoning behind the current explanation for the Sun's x-ray emissions goes like this: one, the green 530.3 nm emission line observed in the corona is the result of highly ionized iron; two, a temperature of at least 1.1 million K is required to ionize iron to such a degree; three, only very hot gases can produce x-rays; and four, therefore the sun's x-ray emissions must come from the corona.

But if the mechanism by which Fe xiv and other Fe ions are produced is something other than extreme temperature, this line of reasoning collapses like a magnetic field on the Sun. A coronal temperature of under 10000 K would be too low to produce x-ray emissions. But the Sun clearly does emit EMR in the x-ray portion of the spectrum. So where is it coming from?

We submit that there are two sources of the x-rays emanating from the Sun: a background level which is more or less constant and the source of which is the outer reaches of the Sun's core; and an intermittent 'blooming' of gamma rays and x-rays which are a consequence of solar flares and coronal mass ejections.

The constant background level of x-ray wavelength EMR emitted by the Sun begins its journey out into the solar system as gamma radiation emitted by the proton-proton chain process in the very shallow regions of the Sun's core. Its journey to the outer surface of the core and through the highly stressed space between the core and the surface of the Sun lengthens its wavelength from that of gamma radiation to that of x-rays. Similarly, as we have previously discussed, the gamma radiation produced from a little deeper in the core reaches the surface of the Sun with wavelengths corresponding to the ultraviolet portion of the spectrum, and so on, and thus the source of this constant background x-ray radiation is the Sun's core, not the Sun's corona.

Now, there is also evidence that some of the gamma radiation produced in the very outer layer of the core makes it to the surface of the Sun with its gamma-ray wavelength intact. NASA's Fermi Gamma-ray Space Telescope has detected a faint, steady gamma-ray signal from the Sun. The source of this signal has previously been ascribed to the impacts of cosmic rays on the surface of the Sun. Theoretically such impacts could indeed result in the production of gamma radiation, but we suspect that if the gamma-ray signal detected by Fermi truly is 'steady' then, as in the case of the constant background x-ray radiation, its source also is probably the Sun's core.

There remains the mystery of why the top of the chromosphere is hotter than its bottom. It is obvious that this condition is due to the transfer of hot ionized gas from just below the convective zone / photosphere boundary. The mystery resides in understanding how this can take place without heating the photosphere and the lower chromosphere in the process. Astrophysicists have identified the process by which this heating of the Sun's upper atmosphere occurs. They are known as 'spicules,' and it is at this point that we must once again take into account the presence of the powerful magnetic fields within the Sun.

To understand these spicules we must keep in mind what a 'magnetic field' is. Our experiment with the two bar magnets taught us that a magnetic field is the rotation of a given volume of space, which is brought about by the aligned rotation of charged particles on their axis. The convective zone, which is the primary source of the Sun's magnetic fields, is in a constant state of chaos and flux. In this constant state of flux, which consists entirely of charged particles (ions), magnetic fields are constantly being created when 'clouds' of those ions are, by chance, temporarily aligned in such a manner that they can produce a coherent magnetic field. How long such an alignment lasts and how large is the magnetic field produced, depends on the localized circumstances of the portion of the convective zone from which the field has been generated.

At any given moment there are as many as 10 million spicules exploding upward from the top of the convective zone, reaching as high as 10,000 km above the Sun's surface. Since the combined thickness of the photosphere and the chromosphere is only about 3000 km, this means that the spicules protrude well into the Sun's corona. On average, spicules have a diameter of about 500 km and they last anywhere from about two to eleven minutes. Above and around spicules, in the corona, EMR emissions from iron ions have been observed. Because of the confusion regarding the temperature at which iron ions can be created, these observations have led astrophysicists to mistakenly conclude that the temperature of spicules exceeds 1 million K. But this cannot be the case. The spicules rise up from below the convective zone / photosphere boundary, which is thought to be some 5700 K. From where could the spicules absorb the heat required to raise their temperatures to such heights? It is simply not possible.

The precise cause of spicules is still a matter of some debate in astronomical circles, but our present inability to nail down their exact cause is of no consequence to our current discussion. What we are interested in is why the spicules do not heat the photosphere and lower chromosphere as they pass through them. Some who have studied images of spicules in the chromosphere have described them as looking like a 'shag carpet' or plasma 'spears.' Although spicules do not resemble them physically and so the analogy is not exact, we believe that a more useful analogy is that of bubbles of air rising up from the bottom of a pot of water just as it starts to boil. Just as the air in a rising bubble is confined by the walls of the bubble as it moves towards the surface of the water, so too is the plasma from the convective zone confined by the magnetic field the plasma has created as it rockets upwards from the Sun's surface at speeds as high as 360,000 km/hr. What propels the spicules to such velocities? We shall propose an answer to this question presently. Because the plasma is confined within the boundary of the magnetic field, its effect on the temperatures of the photosphere and the lower chromosphere are minimized. The high

velocity of spicules disturbs the alignment of the ions which is what created the spicule in the first place, and in the corona the magnetic field dissipates, allowing the plasma which it had contained, which may have a temperature as high as 8000 to 10,000 K, to spread out, just as a bubble of air bursts open and spreads out into the atmosphere when it reaches the surface of the boiling water. Some of the plasma falls back towards the surface of the Sun, giving off its heat as it drops down through the atmosphere. This explains why the top of the chromosphere is twice as hot as its base. The rest of the charged particles that have been transported into the corona by this process are carried off into the solar system as components of the solar wind. Thus spicules are responsible for continuously re-fuelling the stream of particles carried throughout the solar system by the solar wind.

Since the time of Galileo and the invention of the telescope, scientists have been observing the Sun in ever-increasing detail and have amassed a large amount of information concerning its structure and its behaviour. The rapid development of new technologies in the 20th Century has greatly accelerated this process, so that now there is almost a glut of information. Using their advanced technology, scientists have observed and measured solar phenomena at an ever-finer level of detail. When they write down their findings in their scientific papers they describe their methodologies, explaining how those methodologies differ from the methodologies of their predecessors. They then analyze the data obtained in the language of mathematics, rendering it incomprehensible to the 99% of humanity who are not conversant in that language. Heliophysicists are like people wandering around in a forest, carefully measuring the height and circumference of each tree they encounter, counting the number of branches it has and studying the patterns of its bark in exquisite detail, all the while calling out to one another in a coded language that only they can understand. Proceeding from tree to tree and struggling to process the deluge of data which has been accumulated, some of which is contradictory, they have lost sight of the fact that the purpose of the

enterprise is to arrive at an understanding of how the forest as a whole functions, and that an important part of that goal is to explain it to the rest of us.

Chapter Forty-five

A GATHERING OF CLUES

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The result of all this is akin to what the detective Hercule Poirot famously said in Agatha Christie's *Murder on the Orient Express:* "There are too many clues in this room." The challenge, therefore, is to sort through the mound of gathered facts and to pick out those clues which will help us to solve the mystery, while setting aside those which only tend to muddy the trail. To this end, we have gathered together a particular set of clues which, we believe, when taken together, will fully solve the mystery of how the Sun functions.

To arrive at the correct explanation of any mystery, it is necessary that the basis of our inquiry be sound; that the framework of the investigation be such that the clues obtained will properly fit together and reveal the truth. To date, the framework upon which heliophysics has assembled its facts has been the idea that solar behaviour can ultimately be understood in terms of the Sun's magnetic fields. We have concluded that this approach is flawed. Although the Sun's magnetic fields are an important facet of the Sun's behaviour, in the final analysis they are an effect, not a cause.

The driver of solar phenomena is not the Sun's magnetic fields; rather, the driver is the solar wind. And the key to understanding the solar wind turns in the lock that is the Sun's core.

From amongst the welter of available information, we have prepared the following list of verified facts - - - our clues - - - which we believe that, when taken together with the information about the Sun already presented, will allow us to reach a satisfactory and convincing conclusion concerning the Sun's structure and behaviour.

1. It has been well established that the Sun goes through a fairly regular cycle of about 11 years duration. Every 11 years or so activity on the solar surface ramps up with a marked increase in the number and size of sunspots, temporary dark areas which appear on the surface of the photosphere where the plasma is cooler than the rest of the Sun's surface, and where the strength of the magnetic field is much greater than normal. Surrounding the sunspots are areas brighter than the rest of the photosphere, known specifically as 'faculae' and 'plages.' Together these phenomena are known as 'active regions' (ARs.) Accompanying the increase in the number of sunspots is an increase in the number and power of solar flares, prominences, and coronal mass ejections - - - manifestations of so-called 'space weather,' which if aimed in our direction can possibly affect the Earth's magnetic field, our system of satellites, and even the electrical grids upon which our modern civilization depends. At its website weather.gov, the National Weather Service of the National Oceanic and Atmospheric Administration (NOAA) provides a useful summary of these phenomena:

> "Sunspots are areas where the magnetic field is about 2,500 times stronger than Earth's, much higher than anywhere else on the Sun . . . the concentrated magnetic field inhibits the flow of hot, new gas from the Sun's interior to the surface. Sunspots tend to occur in pairs that have

> magnetic fields pointing in opposite directions . . . Coronal mass ejections and solar flares are extremely large explosions on the photosphere. In just a few minutes, the flares heat to several million degrees F. and release as much energy as a billion megatons of TNT. They occur near sunspots, usually at the dividing line between areas of oppositely directed magnetic fields. Hot matter called plasma interacts with the magnetic field sending a burst of plasma up and away from the Sun in the form of a flare. Solar flares emit x-rays and magnetic fields which bombard the Earth as geomagnetic storms."

Solar flares can last from minutes to hours. From NOAA's Space Weather Prediction Centre's website (swpc.noaa.gov) we learn that:

> "Sunspots appear in a wide variety of shapes and forms. The darkest area of a sunspot (also the first to be observed) is called the umbra. As the sunspot matures (becomes more intense), a less dark, outlying area of well-defined fibril-like structure develops around the umbra – called penumbra. Sunspots can grow from an individual unipolar spot into more organized bipolar spot groups; or even evolve into immense, very complex sunspot groups with mixed magnetic polarities throughout the group. The largest sunspot groups can cover larger swathes of the Sun's surface and be many times the size of Earth . . . A new solar cycle is considered to have begun when sunspot groups emerge at higher latitudes with the magnetic polarities of the

leading spots opposite that of the previous cycle."

For the purposes of our investigation, it is the fact of the solar cycle itself which is of prime importance. The period during which the above events are most numerous is known as the 'solar maximum,' and the period in between in the middle of two solar maximums, when the surface of the Sun is at its most quiescent, is called the 'solar minimum.'

2. So-called 'coronal holes' are cooler, less dense regions of the corona. Coronal holes often persist for weeks or months, and can change in shape and size over time.

3. Coronal holes occur when the Sun's magnetic field is open to interplanetary space. Under these conditions, that portion of the Sun's magnetic field is said to be 'unipolar.'

4. Coronal holes can form at any time during the 11-year solar cycle but are more prominent near solar minimum when persistent coronal holes can form near the Sun's polar regions. (287)

5. Coronal holes are most prevalent and stable at the solar north and south poles. (288)

6. Coronal holes only appear in the extreme ultraviolet and soft x-ray portion of the EMR spectrum; that is, with wavelengths ranging from about 5 to 100 nanometres.

7. During solar maximum activity coronal holes are found at low latitudes (closer to the equator) of the Sun with fewer of them at the polar regions. (289)

8. During solar maximum the area of the polar coronal holes diminishes while the area of equatorial coronal holes increases. (290)

9. In general the number of coronal holes decreases during solar maxima, and the number of equatorial corona holes decreases with an increasing number of active regions. (291)

10. Observations made by NASA scientists around the time of the solar maximum in April 2014 revealed that the coronal holes above the Sun's north and south poles had completely disappeared.

11. Observations made in March 2015 revealed that a large coronal hole had reopened over the Sun's south pole, and that a smaller coronal hole had opened up close to, but not directly over the Sun's north pole.

12. The velocity of the solar wind increases as it moves outward through the Sun's atmosphere. The average speed of the solar wind when it departs the Sun is 300 – 400 km/second. The speed of the solar wind departing through coronal holes is up to 800 km/second.

13. The Sun is more luminous at sunspot minimum than at maximum. Luminosity is a measure of the total amount of energy radiated by a star per second. This is therefore the power output of a star.

14. The class of stars known as 'Cepheid variables' pulsate in a regular way, rapidly increasing in brightness as they increase in size, then slowly decreasing in brightness as they decrease in size. Several hundred Cepheid variables are known in our galaxy. Most Cepheids have periods in the range of 3 to 50 days, and luminosities that are about 1000 to 10000 times greater than that of the Sun.

15. Recent evidence suggests that all stars pulsate (if we measure them closely enough). (292)

16. In October 2022, in a study published in Nature Astronomy, Norbert Przybilla, head of the Institute for Astro- and Particle Physics at the University of Innsbruck, announced the discovery that the star Gamma Columbae, situated about 870 light years from Earth, is actually the "stripped *pulsating core* (emphasis added) of a massive star." (293)

17. In the August 26, 2023, issue of New Scientist magazine, under the headline "Neptune's clouds have vanished," Leah Crane reported that:

> "Erandi Chavez at the University of California, Berkeley,and her colleagues have tracked Neptune's cloud cover from 1994 to 2022 using images from ground-based observatories and the Hubble space telescope. They have found that the amount of clouds *fluctuates roughly in line with the sun's 11-year cycle of activity,* (emphasis added) albeit with a two-year lag. When the sun is most active, more clouds begin to form, and when it is least active, the clouds dissipate." (294)

Having assembled our clues, we are now ready to present our hypothesis. Our hypothesis rests upon three postulates:

1. The first postulate is that the source of the solar wind is the violent collision between Helium-3 isotopes in the last step of the proton-proton chain in the fusion process, which results in the creation of a shock wave which propagates through the space within the Sun's core.

2. The second postulate is that the core of the Sun pulsates on a regular approximately 11-year cycle. During this cycle, the core shrinks to its least extent at the time of the so-called 'solar maximum,' and expands to its greatest extent at the time of the

'solar minimum.'

3. The third postulate is that the so-called 'radiative zone' which surrounds the core is, on average, thinner in the areas beneath the Sun's north and south poles than elsewhere within the Sun; and that, in general, the radiative zone contracts and expands in response to the expansion and shrinkage of the core.

Astrophysicists now know that the collisions between neutron stars create shock waves (generally referred to as 'gravitational waves') that propagate through the medium of space. We have shown that space permeates all the material objects within the Field of Play, with the exception of neutron stars. The proton-proton theory of the fusion process in the Sun's core posits that helium-3 isotopes constantly collide to produce helium-4. We submit that these constant helium-3 collisions results in a continual, uninterrupted series of shock waves being generated throughout the entire core. These shock waves propagate through the space which permeates the entire core. The rate at which these shock waves are created is highest at the very centre of the core where the pressure and temperature, and therefore the rate at which fusion takes place, is the highest. The shock waves exert an outward pressure on the surrounding plasma material of the core; it is this outward pressure that prevents the star's gravity from crushing the star. When stars like the Sun run out of the hydrogen fuel necessary to drive the fusion process, the constant helium-3 collisions come to a halt, and for stars that are about seven or more times as massive as the Sun a catastrophic collapse occurs, resulting in a supernova and the creation of a neutron star.

We have seen earlier how EMR in the form of gamma rays is created everywhere throughout the core. Because the core material is so dense, the gamma rays do not travel very far before they are absorbed. This gamma ray absorption is what heats the core to its very high temperatures. This is not because the gamma rays themselves are hot. EMR does not transport heat. The heating

effect is due to the friction between the particles making up the plasma which are excited by the passing of the gamma rays through the plasma material. We have seen that it is only the gamma rays produced in the very outer reaches of the core, in the core's 'skin', which escape the Sun's core to become the EMR which spreads out into the solar system. Moreover, we know that it is the omnipresence of immaterial space which makes the transmission of EMR possible, but we also know that it is the density of the material in which immaterial space is embedded which determines the velocity of the EMR through any given region of the Field of Play. The speed of light is different in the vacuum of space than it is in the atmosphere of the Earth than it is through water than it is through glass. In general, the denser the material the slower will be the velocity of EMR passing through that material.

These principles hold true as well for the shock waves generated by the collisions of helium-3 isotopes that propagate through the space within the core. The greater the density of the matter through which a shock wave propagates, the shorter is the distance it will travel. We know that from observing explosions here on Earth. A shock wave will more readily penetrate a sheet of glass than it will a block of concrete. Conversely, as the density of the material through which a shock wave travels decreases, the further through that material the shock wave will be able to penetrate, and the greater will be the velocity of the shock wave. Thus the penetrating power of the shock waves generated by the collisions of helium-3 isotopes is limited by the very high density of the core material, and like the gamma rays, it is only the shock waves generated in the very outer layers of the core which escape the core. These escapees are the source of the solar wind.

Once the shock waves escape the core, they enter the radiative zone. The density of the radiative zone decreases as the shock waves move from its boundary with the core towards its boundary with the convective layer, and so the velocity of the shock waves increases as they traverse this zone.

After traversing the radiative zone, the shock waves enter

the convective zone. As we noted earlier, the density of the convective zone actually increases as we rise through it towards the surface of the Sun, and therefore the velocity of the shock waves correspondingly slows as they proceed outwards.

At the convective zone – photosphere boundary the shock waves enter into the Sun's atmosphere and can therefore then be officially recognized as the 'solar wind.' At this juncture the velocity of the shock waves approaches 100 km per second. We know this because the measured speed of spicules in the chromosphere is up to this velocity. Spicules are formed in the very top layer of the convective zone where the plasma has organized itself into coherent magnetic fields. These objects are torn away from the convective zone by the force of the solar wind and flung (like a spear) into the chromosphere and corona. Spicules have not been detected in the photosphere because there they are invisible against the photosphere's bright background. Spicules were initially observed in the chromosphere through the hydrogen alpha emission line at 656.3 nm caused by their presence. But we now know that that hydrogen emission line in the chromosphere corresponds to the hydrogen alpha absorption line in the photosphere, where the atomically-sourced EMR undergoes destructive interference. This is why the presence of spicules has not been detected in the photosphere.

Until now, heliophysicists have not been able to provide an explanation for the fact that the velocity of the solar wind increases as it travels upward through the Sun's atmosphere and out into the vacuum of interplanetary space. This is because that heretofore the solar wind has been thought to consist only of a stream of charged particles. Until now, physicists have been unaware of the existence of the shock waves propagating through space which is what carries the stream of charged particles along with it. Once the shock waves have cleared the outer layer of the convective zone, the density of matter steadily decreases as they propagate upwards through the photosphere, chromosphere, and the corona. This steady diminution in the density of matter allows the solar wind to

substantially increase its velocity. Clue #12 reveals that the average velocity of the solar wind as it exits the corona is 300 – 400 km per second, 3 to 4 times the speed with which the shock waves lift spicules out of the convective zone. Where the solar wind exits the Sun's atmosphere through a coronal hole, where the density of matter is lower than in the rest of the corona (Clue #2), the velocity of the solar wind has been measured to be as high as 800 km per second.

Clue #'s 14, 15, and 16 have all been included in our list of clues to support Postulate #2, our claim that the Sun's core pulsates on a regular approximately 11-year cycle. Clue #14, which raises the topic of Cepheid variables, is not intended to suggest that the cause of their pulsations is necessarily dependant upon the expansion and contraction of their cores. The pulsations of this class of stars are thought to be due to the repetitive heating and cooling, and thus the expansion and contraction, of their atmospheres; and the periods of their cycles, generally ranging from 3 to 50 days, are too short to be caused by a pulsation of their cores. We have included Clues #14 and #15 in our list of clues only to establish the principle that all stars can and do pulsate. Clue #16, which refers to the discovery of a "stripped *pulsating core* (emphasis added) of a massive star" and which was announced only months before the time of this writing, is the first direct evidence we have that the cores of stars do indeed pulsate.

The plasma in the convective zone is under much less pressure than the plasma making up the radiative zone, and is thereby free to move about. The plasma in the convective zone is constantly being churned by the shock waves emanating from the outer layers of the core. The intensity of that churning is determined by where the core is in its 11-year cycle of expansion and contraction. The lower the intensity of the churning of the plasma in the convective zone, the greater is the possibility that 'clouds' of ions in the plasma will be organized into coherent magnetic fields. These possibilities peak when the core has shrunk to its minimum extent. As the core contracts, the thickness of the

radiative zone increases. This means that the solar wind shock waves have more dense plasma to traverse before they reach the convective zone, which means they arrive at the bottom of the convective zone with less pressure. This results in a less effective churning of the convective zone plasma, which in turn permits the creation of larger, more stable magnetic fields, the largest and most stable of which become sunspots. Thus the largest number of sunspots (the so-called solar maximum) occurs when the core of the Sun has contracted to its minimum size.

Once a coherent magnetic field of sufficient size has been established, it is difficult for the solar wind shock waves to penetrate it. The solar wind, which consists of shock waves propagating through space in a straight line, cannot easily penetrate a magnetic field, in which space is being rotated around a central axis. Scientists here on Earth are trying to use this principle in their efforts to mimic the Sun's fusion process in a man-made fusion reactor. They are attempting to prevent the shock waves created by the fusion process from touching the walls of the containment vessel by lining the walls of the vessel with a powerful magnetic field which the shock waves, and the extreme high temperature plasma which the shock waves carry with it, cannot penetrate. On the Sun there is no containment vessel, but the solar wind shock waves are forced to flow around the sunspots' magnetic fields, which increases the intensity of their flow and thus the temperature of the regions on the Sun's surface surrounding sunspots, causing these regions to brighten into the 'faculae' and 'plages' we referenced earlier.

During so-called solar minimums, when there is little or no sunspot activity, the situation is reversed. At that point the core of the Sun has expanded to its maximum extent, and the thickness of the radiative zone has been correspondingly reduced. Thus the solar wind shock waves enter the convective zone with greater pressure which permits the shock waves to lift existing sunspots off the surface of the Sun in the form of so-called coronal mass ejections, and generally causes a more efficient churning of the

convective zone plasma, which results in the creation of fewer coherent and stable magnetic fields and hence fewer sunspots. Also, when the core is at its maximum extent more of the EMR emitted by the core is able to reach the photosphere, which is why the luminosity of the Sun is greatest during solar minimums (Clue #13.)

Thus the constant expansion and contraction of the Sun's core controls the cycle of solar phenomena which we observe. As the core contracts due to the pressure of all of the material above it, the temperature at its centre and therefore the rate at which it fuses hydrogen into helium steadily increases until it reaches some critical point. At that point the rate at which helium-3 collisions take place becomes large enough to produce enough shock waves to counter the contraction, and to push the core back into an expansive phase. It continues to expand until the temperature at the centre of the core drops enough so that the rate of helium-3 collisions falls beneath some critical level and can no longer resist the pressure of all of the material above it, and the cycle begins anew.

The recognition of the source of the solar wind provides an explanation for the phenomena of solar flares and coronal mass ejections, which until now have posed an unsolved mystery. Clue #1 includes three particularly significant facts: one, that solar flares are bursts of plasma which occur near sunspots, usually at the dividing line between areas of oppositely directed magnetic fields; two, that solar flares last anywhere from a few minutes to several hours; and three, in just a few minutes, the flares heat to several million degrees F.

With these facts in hand, we can see that solar flares resemble giant spicules. Solar flares are much larger, much hotter and generally last longer, but both spicules and flares consist of jets of plasma which are thrust upwards from the surface of the Sun into its upper atmosphere. However, their genesis is different. Spicules are formed when a portion of the plasma on top of the convective zone creates a coherent magnetic field, which is then

grabbed by the solar wind and tossed upwards. Solar flares, on the other hand, occur as a result of the collapse of a magnetic field under pressure from the solar wind.

Solar flares are more numerous in the period around solar maximum, when the Sun's core is at its minimum diameter. During these periods the strength of the solar wind when it reaches the photosphere is diminished, but it has by no means disappeared. Keeping in mind that magnetic fields block the flow of the straight-line solar wind, of significance here is the fact that flares usually appear at the dividing line between areas of oppositely directed magnetic fields. It is at this point that the magnetic fields in that region will be the weakest. The solar wind exerts ever-increasing pressure on the nether surface of the magnetic fields that we call sunspots. A solar flare occurs when the pressure of the solar wind destroys the coherence of the magnetic fields at their weakest point, resulting in a sudden release of pressurized plasma from deeper in the depths of the convective zone. Thus solar flares are essentially the same phenomenon that we observe in volcanic activity here on the Earth, but on steroids. In both cases, pressure from hot materials builds beneath a sealed dome until a weak spot in the dome collapses, through which the hot pressurized material bursts forth. The stronger the magnetic field at the dividing line between sunspots, the longer it will be able to endure the pressure from the solar wind. The longer it endures, the more 'backed-up' the column of plasma beneath it becomes, and the more spectacular and longer-lasting will the eruption of the solar flare be when the magnetic field finally collapses.

Unlike spicules the temperature of a solar flare increases rapidly as it grows. This is because the column of plasma which powers the flare is drawn from deeper into the depths of the convective zone. The deeper we go into the convective zone the hotter it is. NOAA's estimate that the flares heat to several million degrees F is rather vague, but we note that 4 million degrees F is equal to 2.2 million degrees K, a number which is consistent with the estimated temperatures for the bottom of the convective zone.

It is certainly conceivable that the largest, longest-lasting solar flares could draw upon a plasma column which extended into the deepest regions of the convective zone.

Solar flares are notable for producing a brilliant flash of light, and are known for emitting EMR across the entire spectrum, up to and including gamma rays. But while solar flares cause EMR, they are not a direct source of EMR. The very hot plasma associated with solar flares, much hotter than the plasma of which spicules consist, heats the atoms and ions of the various elements present in the vicinity of the flare to very high temperatures. These high temperatures mean that these particles collide with one another more often and with greater force. These more powerful collisions cause the electron 'bells' to vibrate more rapidly, resulting in high frequency short wavelength EMR. Some of the atoms are heated to such a degree by the solar flares that their electrons emit EMR with wavelengths in the gamma ray range.

If solar flares resemble volcanoes in that they both erupt from more or less a single point, then coronal mass ejections (CME) resemble supervolcanoes like the large caldera that lies slumbering beneath Yellowstone National Park in the U.S. CMEs are another incidence of a natural phenomenon being inappropriately named, for CMEs do not originate in the Sun's corona, they simply pass through it. A “Space Technology 5” article on the jpl.nasa.gov website describes these phenomena as follows:

> “Coronal mass ejections (CME) are huge bubbles of coronal plasma threaded by intense magnetic field lines that are ejected from the Sun over the course of several hours. CMEs often look like huge, twisted rope, which scientists call “flux rope.”
>
> “CMEs often occur along with solar flares (explosions on the Sun's surface), but they can also occur spontaneously. The frequency of

> CMEs varies with the 11 year solar cycle. At solar minimum we observe about one a week. Near solar maximum we observe an average of two to three CMEs per day. CMEs disrupt the flow of the solar wind and cause disturbances that can damage systems in near-Earth orbit and on Earth's surface.
>
> "Their magnetic fields merge between the interplanetary magnetic field (IMF) and geomagnetic field lines. This direct link between even a small percentage of the geomagnetic field lines and the IMF results in large increases in the rate of energy transfer from the solar wind and the magnetosphere. Because of this, CMEs are among the most important drivers of geomagnetic storms and substorms. These substorms cause the beautiful northern and southern auroral light that often are seen in the night sky at high latitudes."

(In another of the amazing coincidences with which our life has been so generously peppered, on the evening of the day before we consulted the jpl.nasa.gov website for the foregoing information, a powerful geomagnetic substorm produced a spectacular auroral light show in the northern hemisphere that was visible as far south as Texas, which is very unusual indeed).

Because heliophysics to date has been unaware of the true nature and source of the solar wind, and has thus incorrectly viewed the Sun's magnetic fields to be the primary determinant of solar phenomena (confusing which is cause and which is effect), the interpretation of the above facts has become very complicated. Here is part of the current scientific explanation for CMEs according to an article on the topic which can be found at en.wikipedia.org:

> "It is unknown whether CME initiation is driven

> by either ideal or non-ideal magnetohydrodynamic (MHD) instabilities leading to the expulsion of an existing flux rope, non-ideal instabilities leading to the creation of a new flux rope during the eruption, or a combination of both ideal and non-ideal processes . . . Under non-ideal MHD, initiations mechanisms may involve resistive instabilities or magnetic reconnection: Tether-cutting, or flux cancellation, occurs in strongly sheared arcades when nearly antiparallel field lines on opposite sides of the arcade form a current sheet and reconnect with each other. This can form a helical flux rope or cause a flux rope already present to grow and its axis to rise. The magnetic breakout model consists of an initial quadrupolar magnetic topology with a null point above a central flux system. As shearing motions cause this central flux system to rise, the null point forms a current sheet and the core flux system reconnects with overlying magnetic field."

Whew! What a mouthful! What in hell is "an initial quadrupolar magnetic topology with a null point?" And not just any old "null point" mind you, but a "null point above a central flux system!" Oh, of course. That makes it much more clear. William of Ockham, he of Occam's Razor fame, must be spinning in his grave. Fortunately for us ordinary mortals who are not versed in 'science-speak,' there is a much simpler alternative explanation for CMEs.

CMEs are most common around the time of solar maximum when we observe an average of two to three per day. According to our second postulate, during a solar maximum the Sun's core has shrunk to its least extent; as a consequence of this the solar wind is at the weakest point of its 11-year solar cycle. In turn this means

that the roiling of the plasma in the convection zone is less powerful than during other portions of the cycle, which enables the creation of more coherent and larger magnetic fields, which is what sunspots are. The sunspots, because they are areas in the Sun in which space is rotating, block the weakened solar wind and force it around the boundaries of the sunspots. As a result, the areas around the boundaries of sunspots are observed to be brighter than the rest of the photosphere. Just as blowing on a hot coal will cause it to brighten, these areas of brightness, known as faculae or plages, are direct evidence that the solar wind is flowing through these areas with a greater velocity and pressure than in the rest of the photosphere.

The boundary around sunspots can be usefully compared to the calderas of supervolcanoes here on Earth, such as the caldera which encompasses a major portion of Yellowstone National Park. A caldera is a large basin formed by the explosion and collapse of the centre of a volcano, and which may serve as the outer boundary of future eruptions. Like within the boundary of a volcanic caldera here on Earth, within the boundary marked by faculae or plages the pressure of the constant solar wind builds steadily beneath the sunspot. As we have seen, a solar flare is an event where the solar wind bursts through a particularly weak spot in the magnetic field joining two sunspots. On the other hand, when the solar wind pressure beneath a sunspot builds more quickly than it can 'leak out' through the surrounding faculae a CME occurs, in which an entire region of the photosphere is blown off into space. Coronal mass ejections are therefore not initiated in the Sun's corona. They are very large explosions that occur at the boundary of the convection zone and the photosphere, and are the result of processes that are very similar to that which powers volcanoes here on Earth, in the sense that both types of phenomena are examples of extremely hot material under high pressure pushing up against a barrier of some sort.

CMEs are so large that the magnetic fields which were blocking the solar wind and causing the solar wind pressure to

build up until the moment of release are carried away more or less intact, as a huge volume of plasma is lifted into the Sun's atmosphere and beyond. These magnetic fields, which consist of coherent plasma structures, speed rapidly out into the solar system at speeds from 20 up to 3200 km/second. It is because these plasma structures maintain their coherence that they have such a large impact on the Earth's magnetosphere when they intersect with it.

Now, the basis of our hypotheses is that the conditions which give rise to an increase in the creation of sunspots is a result of a weakening of the solar wind, which is itself a consequence of the periodic shrinking of the Sun's core. We should note here that, given the fact that near solar maximum we observe an average of two to three CMEs per day, it is entirely possible that the conditions required to bring about CMEs, that is, a temporary blockage of the flow of the solar wind by large-scale coherent magnetic fields, can occur without the creation of a darkened sunspot on the surface of the photosphere. Whether directly observable or not, the number of such blockages increases as the solar maximum, when the core has shrunk to its minimum diameter, approaches. Once solar maximum has passed and the core has once again begun to expand, the conditions required to create many blockages are still prevalent for some time, so blockages of the solar wind continue to be created, but at a diminishing rate. As the core expands, the solar wind strengthens. If our hypothesis is correct, since the total number of blockages created in any given cycle is greater after maximum has occurred than prior to its occurrence, and since after maximum the strength of the solar wind is increasing, meaning that its power to create CMEs is steadily growing, it follows logically that the rate at which CMEs occur will be greater after solar maximum than before it. This is precisely what has been observed. The same Wikipedia article that brought us “initial quadrupolar magnetic topology” states, clearly, that “the peak CME occurrence rate is often 6 – 12 months after sunspot number reaches its maximum.”

We have included Clue #17 as additional evidence for the theory that the solar wind waxes and wanes in relation to the pulsations of the Sun's core. Clue #17 states that Chavez and her colleagues have found that the amount of cloud cover on Neptune fluctuates roughly in line with the sun's 11-year cycle of activity. What they found is that when the sun is most active, that is, when there are more sunspots being formed, which according to our theory is a result of the shrinking of the core and a corresponding decrease in the strength of the solar wind, more clouds begin to form in Neptune's atmosphere. They also found that when the sun is least active (in terms of the production of sunspots), which according to our theory is when the Sun's core is at its most expansive and the solar wind is at its most powerful, Neptune's clouds dissipate. It seems clear that there is a relationship between the varying strength of the solar wind and the formation of clouds in Neptune's atmosphere. That there is an apparent two year lag in these related processes is due to the fact that the pulsating increase and subsequent decrease in the size of the Sun's core is a gradual process. As the core shrinks (leading to a solar maximum) and the solar wind in consequence diminishes in strength, the cloud cover above Neptune gradually increases. It takes two years after the solar minimum - - - when the solar wind is most powerful - - - for the solar wind to entirely dissipate Neptune's clouds because Neptune, unlike Mars, whose atmosphere has been entirely blown away by the solar wind, has a strong magnetic field which provides some protection to Neptune's atmosphere. Also, the fact that Neptune is 20 times farther away from the Sun than is Mars means that the solar wind will be less powerful by the time it reaches Neptune's orbit.

Out of respect for the institution of Science, we feel that we must take this opportunity to say that our gentle mockery of the physics establishment's tendency to indulge in bafflegab is not intended as an insult to their efforts, and that if we have bruised any tender physicist egos, we apologize. The truth is that were it not for the experimental and observational physicists who dedicate

their lives to the collection and cataloguing of arcane data, theorists such as ourselves would simply be floundering around in the dark.

However, there was a larger point to our jibe. We have come to believe that while the Game of Being is complex, it is not complicated. It operates on all levels on the simple logic of cause and effect. If an effect is observed, a sufficient collection of relevant facts, arranged according to the dictates of logic, will lead one ineluctably to its cause. If a particular cause is imagined we can, when armed with the knowledge gained through past experience, predict with considerable confidence what the eventual effect will be. Even in the quantum world, where specific outcomes cannot be reliably predicted, the statistical probabilities of a range of effects can be accurately forecast in advance. Our point is that most conundrums turn out to have fairly simple solutions, and that when Science starts to head down the path of "initial quadrupolar magnetic topology" it is frequently a sign that it is headed off into the wilderness of confusion. The other point we wish to make is that Science's reliance on dense mathematics and jargon, instead of informing and educating the general population about the nature of the universe, leaves much of the public baffled and distrustful, which serves neither Science nor the public weal. In the future, Science must do a better job of presenting the knowledge it has attained in a manner which is more accessible to the average person.

Returning to the topic at hand, just as the pulsations of the core determine the behaviour of the layers of plasma within the Sun's interior, so too do these cycles effect the levels of activity that have been observed in the Sun's atmosphere, particularly in the corona. Clue #'s 2 and 3 supply information concerning the physical characteristics of coronal holes. Conventional thinking states that in coronal holes, the Sun's magnetic field is 'open' to interplanetary space and that coronal holes are therefore 'unipolar.' We believe that this conclusion constitutes a mis-characterization of the situation. Recall our assertion that magnetic fields are created when a sufficient number of charged particles are aligned in

such a way that their spins cause the space around them to rotate. If this is correct, an absence of magnetic fields implies a relative absence of the charged particles required to create them. If this is correct, it implies that coronal holes are regions of the Sun's atmosphere where the numbers of charged particles has temporarily dropped below the number required to sustain coherent magnetic fields. This conclusion is consistent with Clue #2. The question that then arises is: what set of circumstances would cause the number of charged particles in a given region of the Sun's atmosphere to diminish? And the converse of that: under what circumstances would the number of charged particles in a given region of the Sun's atmosphere increase? We believe that the answer to both of these questions is to be found with an understanding of the solar wind.

Clue #'s 4 and 5 inform us that coronal holes are most persistent and stable when situated over the Sun's poles, and that they are more prominent near solar minimum. If our hypothesis concerning the pulsations of the Sun's core is correct, then during a solar minimum the core will have expanded to its greatest extent. In that situation not only will the outer layer of the core be closer to the surface of the Sun, but also the radiative zone will be at its minimum thickness. The combined effect of these two circumstances results in a solar wind shock wave that reaches the Sun's atmosphere with greater pressure and higher velocity. This result is more pronounced over the Sun's poles because the radiative zone in those regions is, on average, thinner than it is elsewhere (Postulate #3.) The resultant extra-powerful solar wind more effectively clears out the charged particles in the coronal polar regions, carrying the ions off into interplanetary space and thus inhibiting the creation of magnetic fields in those regions of the corona. Since the density of the matter through which it flows affects the velocity of shock waves travelling through space, this also explains why the solar wind exiting coronal holes has a velocity which is up to twice the average velocity of the solar wind emanating from other regions of the corona (Clue #12.)

Assigning responsibility for the existence of coronal holes to the behaviour of the solar wind also allows us to explain why coronal holes only appear in the extreme ultraviolet and soft x-ray portion of the EMR spectrum (Clue #6.) This is not due to extremely high temperatures of coronal holes as is currently believed. Rather, this is due to the high velocity solar wind smashing the atomic particles resident in those regions together with increased force, causing those particles' electrons to vibrate more rapidly, pushing the wavelengths of the EMR emitted by those electrons up into the extreme ultraviolet and soft x-ray portion of the spectrum.

Taken together, Clue #4 plus Clues #7 through #11 support the general proposition that coronal holes are the result of a strengthening of the solar wind in particular portions of the corona, and that in general their numbers and size rise and fall in conjunction with the pulsations of the Sun's core. During solar minimum, when the core is at its fullest extent and the solar wind is at its most powerful, coronal holes at the Sun's polar regions are large and stable (Clue #4) due to the relative thinness of the radiative zone in those regions (Postulate #3.) Clues #10 and #11 suggest that the thickness of the radiative zone over the polar regions plays a critical role in determining the strength of the solar wind in those polar regions. During the solar maximum in April 2014, when the core was at its minimum extent and that therefore the radiative zone was at its maximum thickness, the normally stable polar coronal holes disappeared entirely, indicating that the solar wind was much diminished. But by March of 2015, less than one year into the development of the next solar minimum, and when the core would still be far from achieving its maximum extent, the solar wind had regained enough of its strength to open a large coronal hole above the Sun's south pole and another smaller hole close to the Sun's north pole. This suggests that the strength of the polar solar winds rests on a fine balance between the size of the core and the relative thickness of the radiative zone over the poles.

Clue #'s 7, 8, and 9 all support our hypothesis that at times of solar maximum, the strength of the solar wind is at its minimum due to the shrinkage of the core and the corresponding thickening of the radiative zone, the consequence of which is a general decline in the number of coronal holes, and an increase in the number of active regions (sunspots, faculae and plages.) Clues #8 and #9 were both obtained from a statistical study of the maxima of the last four solar cycles which was carried out by Mahendra Lal Karna *et al* and reported in The Astrophysical Journal, Vol. 901 #2 in 2020. Their conclusion, which we have presented as Clue #9, is a logical consequence of our hypothesis. If coronal holes are areas in the corona which have been relatively cleared of plasma by the passage of the solar wind through the corona, then an increase in sunspots which act as blockages to the solar wind would result in a decrease in the number of equatorial coronal holes.

However, Clue #8 presents something of a puzzle: why does the area of equatorial coronal holes increase during solar maximum? A potential answer lies with what we might call Clue #8 (a). In their study Karna *et al* refer to a previous study by Habbal *et al* (2008) which "found that when enhanced unbalanced magnetic flux from AR extends into neighbouring coronal holes, *outflows and their gradients become significantly enhanced within* (emphasis added) the coronal holes. This final result implies that ARs can enhance plasma outflows in neighbouring coronal holes." The significance of Clue #8 (a) lies in the phrase "enhanced unbalanced magnetic flux from AR." So-called 'active regions' are comprised of dark sunspots surrounded by faculae, areas on the Sun's surface which are brighter than the rest of the photosphere. We have suggested that this increased brightness is a consequence of the increased flow rate of the solar wind around the blockage caused by the sunspots. If a coronal hole was to open up, not directly above (this should be unusual,) but in the neighbouring vicinity of a sunspot, the increased flow rate of the solar wind through the faculae might 'nibble' at the edges of the coronal hole, thus increasing its area. This set of circumstances would be much

less likely to arise during periods other than the solar maximum.

So, in summary, we believe that our three postulates are supported by the available evidence. The core of the Sun pulsates on an 11-year cycle and the thickness of the radiative zone varies accordingly. The strength of the solar wind, which is a continuous series of shock waves generated by the collisions of helium-3 isotopes in the outermost layers of the core, waxes and wanes as a consequence of the core's pulsations. The relative strength of the solar wind determines the numbers and sizes of sunspots, solar flares, coronal mass ejections, and coronal holes. The varying behaviour of the solar wind is the determinant factor in the creation of the magnetic fields on the surface and in the atmosphere of the Sun, not the other way around.

Chapter Forty-six

THE STANDARD MODEL OF PARTICLE PHYSICS

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We are nearing the end of our journey through physics, but we cannot rest quite yet. Although we earlier touched upon it briefly, we have not thus far examined the Standard Model of particle physics at any level of detail. The foundations of the much-touted Standard Model, which purports to explain the fundamental workings of the universe, in fact rest upon a bed of sand, and are flawed in two key respects: one, thanks to the erroneous interpretation of the results of the Michelson – Morley experiment the Standard Model does not take into account the existence of immaterial space and the multiple roles it plays in the functioning of the universe; and two, to explain the interactions between subatomic particles the Standard Model relies upon a belief in the existence of mystical (may the 'force' be with you) forces. As usual, we will begin our exploration of this theory with a presentation of its basic claims as explained by the experts. The

CERN website home.web.cern.ch hosts the following article on the Standard Model:

> "The theories and discoveries of thousands of physicists since the 1930s have resulted in a remarkable insight into the fundamental structure of matter: Everything in the universe is found to be made from a few basic building blocks called fundamental particles, *governed by four fundamental forces* (emphasis added.) Our best understanding of how these particles and three of the forces are related to each other is encapsulated in the Standard Model of particle physics. Developed in the early 1970s, it has successfully explained almost all experimental results and precisely predicted a wide variety of phenomena. Over time and through many experiments, the Standard Model has become established as a well-tested physics theory . . .
>
> "There are four fundamental forces at work in the universe: the strong force, the weak force, the electromagnetic force, and the gravitational force. They work over different ranges and have different strengths. Gravity is the weakest but it has an infinite range. The electromagnetic force also has infinite range but it is many times stronger than gravity. The weak and strong forces are effective only over a very short range and dominate only at the level of subatomic particles. The weak force is weaker than the strong force and the electromagnetic force, but it is still much stronger then gravity. The strong force, as the name suggests, is the strongest of all four fundamental interactions.
>
> "Three of the fundamental forces result

> from the exchange of force-carrier particles, which belong to a broader group called “bosons”. Particles of matter transfer discrete amounts of energy by exchanging bosons with each other. Each fundamental force has its own corresponding boson - - - the strong force is carried by the “gluon”, the electromagnetic force is carried by the “photon”, and the “W and Z bosons” are responsible for the weak force. Although not yet found, the “graviton” should be the corresponding force-carrying particle of gravity. The Standard Model includes the electromagnetic, strong and weak forces and all their carrier particles, and explains well how these forces act on all of the matter particles. However, the most familiar force in our everyday lives, gravity, is not part of the Standard Model, as fitting gravity comfortably into this framework has proved to be a difficult challenge.”

The article goes on to comment on the incompatibility of the mathematics of Quantum Mechanics with the mathematics of the General Theory of Relativity, a point which we have previously touched upon. But this mathematical incompatibility is the least of the Standard Model's problems. Aside from the fact that in order to make its equations balance a number of its parameters have to be assumed to be correct, a more fundamental problem is its reliance on the mystical notion of 'forces'.

In the course of our journey through physics we have already eliminated the need to believe in the existence of three of the four so-called fundamental forces. First, although it was not in need of any such validation, we have firmly established the validity of Einstein's General Theory of Relativity which, when fully embraced and when the role of immaterial space is taken into account, simply does away entirely with the Newtonian belief that

gravity is an attractive force with an infinite range; nor is there any evidence for the existence of 'gravitons.'

Second, the work of Alain Aspect and his colleagues demonstrated that the 'force carrier' of the electromagnetic force - - - photons - - - do not in fact exist. Natural light does not consist of particles. It is a wave phenomenon, as Thomas Young's famous double slit experiment proved. It is true that human ingenuity has figured out a way to fabricate an object which passes Aspect's anticorrelation test, but these objects are not so-called 'bundles of energy' as claimed. 'Energy' is a figment of the collective human imagination and does not actually exist. All electromagnetic radiation is a wave-crest displacement of the ether. These unnatural entities, these manufactured 'photons,' are nothing more than simple singular wave-crest displacements of the ether.

Third, we have suggested that the actual cause of the radioactive decay of unstable elements is not any so-called 'weak force' as current theory postulates, but is in fact evidence of the erosion of those elements by their passage through immaterial space. Just as a river changes the shape of its banks, so too does the passage of immaterial space affect unstable elements as it passes through them, resulting in their gradual transmutation. We shall discuss the various manifestations of the 'weak force' in more detail presently.

This brings us to the so-called 'strong force' which is supposedly responsible for holding the components of atomic nuclei together. According to the Standard Model, the strong force is manifest at two different levels within the atomic nucleus. At the most fundamental level the strong force is said to be responsible for holding together the components of the protons and neutrons (the nucleons) which comprise the nucleus of an atom. The theorized components of the nucleons are called 'quarks,' and the force carrier which binds the quarks together are known as 'gluons.'

The quark theory of the sub-atomic realm is positively Ptolemaic in character. This theory sprung from the imagination of the theoretical physicist Murray Gell-Mann in the early 1960's, and

for a few years was regarded by most of the physics community as a purely mathematical contrivance. The theory states that each proton and each neutron is comprised of three quarks. Quarks come in six different 'flavours' (this is just a descriptor and has nothing to do with how they taste), and each flavour comes in 3 different 'colours' (this is also is just a descriptor and has nothing to do with their appearance). Each flavour of quark has a corresponding antimatter antiquark which also comes in three different colours. Quarks are said to carry fractional electric charges, a claim which has never been experimentally verified. The idea that they carry fractional electric charges is necessary so that the total electric charge equals the charge of the proton (+1) and the neutron (which is electrically neutral). Thus protons are said to be comprised of two 'up' flavour quarks each of which carries a +2/3 charge and one 'down' flavour quark which carries a -1/3 charge. Neutrons are thought to be composed of two down quarks and one up quark. Quarks are considered to be 'point-like' entities and all three together account for just over 1% of the mass of the nucleon. The rest of the mass of the nucleons is said to come from the energy contributed by the action of the gluons ($m = E/c^2$) which hold the quark constituents of the nucleons together. Three of the flavours of quarks appear to play no significant theoretical or phenomenological role in the functioning of the sub-atomic realm, and seem to be included in the theory only in order to provide 'symmetry' to the theory's equations, a signifier of mathematical elegance much prized by physicists.

During the latter part of the Middle Ages, theologians seriously debated the question of how many angels can dance on the head of a pin. Like the theologians' angels, quarks can never, in principle, be directly observed. To explain their in-born invisibility the theory provides the concept of 'colour confinement.' According to Wikipedia:

> "All commonly observable matter is composed of up quarks, down quarks and electrons. Owing to

> a phenomenon known as colour confinement, quarks are never found in isolation; they can only be found within hadrons, which include baryons (such as protons and neutrons) and mesons, or in quark-gluon plasmas. For this reason, much of what is known about quarks has been drawn from observations of hadrons."

So the question then becomes: in what manner have hadrons been observed? They have been observed through a process known as 'deep inelastic scattering'. This process involves firing beams of high-energy electrons at targets consisting of liquid hydrogen or deuterium. Remember that the hydrogen atom consists of a single proton as its nucleus, and that its isotope, deuterium, has a nucleus consisting of a proton and a neutron. This idea of 'scattering' is based on the early 20th Century work of Ernest Rutherford, who discovered the proton by firing alpha particles at thin foils made of gold. Rutherford found that while most of the alpha particles passed right through the foil, some were 'scattered,' that is, deflected at sharp angles or even bounced straight back towards their source. On the basis of this evidence Rutherford concluded that atoms are mostly empty space surrounding a small dense nucleus. We now know that that small dense nucleus consists of protons and neutrons - - - also known as 'hadrons.'

In the late 1960's and early 1970's, physicists employed Rutherford's basic idea, only this time the projectiles used were high-energy electrons. The thinking was that because the electrons were of very high 'energies' (meaning that they were accelerated to extreme velocities) the wavelengths of the electrons would become small enough to allow the electrons to 'see' inside of the hadrons and thereby reveal what they consisted of. Thus the entire experiment rests upon the theory that electrons, which are particles, also behave as if they are waves. Modern physics insists that they do; we remain highly skeptical of this notion. So the expectation of

the physicists carrying out these experiments was that the projectile electrons would be 'scattered' by whatever they encountered within the interior of the target hadrons, and that the angles and exit velocities of the electrons would provide information about the nature of what it was that they encountered.

However, when the experiments were carried out they revealed that the electrons, rather than 'scattering' off of any entities within the hadrons as had occurred in Rutherford's experiment, instead acted like tiny cannonballs (like a particle, not a wave) which, to quote Wikipedia, "shattered" the target hadrons into 'jets' of debris of various types of short-lived subatomic particles of various masses. No particles with the predicted masses of quarks were detected. Undeterred by this apparent setback to the quark theory, the physics community set about developing an extremely complicated mathematical model which has been used to interpret the quantum debris field which resulted from the collisions between the electrons and hadrons as evidence for the existence of quarks, in all their different flavours and colours, and later, for the existence of gluons.

To provide you with just a taste of the complicated nature of this Ptolemaic-like model of the subatomic realm, we quote again from the Wikipedia article on quarks:

> "Unlike leptons, quarks possess colour charge, which causes them to engage in the strong interaction. The resulting attraction between different quarks causes the formation of composite particles known as hadrons . . .
>
> "The quarks that determine the quantum numbers of hadrons are called valence quarks; apart from these, any hadron may contain an indefinite number of virtual "sea" quarks, antiquarks, and gluons, which do not influence its quantum numbers. There are two families of hadrons: baryons, with three valence quarks, and

mesons, with a valence quark and an antiquark. The most common baryons are the proton and the neutron, the building blocks of the atomic nucleus. A great number of hadrons are known . . . most of them differentiated by their quark content and the properties these constituent quarks confer. The existence of "exotic" hadrons with more valence quarks, such as tetraquarks and pentaquarks was conjectured from the beginnings of the quark model but not discovered until the early 21st Century.

"Elementary fermions are grouped into three generations, each comprising two leptons and two quarks. The first generation includes up and down quarks, the second strange and charm quarks, and the third bottom and top quarks. All searches for a fourth generation of quarks and other elementary fermions have failed, and there is strong indirect evidence that no more than three generations exist. Particles in higher generations generally have greater mass and less stability, causing them to decay into lower-generation particles by means of weak interactions. Only first generation (up and down) quarks occur commonly in nature. Heavier quarks can only be created in high-energy collisions (such as in those involving cosmic rays), and decay quickly; however, they are thought to have been present during the first fractions of a second after the Big Bang, when the universe was in an extremely hot and dense phase (the quark epoch). Studies of heavier quarks are conducted in artificially created conditions, such as in particle accelerators."

Leptons, hadrons, baryons, fermions, up, down, strange, charm, top and bottom quarks, valence quarks, virtual "sea" quarks, antiquarks, tetraquarks, pentaquarks, 8 different types of gluons, over 200 types of mesons, strong interactions, weak interactions, and this is just the tip of the fantastical iceberg of complication which has kept much of the physics community gainfully employed for the last sixty years. The complexity of the mathematics required to bring some semblance of order to this menagerie is mind-boggling. The entire Standard Model is Reductionism run amok. And there are some theoretical physicists who think this mind-set should be taken to an even greater extreme. For these theorists not even impossible-to-ever-be-observed quarks are fundamental particles. They posit that at the most fundamental level matter consists of tiny vibrating one-dimensional strings. The genesis of string theory was a 1968 paper written by the theoretical physicist Gabriele Veneziano titled *"Construction of a crossing-symmetric, Regge behaved amplitude for linearly-rising trajectories."* Just how many angels do you believe can dance on the head of a pin?

(For those readers who might be interested, in his book *Reinventing The Sacred,* Professor Stuart A. Kauffman mounts a spirited attack on the Reductionist model of understanding the nature of the universe. It is not an easy read for the scientifically uninitiated, but it contains interesting ideas for those who enjoy an intellectual challenge.)

Proponents of the Standard Model point to its successes in predicting the existence of seldom-seen particles such as the W, Z, and Higgs bosons. The discovery of these particles was the result of a number of repeated experiments in which beams of protons and/or antiprotons, consisting of hundreds of billions of those elementary particles, approach each other at velocities approaching the speed of light, resulting in some 600 million collisions per second.

Let us return to our beer bottle and concrete wall experiment. Suppose I were to show you a drawing and say, "This

is a drawing of a 'beergle.' I predict that if I throw a beer bottle at that wall, it is possible that one of the resulting pieces of glass will look exactly like this beergle and will weigh precisely 2.5432109876 grams." You say, "That sounds interesting. Let's find out." So we throw a beer bottle at the wall and then carefully sift through the debris. No beergles. So we drink another beer and throw the empty at the wall. Still no beergles. But I am quite certain of the validity of my hypothesis so, undaunted, we carry on this process for some time. Actually, for quite a long time. Soon, out of concern for the health of our livers, we are simply pouring the beer out on the ground. Where is Supreme Court Justice Brett Kavanaugh when you really need him? Our pitching arms begin to tire, but we have not yet discovered any beergles. Then, after destroying the 100 millionth beer bottle, I pull a piece of glass out of the debris pile and cry, "There it is!" In my hand is a piece of glass which matches the drawing in every respect. I place the shard on our extraordinarily sensitive scale which reveals that it weighs precisely 2.5432109876 grams. "So," I say with no small amount of satisfaction, "My prediction was correct. Beergles exist and they are a fundamental aspect of the universe of beer bottles."

Now, would you consider that claim to be valid, or would you rather be inclined to think that the appearance of the beergle was a random event brought on as the inevitable result of the law of large numbers?

We have yet to deal with the second manifestation of the so-called 'strong force', that being the 'force' which binds protons and neutrons together in the nucleus of atoms. The explanation for this force is every bit as convoluted as the quark model is for the forces that supposedly hold individual nucleons together. To make things as confusing as possible right from the beginning, this version of the strong force is known as the 'nuclear force' or as the 'nucleon-nucleon interaction' or as the 'residual strong force' or as the 'strong nuclear force'. Take your pick. No matter which name you choose, the Standard Model's description of the behaviour of this force is puzzling. We begin by quoting Wikipedia on the topic of the range

of the nuclear force:

> "The nuclear force is powerfully attractive between nucleons at distances of about 0.8 femtometre (fm, or 0.8 x 10^(-15) metre), but it rapidly decreases to insignificance at distances beyond about 2.5 fm. At distances less than 0.7 fm, the nuclear force becomes repulsive. This repulsion is responsible for the size of nuclei, since nucleons can come no closer than the force allows. . . .
>
> "While the nuclear force is usually associated with nucleons, more generally this force is felt between hadrons, or particles composed of quarks. At small separations between nucleons (less than ~ 0.7 fm *between their centers,* (emphasis added) depending upon spin alignment) the force becomes repulsive, which keeps the nucleons at a certain average separation. . . .
>
> "At distances larger than 0.7 fm the force becomes attractive between spin-aligned nucleons, becoming maximal at *a center-center distance of about 0.9 fm* (emphasis added). Beyond this distance the force drops exponentially, until beyond about 2.0 fm separation, the force is negligible. *Nucleons have a radius of about 0.8 fm* (emphasis added)."

The belief that the universe contains magical forces goes back a very long way into human history. This belief gave rise to the notion of gods, who magically intervened in the affairs of humans. The legends surrounding Moses, Jesus Christ, and Muhammad ascribe magical powers to each of those men. Issac Newton bestowed scientific respectability upon the idea of magical

forces when he described gravity as a mysterious attractive 'force' which possesses an infinite reach, and which somehow permits one body to pull on another without any physical contact between them.

The 'nuclear force' is one very magical force. Over the span of one one-hundred trillionth of a metre it goes from being a repulsive force to being the second most powerful attractive force in the universe, and then, if the distance between the two nucleons which it is connecting increases by just a further 1.5 femtometres (10^-15 metre), it disappears altogether. Very magical indeed. Merlin would no doubt be impressed.

However, not only is this scenario improbable, the numbers don't seem to add up. The Wikipedia article states that nucleons have a radius of about 0.8 fm. If this is true, then when two nucleons are side by side and just touching, their centres will be 1.6 fm apart. The article also states that at small separations between nucleons (less than ~ 0.7 fm between their centres), the force becomes repulsive. But in order for the centres of the nucleons to be only 0.7 fm apart, the nucleons would have to be overlapping each other by a distance of 0.9 fm. The article then states that the nuclear force becomes maximal at a centre-centre distance of about 0.9 fm. But at this centre-centre distance the two nucleons would have to be overlapped for some 0.7 fm, or approximately 44% of their radius. To the best of our knowledge, nowhere in the Standard Model is there a suggestion that the protons and neutrons in an atomic nucleus actually meld together, and our theory of the behaviour of nucleons (which we will get to shortly) certainly does not allow for that. When closely scrutinized, the Standard Model's description of the behaviour of the nuclear force does not make any sense.

Another highly questionable aspect of the Standard Model's understanding of the nuclear force is that it is apparently (somehow?) just a leftover remnant of the strong force which supposedly binds quarks together to create the nucleons in the first place. On this topic Wikipedia states the following:

> "The nuclear force is a residual effect of the more fundamental strong force, or strong interaction. The strong interaction is the attractive force that binds the elementary particles called quarks together to form the nucleons (protons and neutrons) themselves. This more powerful force, one of the fundamental forces of nature, is mediated by particles called gluons. Gluons hold quarks together through colour charge which is analogous to electric charge, but far stronger. Quarks, gluons, and their dynamics are mostly confined within nucleons, but *residual influences* (emphasis added) extend slightly beyond nucleon boundaries to give rise to the nuclear force.
>
> ". . . even though nucleons are made of quarks in combinations which cancel most gluon forces (they are "colour neutral"), some combinations of quarks and gluons nevertheless *leak away from nucleons* (emphasis added), in the form of short-range nuclear forces that extend from one nucleon to another nearby nucleon. These nuclear forces are very weak compared to direct gluon forces ("colour forces" or strong forces) inside nucleons, and the nuclear forces extend only over a few nuclear diameters, falling exponentially with distance. Nevertheless, they are strong enough to bind neutrons and protons over short distances, and overcome the electrical repulsion between protons in the nucleus."

So let's get this straight. The nuclear force, responsible for holding the nuclei of atoms together, has no direct source of its own. It is a "residual influence," a plate of left-overs, which has somehow "leaked out" from the nucleons. So now protons and

neutrons leak? How does that happen? After it has leaked out of the nucleons, it somehow acts to pull those nucleons (the protons and neutrons) towards one another if they should stray too far apart, while simultaneously pushing them apart if they crowd one another. Furthermore, if this apparition is ghostly enough to leak out of the boundaries of the nucleons, how then does it manage to exert a force upon the nucleons that can push and pull them about? And of course, this entire scenario depends upon the acceptance of a prior belief in the existence of quarks and gluons to be the source of the 'leakage;' entities that can never, in principle, be directly observed. We ask you, is the belief in this 'force' any less inherently magical than the belief that a man rose from the dead?

We repeat: the Game of Being is complex - - - there are many different kinds of manifestations within the Field of Play - - - but it is not complicated. The rules that govern the progress of the Game are simple and straight-forward. The complicated content and inherent contradictions of the Standard Model alone are reason enough to doubt its validity as a correct description of the fundamental nature of the universe. Furthermore, consider 20th Century Science's track-record: from black holes to the cosmic microwave background, from dark matter to dark energy, from the Special Theory of Relativity to the supposed expansion of the universe and more, physics over the last 100-plus years has simply been mistaken about so much. Seen in this light, a healthy skepticism regarding the Standard Model's claims to represent how the Field of Play functions at its most fundamental level certainly seems to be warranted.

The Standard Model has become a self-perpetuating research project in which no conclusion reached is ever considered to be final. Scarcely a month goes by without some new claim being put forth regarding some aspect of the Standard Model, suggesting that the latest findings reveal a possible discrepancy with measurements obtained in earlier experiments or with the Model's theoretical predictions, and, always, that further research will be required to resolve the matter. Just recently physicists at the

Argonne National Laboratory in Illinois announced that “We have a new picture of the proton.” (295) New Scientist captioned its article on the announcement by saying that “The radius of this subatomic particle seems to vary depending on how you look at it,” thus preparing the field for years of on-going experimentation and endless debate. The mirage of a 'new physics' ever beckons alluringly but remains just out of reach.

Chapter Forty-seven

REPLACING THE

STANDARD MODEL

* * * * * *

So, if there is no magical 'nuclear force' operating to hold protons and neutrons together, how do atomic nuclei not disintegrate? To answer this question we must have a new understanding of the nature of the subatomic particles that make up atomic nuclei. We begin with the proton. A useful mental picture of a proton is to imagine it as a tiny marble which constantly spins around a central axis. Protons are solid and are made of the same stuff throughout; there is no difference between their interiors and exteriors. What is the stuff of which they are constituted? That stuff is differentiated immaterial space. Protons are the differentiated beads of perspiration sweated out of the high temperature body of undifferentiated space immediately following the period of Cosmic Inflation, when the hot bubble of space which the inflation event had just created was streaked with tendrils that were hotter than the surrounding areas of the bubble. As we have

previously described, after the era of the matter-antimatter annihilation had been completed, these higher-temperature tendrils would go on to become the filaments of the cosmic web we observe in the contemporary universe.

The rate at which any given proton spins can vary substantially, but they do possess a spin rate 'ground state.' This ground state is exemplified by the spin of the proton in the nucleus of a hydrogen atom. As we shall see, the ability of a proton to spin can be reduced to zero, but their tendency to spin never disappears. The question of what is the source of the energy which drives the proton's spin naturally arises. The answer to this question is that there is no 'energy' source required. The tendency of the proton to spin is innate. The tendency for a proton to spin is a fundamental aspect of the universe in the same way that it is a fundamental aspect of the universe for liquids to flow down a hill rather than up.

Within the nucleus of an atom a continual dance is taking place. As the protons spin they move around within the nucleus within certain bounds, not unlike a spinning top on a table. It is currently thought protons repel other protons because they all carry a 'positive' electric charge and that a force (another one!) called the Coulomb force exerts itself to keep the protons in the nucleus from coming into contact with one another. However, we believe that protons do regularly come into contact with one another but that when they do they are immediately repelled from one another because they bounce off of each other's exterior, due to the fact that they are all spinning in the same direction. It is believed that electrons possess what physicists call 'negative helicity,' which means that they spin in a counterclockwise direction. If this is true, then protons must spin in a clockwise direction. Which actually spins in which direction is not of great importance; what matters is that the electrons' and protons' spins be opposite. The reason why this is important will become clear in a moment.

Imagine that you are looking down on two protons both spinning clockwise side by side on a table, and imagine further that each proton is in the centre of the face of a clock-like device which

has the numbers 12, 3, 6, and 9 painted on the device in the appropriate places on the face. Focus first on the right-hand proton. Because the proton is spinning clockwise you will notice that on the left side of the right-hand proton - - - the side adjacent to the left-hand proton - - - the right-hand proton's spin is going from the 6 to the 9 to the 12 positions on the face of the device. Now focus on the left-hand proton which is also spinning clockwise. You will notice that on the right side of the left-hand proton - - - the side adjacent to the right-hand proton - - - the left-hand proton's spin is going from the 12 to the 3 to the 6 positions on the face of the device. So even though both protons are spinning clockwise, their adjacent sides are spinning in a direction which is opposite to the other. Because of this, whenever two protons come into contact they immediately repel one another and spin away to another location within the nucleus. This behaviour is the source of the so-called 'Coulomb force.'

This behaviour keeps the nucleus of an atom from collapsing inwards. What keeps the nucleus from exploding outwards? This function is performed by the neutrons in the nucleus, and it works because neutrons are coated by a thin film which, to other nucleons, is slightly sticky. The mass of a neutron is greater than the mass of a proton by exactly the mass of a single electron, and they do not spin. This is because a neutron is a proton which has melded together with an electron. This blending of protons and electrons is made possible because these particles spin in directions which are opposite to one another. Imagine once again our two clock-like devices but this time with a proton and an electron situated adjacent to one another, with the electron on the right and the proton on the left. Since the electron is spinning in a counterclockwise direction, the left side of the electron - - - the side adjacent to the proton - - - will be moving from the 12 to the 9 to the 6 positions. Meanwhile, because the proton is spinning clockwise, the right side of the proton - - - the side adjacent to the electron - - - will be spinning from the 12 to the 3 to the 6 positions. So although the proton and the electron are spinning in

opposite directions, their adjacent sides are moving in the same direction. Because of this, when a low energy (low velocity) electron bumps up against a proton, the electron blends into the proton, or, more precisely, the electron blends *onto* the proton, and covers the exterior of the proton in a very thin slightly 'sticky' - - - 'sticky' to protons and other neutrons - - - film. As a result of this 'exterior painting' of the proton, the spin of both of these particles disappears, and a neutron is created.

When a proton comes into contact with a neutron its spin rate is reduced due to the influence of the thin sticky coating on the exterior of the neutron. The natural inclination of a spinning proton is to move about within the nucleus of the atom. But once it has come into contact with a neutron, the neutron's sticky coating attaches to the proton and stretches outwards from the surface of the neutron as the proton tries to move away. Think here of a wad of chewing gum. If you try to pull a wad of gum apart, strands will appear which become thinner and thinner the further and further you separate the pieces of gum. Stretched past a certain point the strands will eventually break, but until they do the two pieces of gum will remain attached to one another. So it is with protons and neutrons. These strands can be thought of as a kind of stretchy 'connective tissue' that binds the nucleons together. The neutron's sticky film stretches out as the proton randomly tries to move away from the neutron, and exerts a braking influence on the proton's movement. The proton moves so far and then, responding to this braking influence, moves back towards the neutron. This braking influence is the so-called 'nuclear force' in action.

How is it that a proton can continue to spin if it is connected to a neutron by this connective tissue? Perhaps a more apt description of this material than chewing gum is to compare it to snot, something which is both slippery and sticky at the same time.

Depending on the size of the nucleus of a given atom and depending on its location within that nucleus, it is possible for a proton to be 'connected' to more than one neutron at a time. The more neutrons a proton is connected to, the greater are the

restrictions on its range of movement and, importantly, the lower will be the rate at which it can spin. All the protons within the nucleus of an atom contribute to the rotating force field which surrounds the nucleus, but their individual contributions to the force field are not necessarily equal. The more neutrons to which a given proton is connected, the lower is its spin rate and the smaller is its contribution to the maintenance of the force field.

There are four other aspects of this model of the neutron of which we must take note. The first is that the thin film coating which envelopes the neutron also causes the neutrons in the nucleus to stick together very tightly. This stickiness is what prevents atomic nuclei from blowing apart.

Secondly, this model accounts for the creation of neutron stars. When the core of a star is undergoing catastrophic gravitational collapse, all the protons and electrons are squeezed together in an ever-smaller ever-denser sphere. Their increased proximity means that the electrons and protons blend together at an ever-increasing rate, resulting in more and more sticky-coated neutrons. The stickiness of the neutrons is also what accounts for the fact that space cannot flow through a neutron star once it has formed. Because the neutrons are stuck together, there is no gap between them through which space can flow.

The third item of interest concerns the fact of 'neutron decay.' Unlike protons, electrons, and neutrinos, an isolated neutron does not last forever. Left on its own, a neutron will decay back into a proton, an electron, and a neutrino in a average of about fourteen minutes. If it is not locked into the nucleus of an atom where its coating is constantly being pulled upon, the flow of space past the neutron effectively 'peels' the electron coating off of the underlying proton. The coating reforms into an electron, and all three particles fly off on their different paths. The more highly stressed is the space through which the neutron is passing, the shorter will be the amount of time required for the 'peeling' of the neutron to take place. How a neutrino, the mass of which has been estimated to be anywhere from 1/500,000 to 1/4,000,000 that of an

electron, arises from this process is a mystery yet to be solved.

A fourth aspect of this model of the creation of a neutron necessitates a reconsideration of the proton-proton chain which powers the process of fusion in stars like the Sun. The current understanding is that the process begins when two protons come together to create the hydrogen isotope deuterium which consists of one proton and one neutron, releasing a positron and a neutrino as a result of the collision. According to currently accepted theory, this process is possible because one of the protons undergoes so-called 'beta- plus decay' (a topic we will deal with shortly).

However, we believe that there are several problems with this formulation. First, there is the problem of how two protons can come together. We know that protons find other protons repulsive and in general try to stay away from one another. How can they 'fuse' together? According to the theory of quantum mechanics, which was developed in the 1920's and 1930's, the fusing of two protons is made possible by 'quantum tunnelling.' This is a neat and very convenient solution to this conundrum but we are highly skeptical because we find that when it is placed under close scrutiny, it raises more questions than it answers.

In this scenario each proton carries around with it a barrier, known as the Coulomb barrier, which normally prevents two protons from coming together. According to quantum mechanics, two protons fuse when one proton successfully 'tunnels' through this barrier to connect with another proton. This proposal leads to many questions. What is this barrier made of? When two protons approach one another in the Sun's core, how do they 'decide' which proton will be the 'tunneller' and which will be the 'tunnellee?' By what means (with what tool) does the tunneller proton do the tunnelling? How long does the tunnelling process take? In the tumultuous environment of the Sun's core the two protons can come into contact for only the briefest instant of time. In that instant, the tunneller proton must first tunnel out through its own Coulomb barrier before attempting to tunnel in through the tunnellee's Coulomb barrier. What prompts the tunneller proton to

begin tunnelling? And once the tunnelling process has been successfully completed, by what means do the two protons stay attached to one another?

Then there is the problem of the beta-plus decay process in which one of the protons, like Cinderella's carriage turning into a pumpkin at midnight, magically turns into a neutron while simultaneously emitting a positron and a neutrino. Neutrons are more massive than protons by exactly the mass of an electron (or positron). This means that somehow, from somewhere, an amount of mass equal to two times the mass of an electron must suddenly appear. And once the two protons have hooked up, how do they 'decide' which proton will become the neutron and which will remain a proton? As we said, the current explanation for the first step in the proton-proton chain raises more questions than it answers.

Alternatively, we believe that there is a simple solution to the riddle of how two protons which find each other repulsive can come together. In short: they don't. We propose that the process begins when a proton and a preexisting neutron collide and stick together. The creation of the neutron is not the result of a proton-proton collision and subsequent beta-plus decay as currently theorized; rather, it is the result of the blending together of a free electron, which are plentiful in a star's core, with a proton to create a sticky neutron, which then goes on to collide with another proton to form the isotope deuterium. The deuterium isotope then goes on to collide with another proton in order to create a helium-3 isotope consisting of two protons and a neutron, which is the acknowledged next step in the chain. This step takes place very quickly because once the sticky neutron has been created, it readily binds to any proton with which it comes into contact, and there are a multitude of 'free' protons in the Sun's core. As a result of each of these two collisions the space surrounding the location of the collision vibrates, initiating the traversing through space of the high-energy wave-crest we call gamma rays, plus a neutrino. Our model does not attempt to account precisely for the appearance of

the neutrinos, which apparently do possess some minute mass. Presumably, neutrinos are somehow spawned during the impact of the collisions between the original proton and neutron, and then between the deuteron and another proton. Also, in this model, no positrons are emitted.

In this model (as in the currently accepted model) two helium-3 isotopes complete the chain by then colliding to form the nuclei of a helium atom (also known as an alpha particle) consisting of two protons and two neutrons, plus freeing two of the protons which were part of each of the helium-3 nuclei. This last collision is so violent that it severs the sticky connective tissue holding one of protons to the neutron in each of the colliding helium-3 isotopes, which then escape back out into the core. In addition, the violent helium-3 / helium-3 collision creates a shock wave in the space surrounding the collision that propagates outward not as electromagnetic radiation, but as the solar wind.

Ultimately, this model suggests that the basis of the fusion process in the Sun is not proton-proton collisions, but is the blending together of protons and electrons to form neutrons. There is in all likelihood a limiting factor to this blending process, which serves to explain why all the protons and electrons in the Sun's core did not long ago all turn into neutrons. We suspect that a successful blending of these two particles can only take place within a certain range of 'energies,' that is, only when the combined velocities of the individual proton and electron fall within a particular range can the coating of the proton by the electron take place. We do not pretend to know the magnitude or limits of this range.

So, thus far, we have rejected the Ptolemaic-like Standard Model's quark-gluon theory on the basis that it represents Reductionism run amok; because of the fact that neither quarks or gluons can ever be directly observed; and because of our disbelief in the existence of mysterious 'forces.' We have provided an alternative explanation for how nuclei are held together (sticky neutrons) which does away with the need to believe in a magical

'strong nuclear force;' and we have employed the 'sticky neutron' model to explain the fusion process in the core of the Sun. We will now proceed to provide an alternative explanation for the so-called 'weak force.'

According to the Standard Model the weak force is manifest within protons and neutrons by changing the 'flavour' of the quarks within those particles, and thus changes neutrons into protons and vice versa. In general these transformations are known as 'beta decay,' and there are three, quite dissimilar, pathways by which these transformations may be achieved. The basic process is described by Wikipedia as follows:

> "In nuclear physics, beta decay is a type of radioactive decay in which an atomic nucleus emits a beta particle (fast energetic electron or positron) . . . For example, beta decay of a neutron transforms it into a proton by the emission of an electron accompanied by an antineutrino; or, conversely a proton is converted into a neutron by the emission of a positron with a neutrino in so-called positron emission. Neither the beta particle nor its associated (anti-)neutrino exists within the nucleus prior to beta decay, but are created in the decay process. By this process, unstable atoms obtain a more stable ratio of protons to neutrons."

The decay of a neutron into a proton is known as beta minus, and the decay of a proton into a neutron is known as beta plus. Beta minus decay usually takes place in unstable atoms that are 'neutron rich'. We believe that in these cases there exists a neutron which is situated on the exterior surface of the nucleus, and which is not in contact with any protons. This means that there is no active 'pulling' on the neutron's coating so that even though the neutron is stuck to one or more other neutrons, it is susceptible to having its coating 'peeled off' by the flow of space past it. When

that occurs this coating reforms into the electron it originally was and, piercing the atomic force field from the inside, exits the nucleus, leaving behind a 'naked neutron' - - - a proton. The electron does not go far. The creation of an additional now once again spinning proton results in an expansion in the radius of the force field, creating room on its circumference for an extra electron which is attracted back towards the nucleus by the additional +1 electric charge of the newly minted proton. Again we cannot account specifically for the appearance of the antineutrino, but we do point out that in the case of beta minus decay the claim that the beta particle does not exist within the nucleus prior to the decay event is not accurate. In this case the beta particle (the electron) is present in the nucleus in the form of the coating of the neutron before it 'decays' into a proton. Note that in this scenario no 'weak force' explanation is required.

The position of any given atom in a collection of such unstable atoms; the position of the neutron on the surface of the nucleus; its connection(s) to other neutrons; and the degree of gravitational stress of the space through which it is passing; all combine to determine how often this 'peeling off' process will take place. The rate at which this process takes place is known as the radioisotope's 'half-life', which is the amount of time required for one-half of all the atoms in a given sample to undergo beta minus decay. Each unstable isotope of each kind of element has a unique half-life.

The second type of beta decay, beta plus decay, also known as 'positron emission', is a process which is essentially the opposite of beta minus decay. Remember that a positron is the antimatter version of the electron, being of the same mass as an electron but carrying an electrical charge of +1, as opposed to the electron's charge of -1. Although both decay processes result in the emission of particles of the same mass, the underlying mechanisms are in opposition to one another. Wikipedia describes beta plus decay as follows:

> "Positron emission, beta plus decay, is a subtype of radioactive decay called beta decay, in which a proton inside a radionuclide nucleus is converted into a neutron while releasing a positron and an electron neutrino. Positron emission is mediated by the weak force. The positron is a type of beta particle . . . . Because positron emission decreases proton number relative to neutron number, positron decay happens typically in large "proton-rich" radionuclides. Positron decay results in nuclear transmutation, changing an atom of one chemical element into an atom of an element with an atomic number that is less by one unit. Positron emission occurs only very rarely naturally on earth, when induced by a cosmic ray or from one in a hundred thousand decays of potassium-40, a rare isotope, 0.012% of that element on earth . . . [Positron emitting] isotopes are used in positron emission tomography, a technique used for medical imaging . . . The short-lived positron emitting isotopes . . . used for positron emission tomography are typically produced by proton irradiation of natural or enriched targets."

We begin by noting that, as with the strong force, there is a magical aspect to the behaviour ascribed to the so-called weak force. The strong force supposedly changes from being repulsive to being attractive over the span of an incredibly minute distance. On the other hand, in one situation the weak force supposedly changes neutrons into protons, but in another situation changes protons into neutrons. How does the weak force 'know' which change to make? Does it 'count' the number of protons and neutrons in the nucleus before 'choosing' which type of change to "mediate," or does it sense by some other magical means the

number of each type of nucleon present?

In the case of beta minus decay, we have proposed a solution for where the mass of the emitted electron comes from: the coating which has been 'peeled off' the neutron. The electron's mass is there to begin with. But in the case of beta plus decay, there is the opposite problem: where does the additional mass come from? In beta plus decay a proton is changed into a neutron, a particle which is more massive than a proton by exactly the mass of a single electron (or positron). In addition to that difference, in beta plus decay there is the mass of the emitted positron to take into account. Altogether in this transmutation there is an amount of mass equal to the mass of two electrons plus the (tiny) mass of the electron neutrino to account for. Where does this mass come from? According to the Standard Model, neither the beta particle nor its associated (anti-)neutrino exists within the nucleus prior to beta decay, but are created in the decay process. But created from what? Simply waving around the magic wand of the 'weak force' and saying “hocus-pocus” or even “boson-boson” is not a sufficient explanation.

We (your author) have no firm idea from whence neutrinos arise, but we do not claim therefore that they just appear from nothing. Some event occurs which results in the appearance of a neutrino. For every effect there is a cause. To believe otherwise is to indulge in magical thinking, which should have no place in Science. We firmly believe that there is a logically coherent solution to the puzzle of the creation of neutrinos in the universe, but that humans have not yet figured it out. Similarly, we are convinced that the appearance of the additional mass in the beta plus decay process has a logical explanation.

Beta-plus decay is rare in the natural world, but is now common when artificially induced by the creation of the radioactive isotopes used in positron emission tomography (PET scans.) These radioisotopes are created by bombarding certain elements (the “natural or enriched targets” referred to in the Wikipedia article quoted above) with high-energy protons. The

target elements are thus “irradiated” when the nuclei of the atoms of those elements absorbs one of the high-energy protons. This process causes the transmutation of the target element into an unstable (radioactive) isotope of another element. This much is clear. But it is at this point that our theory and the Standard Model's theory of beta-plus decay diverge. According to the Standard Model such isotopes are unstable because the ratio of protons to neutrons in their nucleus has been disturbed which, at some subsequent point in time (which is determined by the half-life of the isotope) results in the activation of the 'weak force' which “mediates” the conversion of a proton (is it the recently acquired proton?) into a neutron while simultaneously causing the emission of a positron. The specifics of where the additional mass required to change the proton into a neutron, and to create the positron, comes from, are left unresolved. Somehow the 'weak force' just makes it happen.

Our theory of beta-plus decay provides a specific explanation for the appearance of the additional two electrons' worth of mass. It does not come from within the nucleus (as is the case of beta-minus decay) but unless we are willing to indulge in magical thinking we must believe that it has to come from somewhere. We have stated earlier that all the particles in the universe first appeared when they were 'sweated out' of the hot bubble of space. We know from the Casimir effect that this 'sweating' process continues to this very day, in the form of 'virtual' particles which are constantly appearing and disappearing all around us on time-scales which are so short-lived that their presence goes unnoticed. We propose that when the high-energy protons irradiate the nuclei of the target element during the preparation of radioisotopes for use in positron emission tomography, they stick to the outer surface of the nuclei in such a manner that not only do they spin, but that they also, as a result of the impact, vibrate. This vibration causes them to act like a quantum 'lightning rod' which draws a virtual particle with the mass of two electrons out of space (in this context usually referred

to as the 'vacuum') down onto the proton. Half of the mass of the formerly virtual but now actual particle coats the proton and transforms it into a neutron, while the excess mass is spun off the proton to create a positron. Because the proton was spinning when the virtual particle coated it, the spin imparted to the positron is in the same direction as that of the proton which, as we have previously demonstrated, is in the opposite direction to that of an electron. Thus, when the positron encounters an electron, their opposite spins allow them to blend together and mutually annihilate.

We do not have a specific explanation for those rare positrons which are produced as a result of the collision of cosmic rays with molecules in the Earth's atmosphere, or for the rare (1 in 100,000) decays of potassium 40 via positron emission which, by the way, occasionally occurs in bananas. In the former case it may be that the high-velocity impact of the cosmic ray with an atmospheric molecule sets off a chain of events which is similar to the theory we have outlined or, more likely, the emission of positrons in those cases may be due to an entirely different set of circumstances. As for potassium 40, we do not know why it decays via positron emission .001% of the time. However, we are fairly certain that the positron emissions in these two situations are not a result of the activity of some nebulous 'weak force.'

The third type of beta decay for which the 'weak force' is supposedly responsible is known as 'electron capture.' Wikipedia describes electron capture as follows:

> "Electron capture is a process in which the proton-rich nucleus of an electrically neutral atom absorbs an inner atomic electron, usually from the K or L electron shells. This process thereby changes a nuclear proton to a neutron and simultaneously causes the emission of an electron neutrino . . . Following electron capture, the atomic number [the number of protons] is

> reduced by one, the neutron number is increased by one, and there is no change in mass number. Simple electron capture by itself results in a neutral atom, since the loss of the electron in the electron shell is balanced by a loss of positive nuclear charge . . . Electron capture is an example of [the] weak interaction, one of the four fundamental forces."

Elsewhere Wikipedia states that "The effective range of the weak force is limited to subatomic distances and is less than the diameter of a proton. The weak interaction has a very short effective range (0.01 to 0.1 femtometres)." Recall now our scaled-up model of an atom in which the nucleus of the atom, in which is contained all the atom's protons and neutrons, is represented as a soccer ball situated in the centre of a stadium, and the innermost electrons are orbiting the nucleus at a distance equal to somewhere in the middle of the stadium's seating. How, then, can the weak force, whose range is limited to within the soccer ball nucleus, reach out into the middle of the stands to affect the behaviour of the electrons orbiting there? Clearly it cannot. What, then, accounts for the well-documented phenomenon of electron capture?

We have seen from our observations of bar magnets that when the spins of electrons in an object are aligned, that is, when the matter which makes up that object has been magnetized, the electrons project out into the space surrounding the magnet a rotating volume of space, commonly referred to as a 'magnetic field.' Similarly, a force field of rotating space is projected out into the region surrounding an atomic nucleus by the spinning protons within that nucleus. Like tiny spinning tops the protons move about within the nucleus, bouncing off other protons and continuously stretching and then relaxing their connective tissue connections with the sticky-coated neutrons in their region of the nucleus. Because of their electromagnetic attraction for the protons, electrons swarm about on the exterior surface of an atom's

force field in complex patterns, constantly bouncing off one another (because they are all spinning in the same direction) and continually seeking a way through the force field and into the nucleus so that they can meld together with a proton.

Under most circumstances the electrons are unable to penetrate an atom's force field. However, in the process of electron capture such penetration is evidently permitted. According to the Standard Model this penetration is brought about via the 'mediation' of the 'weak force'. But we have seen that the limited range of the weak force makes this explanation logically impossible. As an alternative, we submit that electron capture occurs when a spinning proton in the nucleus becomes, momentarily, enmeshed with one additional sticky-coated neutron, suddenly reducing its spin rate and resulting in a reduction in its ability to contribute to the force field. Under these circumstances, for a brief period of time, a region of the force field becomes permeable and if, by chance, an electron passes over that region during that period of permeability, that electron can successfully penetrate the force field and consequently rush inwards towards the atom's nucleus, where it collides with a proton and, in the manner previously described, creates a neutron.

As in the case of beta-plus decay, when electron capture occurs there is a reduction of one in the number of protons present in the nucleus, meaning that the atom undergoes a transmutation into another kind of element. This transmutation is manifest as a reduction in the radius of the force field surrounding the nucleus, which in turn changes the pattern of the swarming electrons as they move about on its surface. This in turn affects the amount of force required to make the electrons vibrate, and thus changes the wavelengths at which the electrons of the newly created atom will emit EMR. As mentioned in the Wikipedia article, the new atom remains electrically neutral because the number of protons and electrons have both been reduced by one.

We have now reviewed the three modes of beta decay for which the Standard Model claims are 'mediated' by the weak force.

The three modes are quite dissimilar to one another. How does the weak force 'know' which decay mode to mediate in any particular set of circumstances? We submit that the belief in the weak force as the common agent in all three situations is simply incorrect. Beta-minus decay is properly understood as the erosion of unstable atoms by their passage through the medium of immaterial space. Beta-plus decay, at least in those situations in which it is artificially induced, is the result of the transformation of a virtual particle into two actual particles. Electron capture, which affects the behaviour of a subatomic particle (an electron) which is well beyond the purported range of the weak force, is the result of a temporary weakening of an unstable isotope's force field. The three different modes of beta decay all have very different explanations, none of which involve the so-called 'mediation of the weak force,' and thus there is no need to continue to believe in its existence.

It is worth noting however that these three alternative explanations for beta decay do share a commonality, and that is the existence of immaterial space. Beta-minus decay is the erosion of unstable atoms caused by their passage through immaterial space. In beta-plus decay a virtual particle is plucked from the 'vacuum' of immaterial space and transformed into two actual particles by changing a proton into a neutron and causing the emission of a positron. Electron capture is the result of the temporary weakening of the force field surrounding an atomic nucleus, which is itself a manifestation of immaterial space. And of course all particles, virtual and actual, short-lived and the seemingly eternal, are themselves differentiated material manifestations of undifferentiated immaterial space. Immaterial space, the Mind of God made manifest, is the fundamental basis of all that exists.

There is yet another type of decay which we also believe is best understood as the erosion of unstable atoms caused by their passage through immaterial space. This type of decay is known as 'alpha decay' and the Wikipedia article on the currently accepted theory of how it works contains the following description:

"Alpha decay is a type of radioactive decay in which an atomic nucleus emits an alpha particle (helium nucleus) and thereby transforms or 'decays' into a different atomic nucleus, with a mass number that is reduced by four and an atomic number that is reduced by two. An alpha particle is identical to the nucleus of a helium-4 atom, which consists of two protons and two neutrons . . . [With the exception of the decay of beryllium-8] alpha decay typically occurs in the heaviest nuclides . . .

"Alpha decay is by far the most common form of cluster decay, where the parent atom ejects a defined daughter collection of nucleons, leaving another defined product behind. It is the most common form because of the combined extremely high nuclear binding energy and relatively small mass of the alpha particle. Like other cluster decays, alpha decay is fundamentally a quantum tunnelling process. Unlike beta decay, it is governed by the interplay between both the strong nuclear force and the electromagnetic force . . .

"The alpha particle is trapped inside the nucleus by *an attractive nuclear potential well* (emphasis added) and *a repulsive electromagnetic potential barrier* (emphasis added). Classically, it is forbidden to escape, but according to the (then) newly discovered principles of quantum mechanics, it has a tiny (but non-zero) probability of "tunnelling" through the barrier and appearing on the other side to escape the nucleus . . .

"The quantum tunnelling theory of alpha decay, independently developed by George

> Gamow and by Ronald Wilfred Gurrney and Edward Condon in 1928 was hailed as a very striking confirmation of quantum theory. Essentially, the alpha particle escapes from the nucleus not by acquiring enough energy to pass *over the wall confining it* (emphasis added), but by tunnelling *through the wall* (emphasis added). Gurney and Condon made the following observation in their paper on it:
>
> '. . . Much has been written of the explosive violence with which the alpha particle is hurled from its place in the nucleus. But from the process pictured above, one would rather say that *the alpha particle almost slips away unnoticed'* (emphasis added).
>
> "The theory supposes that the alpha particle can be considered an independent particle within a nucleus, that is in constant motion but held within the nucleus by [the] strong interaction. At each collision with the repulsive potential barrier of the electromagnetic force, there is a small non-zero probability that it will tunnel its way out."

Let us begin by acknowledging that, while it was not the case in 1928, the phenomenon of quantum tunnelling is now an established fact. It has been demonstrated repeatedly in laboratory experiments that electrons possess the amazing ability to 'tunnel' from one side of a solid physical barrier to the other. This ability places a lower limit on the thickness of computer chips; if the chips are too thin electrons leak through them, causing errors. In these cases there is a physical barrier to be tunnelled through.

But we submit that there are no such physical barriers

within the nuclei of atoms. According to the quantum mechanical theory, "the alpha particle is trapped inside the nucleus by *an attractive nuclear potential well* (emphasis added) and *a repulsive electromagnetic potential barrier"* (emphasis added). A well is a hole in the ground. So is the theory claiming that the nuclei of atoms are full of holes, like a Swiss cheese? Of course it is only a 'potential' well, so maybe it's not really there. So do these 'wells' exist or not? And what about the 'repulsive electromagnetic potential barrier?' Is it real or is it not?

Let's assume for the moment that it is. This barrier, created by the electromagnetic force, supposedly is what keeps protons from coming into contact with other protons. Think about it. A proton, in this case a part of an alpha particle, is randomly moving around within the nucleus and moves towards another proton. But then it bumps up against a barrier that stands between it and the other proton. On very rare occasions it then 'decides' to tunnel through the barrier to get closer to that other proton and somehow does so, creating a passageway big enough to drag the entire alpha particle (consisting of two protons and two neutrons) through the tunnel with it. Assuming that all this actually occurs, where does it get the alpha particle? The tunnel does not lead to an escape from the nucleus; it leads to a position closer to the other proton. By definition, the electromagnetic barrier, if it exists, is between the alpha particle (specifically one of its protons) and another proton in the nucleus, not between the alpha particle and the wild blue yonder. By definition, a tunnel through this barrier is not an escape hatch.

When viewed in concrete terms, it quickly becomes evident that in this particular context the notion of quantum tunnelling is nonsensical. Quantum physicists will loudly protest, saying that one, the quantum world is bizarre and cannot accurately be viewed or understood in concrete terms; and two, that the mathematics supports this interpretation. We strongly disagree with the first of these objections, for we firmly believe that heading down that path leads inevitably to the land of magical thinking. As for the second

objection, if we have learned anything thus far, it is that an elegantly written mathematical equation is by no means a guarantee of the truth of its conjecture.

We submit that the quantum tunnelling explanation for the phenomenon of alpha decay is nonsensical not because quantum tunnelling never occurs, but because within an atomic nucleus there are no 'barriers' to be quantum tunnelled through. According to the theory, alpha decay "is governed by the interplay between both the strong nuclear force and the electromagnetic force." However, our model of the dynamics at play within the nucleus of an atom has dispensed with both of these 'forces.' The strong nuclear force, which supposedly not only changes from being attractive to being totally ineffectual over a minute distance, but also apparently creates 'wells' within the nucleus that 'trap' alpha particles, has been replaced by the much simpler (and much easier to visualize) notion of 'sticky neutrons.' The repulsive electromagnetic force has also been discarded, replaced by the idea that protons regularly come into contact with each other, but that when they do they instantly 'bounce' away from one another because of the fact that all protons are spinning in the same direction.

So in our model, alpha decay is actually the erosion of heavy nuclei caused by their passage through immaterial space. Because of the alpha particle's "extremely high binding energy" it acts like "an independent particle within a nucleus." In other words the two protons and two neutrons making up the alpha particle are more tightly bound together than the alpha particle as a whole is bound to the rest of the nucleus, and thus the alpha particle moves around within the nucleus as a unit as its protons randomly bounce off other protons. The passage of immaterial space through the nucleus places a certain but equal amount of stress on the 'connective tissue' that binds all of the protons and neutrons in any given nucleus together. The amount of this stress exerted on that connective tissue depends on the velocity of the nucleus through space, and the amount of gravitational stress being experienced by that space. Because the alpha particle is slightly

more than four times as massive as a proton, its connections to other neutrons are under four times the stress when those connections are pulled upon by the alpha particle's random motions, compared to the amount of stress exerted on the connective tissue when pulled upon by a single proton. The alpha particle's constant motion means that, like single protons but with more force (because of its greater mass), it is constantly pulling, then returning, pulling, then returning, alternately increasing and decreasing the stress it exerts on the connective tissue between it and other neutrons. Slowly, but at a steady rate (the element's half-life), the combination of the alpha particle's pulling and the passage of immaterial space through the nucleus will combine to sever the connective tissue connecting the alpha particle to the rest of each nucleus, and the alpha particle will be 'emitted.'

Gurney and Condon's description of this process now makes perfect sense: ". . . .one would rather say that the alpha particle almost slips away unnoticed." Just as a flowing river gently lifts a clod of mud off its bank and carries it away, so too does the passage of immaterial space free the alpha particle from the nucleus. While the analogy of a flowing river is useful, it is important to remember that, generally speaking, in the case of radioactive decay that which is doing the eroding (immaterial space) is at rest, and it is that which is being eroded (the nucleus) which is in motion.

Over the last sixty years, as the technology to smash elementary particles together at higher and higher velocities has advanced, physicists have discovered a bewildering array of sub-atomic bits and pieces. Because of their adherence to the Reductionist point of view, physicists believe that these bits and pieces are somehow significant and have catalogued some of them and given them names. We believe however, that, for the most part, all they have accomplished is to create a lengthy list of beergles. It is true that certain of these beergles appear regularly in their detectors, but given that their experiments result in up to 600 million collisions per second it is no surprise that certain patterns

appear in the debris fields. Most of these beergles exist for only a vanishingly brief period of time - - - the half-life of W and Z bosons is 3 x 10^-25 seconds - - - and appear to play no discernible role in the unfolding of the Game. An exception here is the muon which, when created by the collisions of cosmic rays with molecules in the atmosphere, live long enough and possess enough energy to penetrate objects on the surface of the planet. It has been suggested that muon-induced DNA mutations may have affected the evolution of hominids.

It is also true that the existence of a few of these beergles was predicted in advance of their discovery. Based on the historical example of P.A.M. Dirac, who in 1928 first formulated a fully relativistic quantum theory the equations of which required the existence of the positron, which was discovered four years later by Carl Anderson, physicists came to believe in the power of mathematics to predict the existence of as yet undiscovered quantum particles. This was a key moment in the evolution of physics: mathematics, which up until then had been primarily a tool of measurement, came to be seen as a tool with the power to predict. There is, however, a truly ironic twist to this tale. Dirac was the first to successfully combine the equations of quantum mechanics with the equations of Einstein's Special Theory of Relativity. But we have invalidated the Special Theory, which means that Dirac's equation is in some way flawed. This means that the equation's prediction of the existence of the positron was to some greater or lesser degree serendipitous.

Nevertheless, physicists used mathematics to predict the existence of the W, Z, and Higgs bosons prior to their discovery. But it is important to note that these predictions allowed for a range of masses within which these particles might be found. So, given the propensity for space (the 'vacuum'), when induced by the necessary conditions, to produce a wide range of beergles, it is unremarkable that particles whose masses fall within the predicted ranges were found. What is remarkable is the ability of space, when induced by the necessary conditions, to produce, if only

momentarily, particles whose mass is greater than the mass of the particles whose collisions created the necessary conditions in the first place.

Chapter Forty-eight

PHYSICS: A SUMMING UP

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So we see that instead of the seventeen 'fundamental particles' postulated by the Standard Model, there are in fact only three truly fundamental particles, that is, particles that remained after the matter-antimatter annihilation event which occurred in the opening chapter of the Game of Being, and particles whose presence is essential to the ongoing functioning of the Game: protons, electrons, and neutrinos. Neutrons, while they are indeed essential to the ongoing functioning of the Game, we do not consider to be 'fundamental' because they are composites of protons and electrons. Neutrinos appear to play an essential role in the creation of supernovas, the necessary process by which star factories distribute their products that go on to create planets, moons, and potentially, lifeforms. Neutrinos apparently come in three different 'flavours,' each of which is considered to be a separate fundamental particle in the Standard Model. However, we consider these three flavours to simply be variations on a theme and are therefore one fundamental particle, not three. The rest of the particles included in the Standard Model, muons, mesons, and bosons, while interesting perhaps in their own right, are merely beergles that play no essential role in the unfolding of the Game,

with the possible exception of muons, which may play a role in the evolution of lifeforms.

In addition to reducing the number of fundamental particles from 17 to 3, we have also eliminated the need to believe in mysterious forces. We have shown that the strong force, the weak force, and the repulsive aspect of the electromagnetic force all have logical explanations. However, there are puzzles still to solve, mysteries which yet demand an unravelling. As we mentioned earlier, one of these is the creation of neutrinos. We know that neutrinos arise from various sources, but we do not yet know the details of their births. How, that is, by what specific means, are neutrinos created? No human knows.

Another major mystery which haunts our dreams is the lack of a logical explanation for the attractive aspect of the so-called electromagnetic force. Physics says that protons carry a positive charge and that electrons carry a negative charge, and that these opposite 'charges' are 'attracted' to one another. But we consider this description to be a mere bookkeeping device. It does not explain how, that is, by what specific means, this process of attraction is manifest. Somehow, the protons in an atomic nucleus seem to send a signal out into the universe which says to electrons, “Come to me.” And somehow, electrons are not only able to respond to this message, they can tell whether or not the message has already been responded to by another electron.

The number of spinning protons in the nucleus of an atom determines the radius of the force field surrounding the nucleus; the more protons in the nucleus the larger is the radius. The larger the radius, the greater is the surface area of the force field. The total surface area of the force field determines how many electrons the force field can accommodate. This relationship between the number of protons in the nucleus and the total surface area of the force field insures that an electrically neutral atom will have an equal number of protons and electrons. In general, the surface area of the force field of any particular atom is just large enough to accommodate a number of electrons that is equal in number to the

number of protons required to create a force field with those dimensions. There are, however, exceptions to this general rule. The force fields of some elements, for example fluorine, bromine, iodine, oxygen, and sulphur are commodious enough to accommodate one or even two additional electrons, thus creating negative ions, also known as 'anions.' Thus electrons will be attracted towards the nucleus of an atom until the force field is full - - - until there is no more room at the inn. How is this possible? How do protons attract electrons, and how do electrons deduce that a force field is full?

We propose the following as a potential solution to this conundrum: recall that the force field around the nucleus of an atom is a swirling vortex in space. As such, it 'sucks in' any debris - - - such as an electron, which is itself a tiny swirling vortex in space - - - which strays too near to the edge of its whirlpool. But there is a limit to the amount of debris which can be contained within the whirlpool. If too much debris accumulates, pieces of the debris are 'spit or knocked out' of the whirlpool back into the non-rotating space surrounding the atom until all the remaining pieces of debris can fit comfortably within the swirling vortex of the force field. This suggestion answers both of the questions posed at the end of the previous paragraph, without relying on the invention of mysterious 'forces.'

In the year 2000 physicists at CERN announced the discovery of a new kind of matter. They named this new kind of matter a 'quark-gluon plasma'. Since we have rejected the quark-gluon model of the structure of hadrons we will ignore this characterization of this phenomenon, but we have no doubts about the discovery of the phenomenon itself. At CERN this plasma was created by accelerating ions of lead to nearly the speed of light and then smashing them together in head-on collisions. Physicists at Brookhaven National Laboratory later repeated the experiments using ions of gold. These collisions resulted in the creation of temperatures exceeding 1.66 x 10^12 K. At this temperature the components of the lead and gold nuclei - - - the protons and

neutrons - - - melted and produced the detected plasma. Physicists believe, and we agree, that a similar plasma once filled the entirety of the Field of Play and was the precursor to the creation of matter and antimatter.

We have discussed the evolution of the early universe earlier but we will revisit the topic now with the knowledge of the demonstrated existence of this 'proton-neutron soup' in hand. After the period of Cosmic Inflation had been completed and the hot bubble of space had expanded until it could stretch no more and then contracted to its present size, the bubble experienced a series of so-called 'phase transitions' as it cooled. The key to understanding the large-scale structure of the universe today is the idea that the temperature of the bubble was not then uniform, but was streaked throughout with regions which were hotter than their surroundings. These regions would go on to become the filaments of the cosmic web we now observe.

The first phase transition occurred when the hot bubble of space 'broke into a sweat,' which created everywhere the plasma condition created in 2000 by the scientists at CERN. Those regions of the bubble of space which were hotter began this first phase transition before the (relatively) cooler regions and thus this transition lasted longer in those regions. We propose that this resulted in a plasma which was denser in those regions.

As the bubble of space continued to cool a second phase transition occurred. During this second transition the cooling plasma gave birth to individual particles: protons and electrons and their antimatter opposites. Whether or not neutrinos were created at this point is unclear. It is probable that other species of particles such as bosons, pions, and kaons also appeared at this juncture, but being unstable they quickly decayed and disappeared. If these unstable particles did appear at this point in the early evolution of the Field of Play, then neutrinos also would have been present since they are products of the decay of pions and kaons.

In those regions where a higher initial temperature had resulted in a denser plasma, more matter than antimatter was

created by the second phase transition, whereas in the cooler regions where the plasma was less dense the amounts of matter and antimatter created were more or less equal. The universe then went through a phase during which matter and antimatter particles mutually annihilated.

After all the antimatter had been annihilated what was left was a plasma of protons and electrons, situated in those regions of the bubble of space that had originally been hotter immediately following the era of Cosmic Inflation. This plasma very much resembled the plasma we find in stars like the Sun today, although initially its temperature was much higher. Of course there were as yet no stars organized into galaxies, but it was at this point that the filament and void cobweb structure of the universe was formed. Eventually the temperature of the plasma fell to the temperature prevailing today in the core of the Sun, some 15 million K. This permitted the 'painting ' of some protons by electrons, and the first neutrons were created. In turn, as the cooling continued, this permitted the creation of small amounts of primordial helium and lithium nuclei. This condition continued for some time until the temperature of the filaments dropped below the point at which electrons could permanently bind to atomic nuclei. At this point a final phase transition occurred which allowed the creation of electrically neutral atoms of hydrogen, helium, and lithium. It then became possible for the Game of Being to begin to construct the star factories which were necessary to produce the elements required to make possible the appearance of lifeforms - - - the jewels in the crown of God's Creation.

We have now arrived at the end of our journey of exploration into the phenomenological workings of the Game of Being. Along the way we have provided a new understanding of how and why the Field of Play and its contents came into existence, and of how and why it will at some point cease to be. Among other things, by demonstrating the existence of immaterial space, we have refined the Einsteinian understanding of gravity; provided an explanation for the results of the Michelson – Morley experiment;

supplied a new and more logical understanding of 'black holes' and the cosmic microwave background; provided an explanation for the large-scale structure of the universe; cleared away the existing confusion surrounding the concepts of time, energy, mass, consciousness, reality, and faith; invalidated the Special Theory of Relativity; provided an alternative explanation for the behaviour of sub-atomic particles; done away with the need for the notions of dark matter and dark energy; described two ways in which electromagnetic radiation is generated; and refuted the idea that the universe is expanding. And, of course, we have re-defined our understanding of the nature of God, the Creator.

All this has been made possible due to our firm conviction that apparently empty space, forever considered by humans to be no-thing, is in fact some-thing. Immaterial space is a pervasive presence in the universe; indeed, it is the primordial fundamental 'stuff' of which the Field of Play and all that it contains consists. It is immaterial: it is not made out of matter, matter is made out of it. And it is quite visible; humans have simply been blind to its presence.

If a state of being undergoes a change of state to another state of being, then there must be some-thing which has undergone the change of state. With this thought in mind, stand in the middle of a well-lit room at night and look about you. What do you see? Perhaps you see a desk piled with books and papers, an office chair, a bookcase full of books, a bed, a bedside table, a fan, and a door. Now shut the door, close the drapes on the window, turn out the light and, standing in the middle of the room, gaze about yourself once again. You can no longer see the desk, the chair, the bookcase, the bed, or the table, fan or door. Some-thing is blocking your view. What was previously transparent has now become opaque. Electromagnetic radiation within a particular range of frequencies is no longer passing through it. It has undergone a change of state. So now, open wide your eyes, and your mind, *and do not merely look, but see. Behold space! The undifferentiated immaterial Mind of God made manifest.*

PART FOUR

A PATH FORWARD

“I dream of things that never were
and ask 'why not?'”
---George Bernard Shaw

“Come, my friends,
'Tis not too late to seek a newer world.”
---Alfred, Lord Tennyson

Chapter Forty-nine

LAUNCH

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He finished rolling the joint and got up from his kitchen table. In six steps he was across the small studio apartment, where he placed the joint in the ashtray which sat upon the nightstand that stood beside his bed. Thank god it was Friday. It had been another long hard week, and although he was happy about the overtime he'd been putting in, everything was getting so expensive and he could use the extra bucks, he was looking forward to having a toke and just relaxing. He then crossed back into the kitchen, opened the fridge and grabbed a bottle of water. He took several large gulps. The Chinese takeout he'd had for dinner had made him thirsty. Hot and spicy Szechuan. He had gotten home in time to watch the Mets bullpen blow another one. He put the bottle back into the fridge and turned out the ceiling light. Now the only light in the apartment came from the streetlight, filtering through the open blinds on the window that looked out on the street in his busy Brooklyn neighbourhood. Even though it was late, there was still plenty of traffic and people out on the street, enjoying the cool of the evening after another hot July day.

He propped the pillows up against the headboard and stretched out on the bed, leaning back into their softness. Ah, another day done. For a few moments he just lay there, savouring the sensation of his tired muscles settling into the mattress, listening to the sounds of the street seeping in through his open window. Suddenly there was a blare of music coming through the thin wall behind his head. As usual, Manny, his neighbour, had his stereo cranked up. He sighed. The trials and tribulations of apartment living. He retrieved the joint from the ashtray and, using the lighter which had been sitting beside it, fired it up. He took a tentative drag to make sure it was going and then another, inhaling deeply and holding it. He could feel the smoke expanding into his lungs and then, almost immediately, the instant head-rush. Manny sold high quality bud. He exhaled, paused, and then took another long toke. The buzz was quick and powerful. As he turned his head to place the joint in the ashtray he noticed the time on the radio alarm clock on the nightstand, the red numbers glowing brightly and seeming to dance in front of his eyes. 12:00 a.m. The witching hour, he thought. Manny was playing Leonard Cohen's song, The Future. He liked Leonard Cohen. Too bad he was gone. Leonard had been a real mensch. The words of the song came clearly through the wall. “When they said repent, repent, repeeeent, I wonder what they meant. When they said repent, repent, repeeeent, I wonder what they meant.” Yes, he thought to himself, I wonder. What did they mean? Leaning his head back into the pillows, he closed his eyes and took a deep breath. Then he drifted off.

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When he opened his eyes he was surprised by the sunlight streaming through the window. He was still sitting propped up against the pillows. What time was it? He turned his head to check the clock and noticed last night's joint sitting in the ashtray. 10:01 a.m. Wow! That's the latest he'd slept in weeks. That weed of Manny's had really zoned him out. But he felt great. In fact, he felt more refreshed than he had for a long time. Today was going to be a good day. He swung his legs off the bed and stood up. He stretched his arms out above his head and then straight out from his sides and did a couple of trunk twists in each direction. Then he bent down and effortlessly touched his toes. Good. No stiffness. His body felt rejuvenated. He padded into the tiny bathroom and took a piss. Then he grabbed his Braun electric razor - - - a birthday present from his mother - - - and ground the stubble off his chin. He grabbed the towel that was draped over the shower curtain rod and walked over to the kitchen sink. He splashed some water on his face and then ducked his head under the faucet, letting the water soak his hair and run over the back of his neck. Ah. Fully awake. He towelled his head dry and then, standing in front of the mirror of his medicine cabinet, carefully combed his hair. He studied his reflection. No lines yet. He looked pretty good for a guy his age. He decided that he would go to the Starbucks around the corner and have a coffee and a muffin for breakfast. He hadn't been in there for more than a month. He sat on one of his two kitchen chairs and pulled on his sneakers. Then he walked over to the window and gazed out on the street. Lots of blue sky. Probably gonna be another warm one. Several cars and a large truck drove down the street. Something struck him as odd, but what was it? He couldn't quite put his finger on it. He shrugged and let it go. Heading for the door he reached into the pocket of his jeans and checked to make sure that twenty was still there. Yup. That would cover breakfast.

He walked down the three flights of stairs and out onto the street and turned right. As he walked along the sidewalk several more cars passed by on the street. Again he had the feeling that

something was odd. But what was it? Then it hit him. The cars were making no sound. They glided by silently. What was going on? Had he gone deaf? A young couple passed by him in the opposite direction and the woman broke into laughter. That he heard clearly, so no, he wasn't suddenly deaf. He reached the corner and turned right, headed for the Starbucks half a block away. More cars ghosted silently down the street. How could this be? How could all the cars in Brooklyn have gone electric overnight? By the time he reached the entrance to the Starbucks the high he had felt when he first woke up had dissipated, and he was starting to feel a little shaky. Something wasn't right.

He stepped into the coffee shop and then stopped dead. It was all different. There were a few customers in the room as usual, but the tables they were sitting at were round instead of square, and the chairs were not the plain wooden chairs that had been here when he last dropped by for a coffee. These chairs had curved backs and arms and padded seats. And the walls. The walls were completely different colours. He walked slowly towards the barista's station, looking uneasily about the place. His gaze was arrested by the sight of a strikingly beautiful woman who stood facing him off to one side of the room. She was tall, with shoulder length jet black hair, prominent cheek bones, and full lips that were covered with bright red lipstick. She was wearing a red blouse that matched the lipstick and a pair of tailored black slacks. She had a rainbow striped bag dangling from her left shoulder and a folded newspaper in her hands. She was looking directly at him with a rather quizzical look on her face. Everything felt odd. He stepped up to the counter and said to the twenties-something man standing behind it, “I see that you have been doing some redecorating.”

“What do you mean, brother?” the young man replied.

“New chairs, new tables, fresh coat of paint on the walls. Everything is different since the last time I was here,” he said.

“So you haven't been in for quite awhile,” said the young man.

“More than a month,” he said.

The young man looked at him with a strange look on his face and said, “Brother, I've been working here for more than three years, and those are the same tables and chairs that were here when I started.”

He felt as if the room was about to start to spin and grabbed the edge of the counter top to steady himself. “What did you say?”

“I said those are the same tables and chairs that were here when I started three years ago. Same paint job too. Say, brother, are you all right? You're looking a little pale.”

He felt lightheaded and found it difficult to speak. Could he still be high from that joint he smoked last night? It had only been a couple of tokes. At last he managed to stammer, “I'll . . . I'll have a large Caffe Americano and a blueberry muffin. To go. Please,” he added, feeling increasingly disoriented.

“Okay, brother.”

While he waited for his order he told himself to be calm and to just breathe normally. I must still be buzzed, he thought. Had Manny laced his herb with some chemical? He glanced around the cafe, a little paranoid, afraid that he was making a fool of himself. His gaze roamed in the direction of the beautiful dark haired woman, and he was embarrassed to discover that she was now staring at him, very intently. He tried to give her a halfhearted smile, but she did not smile back. Now he felt really awkward. Thankfully, the young man returned to the counter with his coffee and muffin.

“Thank you,” he said. “How much?”

“That'll be nine fifty.”

Inflation strikes again, he thought. He reached into the pocket of his jeans and pulled out the folded twenty dollar bill and handed it over. The young man straightened out the bill and looked at it, and then looked at him. “What's this?”

“What do you mean, what's this?” he said.

“I mean, brother, what is this?”

“It's a twenty dollar bill.”

“What's a twenty dollar bill?” the young man asked.

"It's money. Cash. Legal tender. It's real. It's not counterfeit." He felt the panicky feeling he'd been struggling to control began to increase and said, in a voice that was a little louder than he intended, "Look, I just want to pay for my coffee and muffin and leave, okay?"

"Well," said the young man, "You can't pay for them with this. I don't know what this is."

Suddenly she was standing beside him. "What's happening here, JB?" her voice was cool and calming.

"I don't know, Sophia," said the young man, holding up the twenty. "This brother here is trying to pay for his coffee with this piece of coloured paper. It's got some dude's picture on it."

"Let me see that," she said, taking the bill from the young man's fingers. She looked carefully at the twenty, checking out both sides. Then she nodded, as if she had just come to a decision. "It's okay, JB. I'll cover it." She hung on to the twenty with her left hand.

"Are you sure, Sophia? The brother's acting a little strange."

"Yes, it's fine JB. My treat." She turned to him and looked him directly in the eye. She was almost as tall as he was. "Brother, let me buy you a coffee."

Without waiting for a reply she turned back to the counter and held her right hand, palm down, over some device sitting on the counter that he had not noticed before. There was a beep and then a female voice said, "Welcome to Starbucks. Verifying palm print." There was a short pause and then another beep. "Palm print verified. Transaction approved. Thank you for coming to Starbucks. Goodbye." The device made a soft whirring noise and a piece of paper was spit out the back.

"Do you want your receipt, Sophia?" asked the young man.

"Yes, actually I do, JB. I want a record of this moment." She took the receipt and then with her right hand grabbed his left arm saying, "You. Come with me," in a voice that commanded cooperation. "Don't forget your coffee and muffin."

Dumbfounded by what was happening he nodded mutely and picked up the coffee and bag with the muffin in it and followed her as she pulled him out the door onto the sidewalk.

"This way," she said, turning right and keeping a firm grip on his arm.

"Where are you taking me?' he asked.

"Around the corner," she replied, not letting go of his arm.

They reached the corner and turned right. "What is going on?" he asked. "Who are you? Why are you doing this?'

She glanced at him and said, "Your jeans. It's because of your blue jeans."

"My blue jeans? What about them?"

"I'll explain in a moment. Come this way." They had reached an open area between the buildings which was bordered on all sides by a six foot high hedge. They turned off the sidewalk through a gap in the hedge. Within the enclosure there was a patch of green grass, a couple of flower beds, and a park bench.

The lightheaded feeling returned, stronger than before. "I don't remember this park being here. I feel dizzy," he mumbled.

"Sit down," she said. "Eat your muffin. Perhaps your blood sugar is low."

He nodded. Yes, perhaps that was it. He set the coffee down on the bench and took the muffin out of the paper bag and bit into it. It was good. Oh, it was so good! He was suddenly ravenous. He felt like he hadn't eaten in days. He took another bite and then pried the lid off the coffee and took a sip. Hot! While he ate the rest of the muffin she sat quietly beside him, coolly appraising him with her deep blue eyes. When he had finished the muffin he took another sip of coffee and said, "Thanks for the coffee and muffin. I needed that."

"My pleasure, brother. You ate that muffin like you hadn't eaten for some time. Do you feel better now?"

"A little. I still feel a bit lightheaded, like the world will start spinning around if I don't concentrate on keeping it still."

"That's understandable, all things considered. I suspect, my

friend, that you have travelled quite some distance."

"What do you mean?" he asked. "I haven't come from far away. I live just around the corner from the Starbucks in the opposite direction."

She did not answer his question. Instead she said, "How long have you lived in Flatbush?"

"I've lived in the same apartment for about seven years," he replied.

"And you've walked down this street before?"

"Many times."

"And yet you don't remember this park being here?"

"No. No, I . . . I don't," he admitted, looking around. "This is . . . this is very confusing. My blue jeans," he said after a pause, as if grasping for a straw of his sanity. "You said something about my blue jeans."

"Where did you get them?"

"At the Old Navy."

"When did you get them?"

"Three, four months ago. Why?"

"Brother, I'm not sure how to tell you this, but it's been more than fifty years since blue jeans went out of fashion, and Old Navy went out of business decades ago."

The hedge began to tilt and he swallowed hard, struggling for control. "But . . . but that's impossible. I was there. Not that long ago. I remember."

She held up the twenty dollar bill, stretched out between the thumb and index fingers of each hand. "Where did you get this?"

He felt perplexed by her questioning. "Uh, I got it from an ATM."

"An ATM?"

"Yes, an automatic teller machine."

"How does an automatic teller machine work?"

He looked at her askance. "You . . . you put your bank card into the machine, enter the amount you wish to withdraw, and it spits out your cash."

"Where is this ATM, as you call it?"

"At the Chase bank on Flatbush Avenue."

"Brother, I know this will be difficult for you to believe, but there is no Chase bank on Flatbush. There are no Chase banks anywhere. All the banks in the country were folded into one corporation a hundred years ago, the Bank of America. And there are no automatic teller machines. And there is no more cash. The United States has been a cashless society for a hundred years. You saw how I paid for your coffee. Every commercial operation in the country now has a palm reader." She paused. "Tell me brother, who is the current president of the United States?"

Behind her head the hedge seesawed back and forth. Was that some sort of trick question? Like a wave washing over him, it dawned on him that he might not know the correct answer. "Uh, Donald Trump?" he ventured in desperation.

She considered him carefully for a moment. "Brother," she said gently. "Tell me what year you think it is."

What year do I *think* it is? he thought, his panic rising to new heights. Her clear implication was that it was not the year he thought it was. The hedge began to spin. Okay, he said to himself, that's it. I'm swearing off weed. Just make this stop. He was afraid to answer her question.

"What year is it?" she repeated.

"It's . . . it's 2019," he managed to reply, somehow knowing that this answer was incorrect.

She reached into her brightly coloured shoulder bag and pulled out the newspaper she'd had in her hands at Starbucks. "Check this out," she said softly, with a note of awe in her voice.

He opened the folded newspaper to the front page. At first the letters wriggled crazily in front of his eyes. Focus, he told himself. Focus, damn it! The letters slowly resolved themselves into the familiar heading. The New York Times. Underneath in smaller letters it said New York Wednesday July 19 2141. "This can't be happening," he croaked. He gaped at her in disbelief. He paused, and tried to gather his wits. Eyeing Sophia warily he

whispered, “Are you real?”

For the first time she smiled at him and, reaching out to touch his arm said, “Yes, my friend. I am real.” Her smile was dazzling. It made him feel as if all the sunshine in the world was pouring down on him alone. Mercifully, over her shoulder the hedge had stopped dancing.

Chapter Fifty

AWAKENING

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Not certain of the truthfulness of her answer but emboldened by the warm radiance of her smile he asked, “Who are you? What are you? Are you some kind of angel?”

She laughed, a bright tinkling sound, and asked, “Do you believe in angels?”

“No. Not really,” he said sheepishly. “But right now I'm so confused I don't know what to believe.”

She continued smiling and said, “Who am I? My name is Sophia Christopolous. As for *what* I am, I am not an angel. Angels are purely mythological. Know this, brother, I am a human manifestation of the Mind of God, having the experience of being a professor of American history at SUNY.”

“At SUNY? I did some renovation work at SUNY, last year. At least . . . I think it was last year,” he said doubtfully.

“Before my time,” she replied. “What kind of work do you do?”

“I'm a carpenter.”

"Like Jesus."

"I suppose. I've never really thought about it. What did you mean when you said that you are a human manifestation of the Mind of God? What does that mean?"

She paused for a moment, considering. "We'll get to that. First, tell me brother, what is your name?"

"Michael. Michael Messenger."

"Oh my God!" she gasped, covering her mouth with her hand, her eyes wide. The last piece of the puzzle clicked into place. Now it was her turn to gape in disbelief.

"What? What's wrong?" he said, looking over his shoulder, thinking she had seen something behind him.

"It's you. It's you! I can't believe it!" she cried.

"What do you mean, it's me?" he said, her reaction causing the panicky feeling to begin to return.

She took a deep breath and then said, as calmly as she could, "I need to show you something." Reaching into her rainbow coloured bag which was sitting on the bench between them, she pulled out a book with a black mottled faux leather cover that reminded him of the bible his grandmother once had. She handed the book to him saying, "Look at this." Embossed in gold letters on the front cover were the words The Game of Being. Under that, in smaller letters, it said The Universe: An Explanation. Towards the bottom of the cover was the single word Messenger. "Have you ever seen this book before?"

He stared at the book in his hands and slowly shook his head. He suspected that he was still hallucinating. "What is this? Is this some sort of joke? I don't understand."

"I assure you this is no joke," said Sophia seriously. "I believe that this is the book that you will someday write. If I am not mistaken, this is the book you have travelled through time to obtain."

"That's crazy," he said. "I'm a carpenter, not a writer."

"The idea of time travel is crazy too. According to that book it should be impossible. Yet here you are," she replied.

“But I don't remember writing a book.”

“That's because you haven't done it yet.”

He gingerly opened the front cover of the book. On the inside of the first blank page was a neatly penned handwritten inscription: 'For my beautiful daughter Sophia, wise beyond her years, on her sixteenth birthday. Cherish this book always and it will light your way. Love you forever, Father.' Looking into her eyes he said, “Your father gave you this?”

“Yes. Three days after my birthday he was killed in a traffic accident. Ever since then I have carried it with me wherever I go. It makes me feel like he is always beside me. It is my most precious possession.”

He closed the cover of the book and handed it back to her feeling, under the circumstances, that he could not be trusted to handle such a precious thing. She carefully placed the book on the bench between them.

“I'm sorry to hear about your father,” he said.

“It was a terrible blow,” she replied sadly. “I don't think I have ever really gotten over it. I loved my father very much. He was a very special person. But such was his fate. His death on that morning was as inevitable as the rising of the sun.

“Inevitable?” he asked. “Why do you say that?”

“In this book you teach humanity that the Game of Being is fully deterministic, that the state of the universe at any given moment is fully determined by the state of the universe in the moment immediately preceding it, and that therefore every event that takes place in the universe takes place inevitably. The inevitable *always* happens. That's what makes the inevitable inevitable.”

“I'm not sure that I follow you,” he said.

“Consider the case of my father,” she went on. “My father was an architect. On the afternoon of the day before he died he took a phone call in his office during which he arranged to meet someone at a building site early the next day. Because of that phone call, he did not take his usual route to work. Instead he took

a route which led him to enter an intersection at the precise moment that another driver ran a red light and smashed into his car, killing him instantly. If he had not set his alarm for 6:00 a.m. that morning he would not have been in that intersection at that precise moment. If he had taken either a little more or a little less time in the shower that day, he would not have been in that intersection at that precise moment. He usually drank two cups of coffee before going to work. Because he was concerned that he would be late for his appointment, on that morning he drank only one. If he had taken the time to drink his usual second cup, he would not have been in that intersection at that precise moment. If he had not paused on his way out of our kitchen to kiss the top of my head and tell me he loved me, he would have pulled out of our driveway a few seconds earlier, and he would not have driven into that intersection when he did. All of those events, each being an element in the state of being of the entire universe at that particular moment, and all the moments in between those events, and all the moments in his life leading up to those events, each following inevitably upon the moment immediately preceding it, in an unbreakable chain of cause and effect, led, ineluctably, step by step, to his inevitable death. The Game of Being is fully deterministic. Do you see now?'

"I think so," he replied. "But what about free will? Isn't it true that we make choices?"

"Free will is one of the several illusions which are embedded in the Game of Being. And of course we make choices. But the available options from which we can choose in any given moment are predetermined by events that have occurred prior to that moment, and the choice we make in any given situation is contingent upon our previous experience. Normally in the moment in which we make a choice, we are not consciously aware of these facts. We are not aware of all the events which had previously occurred that created the situation which led us to that particular moment of choice, so it seems to us in that moment that we are exercising our 'free will.' But this is an illusion."

He thought about this for a moment. “So you are saying that everything that happens in our lives, including our deaths, are all predetermined.”

“Yes, but the illusion of free will prevents us from behaving as if that were the case. And although there are exceptions, in general the complexity of the Game prevents us from being able to predict with 100 percent certainty the specific details of what will happen in the future. My father's death was completely inevitable, while at the same time it was entirely unforeseeable.”

“So if the choices that I make are inevitable, how can I be held responsible if I break the law?” he asked.

“Ah, my friend, that is a good question,” she replied. “Once this understanding of how the universe functions became widely accepted, it did not take long for some clever lawyers to argue that their clients could not be found guilty because their crime was inevitable, that they had no choice in the committing of it. But there was a simple logical solution to this problem. Legislatures everywhere simply passed laws which stated, in effect, that 'the universe made me do it' is not a valid defence against a charge of criminal misconduct. So that while it is true that the commission of any particular crime is inevitable, criminals can still be held responsible for the choices they have made.

“One of the most important lessons of The Game of Being is the truth that because the Game is utterly deterministic, there is no right or wrong to the functioning of the universe. The universe-at-large is completely amoral. Every event which occurs, occurs inevitably, and it is a waste of breath to categorize events which have already occurred as right or wrong. Likewise, it is metaphysically incorrect to judge an occurrence as 'unacceptable.' In fact, it is counter-productive. Once an event has occurred it cannot be undone, and to label it as 'unacceptable' merely gets in the way of accepting that which is and behaving accordingly. From the human perspective, there is only behaviour which is wise versus behaviour which is foolish; and morally and legally, there is only behaviour which is permissible versus behaviour which is

impermissible.

"I see," he said. "I think I understand. What else is in this book, this book you say I will someday write?"

"A great deal," Sophia began. "First things first. You asked me what I am, and I told you that I am a human manifestation of the Mind of God. Your book taught humanity a prayer called the Song of Being, which explained that every, single, thing, in what you called the Game's Field of Play, everything in the universe is a direct manifestation of the Mind of God. Everything in the universe, from stars to planets to elephants to humans to amoeba, is a direct manifestation of the Mind of God. Therefore, God being every thing, God is every where. God is all around us. According to your book, God created the universe so that God could experience material existence. In this view, the universe created your body so that God can have the experience of being you."

He was listening intently to what she was saying and made no comment, so she continued, "Your book also rewrote human understanding of the phenomenological functioning of the universe. Among other things, your book invalidated Albert Einstein's Special Theory of Relativity; convinced people of the existence of immaterial space, the medium which makes possible the propagation of light; used the idea of immaterial space to refine Einstein's theory of gravity and to provide an explanation for the red-shifting of light from distant galaxies, thereby dispensing with the theory that the universe is expanding."

Astonished by her words he protested, "That seems to be a tall order for a simple carpenter. I have always been interested in physics but beyond high school courses I have no training."

"In your book you credit The Dancing Wu Li Masters, a book about developments in the field of physics in the 20th Century, by an author named Gary Zukav, for setting you on the path which led to your discoveries."

Now he was truly astounded. Shaking his head in disbelief he said, "That book is on my bookshelf. I read it a few years ago, twice. I found it fascinating."

"You will put what it taught you to good use," Sophia said. She continued, "Of all the teachings contained in your book, your analysis that love is the fundamental solution to the problems threatening to overwhelm humanity was the most important. Following in the footsteps of Jesus Christ and many others who came before you, you developed the idea of the logic of love by emphasizing that the Game of Being is logically structured, and that only by the application of logic could humanity hope to solve the problems confronting it. You argued that if humans would accept two basic premises: that every thing in the universe is a direct manifestation of the Mind of God, and that God, as a result of our gratitude for the gift of existence, is deserving of our love and reverence, then it follows logically that our fellow beings, themselves being a direct manifestation of the Mind of God, are each deserving of our love and compassion. If we lash out at others in anger, if we allow our emotions to dictate our actions, our behaviour is frequently illogical, and problems, instead of being solved, multiply. This is because in those instances we are behaving in a manner which is not consistent with the basic *modus operandi* of the Game of Being.

"To overcome this problem, your book teaches that each human must exercise their illusion of free will to make a conscious, intellectual decision to treat their fellow humans with love and compassion. In order for human civilization to survive, humans needed to *choose* love. The message that love is the solution to our problems had been delivered to humanity many times before you came along, and had, for the most part, been ignored. But because your deliverance of this message was accompanied by a revelatory understanding of the phenomenological functioning of the universe, humans listened this time and took heed. People realized that if human civilization was to survive, homo sapiens must evolve.

"We could not evolve physiologically quickly enough to adapt to the changes we had wrought upon the planet. Our only choice was to evolve socially. In order to evolve socially, we had

to evolve economically. In order to evolve economically, we had to evolve politically. In order to evolve politically, we had to evolve psychologically. In order to evolve psychologically, we had to evolve spiritually. In order to evolve spiritually, we had to evolve theologically. And in order to evolve theologically, we needed a new understanding of how the universe functions. Your book, The Game of Being, provided that new understanding."

"Are you saying that this book I have not yet written will change the course of history?" he asked. "That's a heavy responsibility to lay on the shoulders of an unknown carpenter living in a small apartment in Brooklyn."

"Yes, that is what I am saying. But, you know brother, no pressure," Sophia said, smiling.

"Easy for you to say," he retorted.

"You may be confident that you will succeed in this task, Michael. Here is the proof," she said, touching the book sitting on the bench between them.

"But I have no idea of where to even begin," he protested.

"You began with the idea that in order to fully understand something, be it an object or a system, one must be clear about that thing's purpose. Your understanding of the fundamental nature of the universe flows directly from your conclusion that the Creator's purpose in creating the Game of Being was to permit God to experience material existence, so as to experience unceasing change and endings.

"Experience endings? What do you mean?" he asked.

"Your teachings endorsed the long-standing belief that God is eternal. God has always been and always will be. Your idea was that since God is eternal, God longed to experience an ending. Thus one of the fundamental Rules of the Game is that in the Game of Being all beginnings must have an ending."

"Hmmm. Yes, I see. That makes sense." He paused, then continued, "So by grasping God's purpose, we can understand why the universe functions as it does."

"Correct. Using the question, 'What is its purpose?' as a

framework allowed humanity to begin to confront the serious challenges it was facing. By the end of the second decade of the 21st Century, the global situation was becoming increasingly grim. The impact of global warming was causing heat waves, droughts, floods, forest fires, and ever more powerful cyclones and hurricanes. Around the world liberal democracies were being threatened by the rise of autocracies fuelled by right-wing populism. Western nations were inundated with a rising tide of migrants desperate to flee the poverty and political repression of their homelands. In the early 2020's wars of aggression broke out. Chaos was advancing on many fronts simultaneously. Our world was in peril. Every day it was becoming more and more fractured, toxic, seemingly out of control. We were being torn apart by immense gulfs of selfishness, distrust, fear, hatred, indifference, denial. (296)

"Europe's identity in the twentieth century had been painfully wrought in the wake of dreadful carnage. By 2020 its hard-won political coherence, marked by a nervous insistence on peace, felt endangered. Neo-Fascist parties in France, Italy, and elsewhere were gaining in support, re-branding themselves into respectability, trying to erase the fact that the previous century's darkness had its genesis in ideas like the ones they were now disseminating so blithely. (297)

"The conditions that make a society vulnerable to political violence are complex but well established," Sophia continued. "Highly visible wealth disparity, declining trust in democratic institutions, a perceived sense of victimhood, intense partisan estrangement based on identity, rapid demographic change, flourishing conspiracy theories, violent and dehumanizing rhetoric against the "other," a sharply divided electorate, and a belief among those who flirt with violence that they can get away with it. (298)

"All of those conditions were present in American society at the beginning of the third decade of the 21st Century," said Sophia. "According to records of the Federal Reserve, at the end of 2021 the richest 1% of the country's population owned 32.3% of the

nation's wealth, while at the bottom of the wealth distribution curve one in ten household's liabilities were greater than their assets, giving them a negative household net worth of -$1,450. By the second quarter of 2023, 69% of the wealth in the United States was owned by the top 10% of earners, while the lowest 50% of earners owned only 2.5% of the total wealth. According to Bankrate's 2023 Annual Emergency Fund Report, 68% of Americans were worried that they would be unable to cover their living expenses for just one month if they lost their primary source of income, and a majority - - - 57% - - - of U.S. adults were unable to afford a $1000 emergency expense.

“In the first two decades of the 21st Century public approval of the U.S. congress fell from 80% to 20%. (299) The appointment of three conservative justices to the Supreme Court by Donald Trump gave conservatives a solid majority. Three of the justices, including Chief Justice John Roberts, had made their legal bones representing the Bush campaign in the Bush v. Gore controversy in Florida following the 2000 election. Many Americans felt that the Court was no longer an institution of impartial judgment but had become simply another political partisan arena. In 2023, Americans' approval of the Supreme Court slipped to the historic low of 40%. (300)

“In his campaigns for the presidency, Donald Trump's primary strategy was to make ordinary Americans feel like they - - - and he - - - were being victimized by deep-state bureaucrats and wealthy elites. The divide between rural and suburban and urban America deepened. Many white people on the right of the political spectrum felt threatened by the possibility that whites would cease to be the majority of Americans in the not-too-distant future. The Trump era was also the era of the Q-Anon conspiracies phenomenon. Wild conspiracy theories, from claims of rigged elections to the existence of child sex rings in the basements of pizza parlours, appeared on the Internet and roiled a significant segment of the population. Politically, America was more divided than it had been at any time since the birth of the Confederacy, and

the idea that the use of violence as a legitimate tool to achieve political goals was gaining currency. Sixty year old grandmothers appeared on television claiming that civil war would be necessary if their candidate did not win the next election. The situation during your times, brother," said Sophia, "was becoming increasingly fraught with uncertainty and threats of various kinds."

"Yes," he agreed. "The news these days is rather discouraging, to say the least."

"Some far-sighted people had seen it coming. In his 1998 book Achieving Our Country, the philosopher Richard Rorty predicted that 'the old industrial democracies are heading into a Weimar-like period, one in which populist movements are likely to overturn constitutional governments. Members of labour unions, and unorganized unskilled workers, will sooner or later realize that their government is not even trying to prevent wages from sinking or to prevent jobs from being exported. Around the same time, they will realize that suburban white-collar workers - - - themselves desperately afraid of being downsized - - - are not going to let themselves be taxed to provide social benefits for anyone else. At that point, something would crack. The non-suburban electorate would decide that the system has failed and start looking around for a strong-man to vote for - - - someone willing to assure them that, once he is elected, the smug bureaucrats, tricky lawyers, overpaid bond salesmen, and post-modern professors would no longer be calling the shots. One thing that was very likely to happen is that the gains made in the past forty years by black and brown Americans, and by homosexuals, would be wiped out. Jocular contempt for women would come back into fashion. All the resentment which badly educated Americans feel about having their manners dictated to them by college graduates would find an outlet.' (301) Much of what Rorty predicted materialized with the election of Donald Trump in 2016."

"Yes," he replied. "Trump's election victory was a real shock to many Americans."

"Even earlier, back in the mid-80's, the critic Neil Postman

foresaw the trend in which politics was lapsing into just another form of entertainment. In his book Amusing Ourselves to Death, Postman's diagnosis of the state of the nation was that American society was engaged in a 'vast descent into triviality.' He saw a public that confused authority with celebrity, assessing politicians, religious leaders, and educators according not to their wisdom, but to their ability to entertain. He feared that the confusion would continue. He worried that the distinction that informs all others - - - fact or fiction - - - would be obliterated in the haze. These concerns were exemplified by the former Obama voter who explained to Politico in 2016 that he would be switching his allegiance because 'At least Trump is fun to watch.' This was Postman's fears in action.

"They were also Hannah Arendt's. Studying societies held in the sway of totalitarian dictators - - - the very real dystopias of the mid-20th Century - - -Arendt concluded that the ideal subjects of such rule are not the committed believers in the cause. They are instead the people who come to believe in everything and nothing at all: people for whom the distinction between fact and fiction no longer exists. (302)

"Many commentators tried to warn Americans of the dangers the nation was facing by reminding them of how swift and brutal the Nazi takeover in Germany in the 1930's had been, once a certain political tipping point had been crossed. The Nazis' first steps - - - censorship, disinformation, and the sowing of fear and mistrust among citizens - - - in turn permitted the unspeakable. (303)

"In the U.S. in the 2020's misinformation and disinformation had become widespread, and with the developments in the field of Artificial Intelligence this contagion threatened to become an epidemic. Legislatures in states controlled by Republicans began to ban certain books from schools and public libraries. Voices on the far-right called for the imprisonment and execution of members of the Democrats. Trump himself called the former Chairman of the Joint Chiefs a traitor, and said he should be

executed.

"It was becoming increasingly obvious," continued Sophia, "that the system - - - worldwide - - - was breaking down. And there were those who were actively working to bring total collapse about. A man named Steve Bannon, who was influential in right-wing circles, stated repeatedly that his goal was to burn the system to the ground. Using a sports metaphor, he said that the way to achieve that goal was 'to flood the zone with shit.' The basic idea was to drown the citizenry in an ocean of disinformation, so that a grasp on the truth became unattainable."

"Yes," he nodded. "I've heard of Steve Bannon. He is a prominent associate of President Trump, right?"

"Yes," she replied. "For a brief period he ran Trump's 2016 presidential election campaign." She paused for a moment, then went on, "In the face of so much confusion and uncertainty many people, especially the young, slipped into a kind of existential despair. Random mass shootings became a regular occurrence in America. As a result more and more Americans were fearful for their and their family's safety, and the number of people purchasing guns skyrocketed. The nation was turning into an armed camp.

"There was a dim awareness among the general populace that the system had become irrevocably diseased, that it could no longer guarantee even their safety, let alone their well-being. Yet few understood that only fundamental changes to the structure of society could avert ultimate disaster, and fewer still had any ideas about what the necessary changes entailed. But there were some who had an understanding of what was required. As if in anticipation of the teachings of your book, the writer Ariel Dorfman stated that what was necessary was 'a radical redefinition of our purpose as a species.'" (304)

"So Dorfman posed the question: What is our purpose?" he said.

"Yes," Sophia replied. "And your book provided the answer. It supplied an answer to the question: why are we here? According to the teachings of the prayer you composed, the Song

of Being, humans exist so that God may have the experience of being human. Furthermore, the Song teaches that the human quest for happiness is God's quest. The logical implication of this is that our proper purpose is to make one another happy. Clearly the structure of most human societies in the early 21st century was failing to fulfill that purpose. If that purpose was to be fulfilled, a fundamental restructuring of the organization and functioning of human societies was required. It became imperative for humans to figure out a way of organizing their societies so that they functioned in accordance with the logic of love.

"In the past major changes to societies had been brought about through revolution. Revolutions were often violent and bloody as different segments of a society battled one another in a struggle for control. If the goal was a society based upon the logic of love, then the path taken to achieve such a society could not be the path of revolution, because such a path results in behaviours which are logically inconsistent with the stated goal. What was required was a path not of revolution, but a path of evolution; a path which would allow societies to shift from their current modes of operation to a mode that was consistent with the logic of love, in a manner which took into account the interests - - - particularly the economic interests - - - of all the different segments and classes within that society.

"The first step along this path of evolution was for humans to evolve theologically. The theology of the Game of Being was evolutionary in that it combined certain aspects of traditional theism - - - the idea that there is an eternal personal God who is responsible for the existence of the universe - - - with the ideas of pantheism - - - the idea that God is immanent in the universe, present in all things, or, more precisely, present *as* all things. Thus the Song of Being, which like all prayers is addressed to God, teaches that Thee (God) are we, and we are Thee. Thus the theology of the Game of Being was *evolutionary* in that it was a development based upon that which had come before it, a melding together of previously held theologies.

"This theological evolution - - - this change in our understanding of the nature of God - - - permitted humanity to evolve spiritually. Humans came to see themselves, and each other, and indeed all things, as direct manifestations of the Mind of God. This fundamental aspect of our beings was something that all humans shared. Humans everywhere came to see, as long had been taught in the East, that our apparent separateness from one another is, in the final analysis, illusory; that we are all expressions of the one Mind. As the Song of Being says: "Each being all, all beings each, a continuum."

"This spiritual evolution made it possible for humanity to undertake a psychological evolution, to change the way in which we looked upon ourselves and our role in society, and to change the manner in which we approached our relationships with others. For the 150 years prior to the appearance of The Game of Being, in the West at least, the dominant political philosophy which had shaped these views was known as liberalism.

"A founding document of the liberal world order was the book On Liberty, written by John Stuart Mill and his wife Harriet. In that book the Mills argued that individuals have the right to be the architect of their own life, to choose whom to marry, where to live, what to believe, what to say. Accordingly the state has no right to impinge on a citizen's individual freedom of choice, provided that the person isn't harming anyone else. A society organized along these lines, the Mills hoped, would produce a rich variety of creative and daring individuals. You wouldn't have to agree with my mode of life, and I wouldn't have to agree with yours, but we would give each other the space to live our fullest life. Individual autonomy and freedom of choice would be the rocks upon which we built flourishing nations.

"Many good ideas turn bad when taken to their extreme. So it was with liberalism. The freedom of choice that liberals celebrate turned into a rigid free-market ideology that enabled the rich to concentrate economic power while the vulnerable were abandoned. The wild and creative modes of self-expression that

liberals adore turned into a narcissistic culture in which people worship themselves and neglect their neighbours. (305)

"This kind of liberalism," said Sophia, "known as neoliberalism, came to dominate economic and political thinking among the elites in many societies in the latter part of the 20th and early part of the 21st centuries. The basic belief underlying neoliberalism was that the primary purpose of a human life is for each individual to acquire as much wealth as possible. In 1930, the economist John Maynard Keynes predicted that by 2030 'the love of money as a possession will be recognized for what it is, a somewhat disgusting morbidity.' It would be seen as a 'semi-criminal, semi-pathological' propensity. It is only, Keynes said, when the accumulation of wealth is no longer the central impulse of humanity that we would uncover in ourselves what has lain dormant. (306)

"The spiritual evolution brought about by the Game of Being theology challenged this belief in the primacy of wealth accumulation by teaching that in order to truly fulfill our purpose as humans, it is not enough to simply provide our neighbours with the freedom to succeed or fail, but, rather, that it is incumbent upon each of us to do all that can be reasonably expected to ensure our neighbour's happiness.

"Obviously," she went on, "it is impossible for any given individual to ensure that everyone they encounter is living a happy life. Such a goal can only even be approached through a collective effort, and the effectiveness of such an effort is determined by the political and economic organizational structure of the society striving towards that goal. By 2020, the social sciences had made great strides in identifying the specific steps societies could take to increase the levels of happiness of their citizens.

"In 1974, the economist Richard Easterlin found that despite the economic boom that the U.S. had experienced since the end of the Second World War, the average life satisfaction of U.S. citizens remained the same from 1946 to 1970. This finding came to be known as the 'Easterlin paradox' and over time it prompted

social scientists to explore factors other than the purely economic measure of a country's gross domestic product as a proxy for measuring the emotional well-being of its citizens.

"The first factor that helped to explain the Easterlin paradox is economic inequality. It is well known that humans tend to compare their successes to those of others, creating an unhealthy sense of competition that often results in frustration and unhappiness. Further studies demonstrated that social comparisons can influence people's well-being in many diverse situations. We measure our success relatively. When it comes to economics, psychologists have shown that our perceptions of how our income relates to other people's matters as much, if not more, than the actual amount we earn. And if there is a large amount of inequality, you may be more likely to make those comparisons. (307)

"A second explanation for the Easterlin paradox came from studies of so-called social capital: that is, the links and bonds that we forge with other members of our community. Most psychologists readily accept the idea that friendly interactions with others can make a huge contribution to our mental and physical health. Studies revealed that economic growth only improves life satisfaction when it is accompanied by declining inequality and an increase in social capital. There are many ways that economic growth might reduce social capital. In a highly competitive environment, people might start working longer hours, with less time for their friends and family. The rapid construction of tower blocks can break up communities, and increased consumerism can mean that people focus more on buying new objects than maintaining their relationships. The pressure to compete can result in the destruction of social ties, which tends to mitigate an increase in material comfort brought about by a higher income. (308)

"Social scientists found that a third factor influencing the link between a country's gross domestic product and the happiness of its citizens is the quality of its institutions and the ways that they look after those who are in need - - - through healthcare,

unemployment benefits and pensions. Careful studies made it clear that an effective welfare state really does play an important role in people's life satisfaction." (309)

Sophia went on, "The teachings of the Game of Being made possible the psychological shift necessary to bring about the political and economic changes required to re-orient society's goals away from the acquisition of wealth towards the acquisition of happiness on a global basis. This shift was not easily accomplished, for it runs counter to the way in which evolution has shaped our brains. The great flaw in the make-up of the human character is our susceptibility to addictive behaviours. Humans can become addicted to all manner of things: food, nicotine, alcohol, caffeine, cocaine, heroin, methamphetamine, sex, money, fame, power.

"In your times, brother, the exemplars of an addiction to these last three things were Donald Trump and Vladimir Putin. Trump's addiction to power was clearly demonstrated by the lengths to which he was willing to go in order to hang onto it. Putin's addiction was even more powerful. He was willing to send to their deaths tens of thousands of his fellow countrymen if that would increase his personal power. Trump's and Putin's mutual addictions were the basis for their relationship. They each recognized something of themselves in the character of the other.

"It is extremely unwise to allow those who are afflicted with an addiction to be in charge of anything. The nature of addiction is that it is all-consuming. The addict's only concern is the maintenance of the supply of whatever it is that they are addicted to. Political leaders who become addicted to power are pathologically incapable of looking after the needs of the society they lead. The constant hunger to consolidate and extend their personal power is the only need which they are capable of attending to. Whenever such individuals are permitted to seize political control, disaster is not infrequently the result.

"On a more prosaic level which is less extreme than outright addiction, the neurobiological instinct to have more than

others, to be more than others, is what drives us forward. (310) And for many of us this innate urge never abates, its demands upon our behaviour are never fully satisfied. For such people no matter how great their accomplishments, their appetite for more is never sated. As the great 19th-century philosopher Arthur Schopenhauer said, "Wealth is like sea-water, the more we drink, the thirstier we become; and the same is true of fame." (311) Moreover, because these people are such intensely competitive strivers, they often rise to leadership roles within society wherein their belief that constant increase is the purpose of life becomes influential in the society at large. In your time, brother, it was widely believed that for a country's economy to be healthy, its gross domestic product must constantly increase. This idea was a direct consequence of the belief that the purpose of a human life is to acquire an ever-increasing amount of wealth.

"We can express the problem of how an individual can achieve and maintain a state of happiness with the formula: *satisfaction is equal to what you have divided by what you want.* All of our evolutionary and biological imperatives focus us on increasing the numerator - - - our *haves.* But the path to stepping off the treadmill of constant increase is to be found in the denominator - - - our *wants.* The modern world is made up of clever ways to make our wants explode without us realizing it. The secret to satisfaction is not to increase our haves - - - that does not work. The secret is to manage our wants. By managing what we want instead of what we have, we give ourselves a chance to lead more satisfied lives. (312) This, of course, is in accord with the insight of the Buddha, who taught that the cause of all suffering is desire.

"Thus the teachings of the Game of Being theology initiated a profound psychological shift in how humans related to one another," said Sophia. "Individuals everywhere began to live their lives in accordance with the wisdom of the ancients who, from Plato to Confucius, preached that the best lives result when lived according to the motto: 'moderation in all things,' which came in

time to be applied to the very idea of the accumulation of wealth itself. One after another, nations took steps to limit the amount of wealth any one individual could amass. John Maynard Keynes' vision of a world where the accumulation of wealth was no longer the central impulse of humanity gradually came to be the case."

Chapter Fifty-one

GOVERNANCE

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"That is hard to believe," he said. "People are so conditioned to constantly want more stuff. How was this evolution brought about?"

"By a conscious adherence to the logic of love, and the steadfast application of the question: What is its purpose?" Sophia replied. "In order for societies to evolve, it was necessary for the political structures of those societies to evolve. This required new ways of thinking about the existing political structures. As Einstein said, 'You cannot solve a problem with the same mind that created it.'

"To begin with, it was necessary to ask the question: What is the purpose of society? More specifically, why have humans chosen to live together in large groups? There are potentially many answers to this question but they all boil down to one overriding concern. Ten thousand years ago, the invention of agriculture persuaded our ancestors to abandon the hunter-gatherer lifestyle and to create permanent settlements. This is an historical example of humans evolving at a society-wide level, and is evidence that humans are capable of making fundamental changes to the ways in

which we live our lives and structure our relationships to one another, adapting to new circumstances. Hunter-gatherers made that change because this new way of living provided greater security for themselves, their kin, and their tribe. Thus the primary purpose of a society is to enhance the security of its members."

Sophia went on, "It is useful to think of any social system as a complex mechanism, the churning of which drives the society forward through history. Any societal mechanism consists of a certain set of inputs, certain organizational structures which process those inputs, and a resulting set of outputs. In any modern society the two most important gears that drive the mechanism forward are the political structure and the economic structure. All inputs are processed through these two structures. If the outputs that a given mechanism delivers are unsatisfactory and do not meet the needs of the members of that society - - - in particular, if the outputs do not enhance the security of those members - - - then logic dictates that it becomes necessary to make changes to either or both of the inputs and/or the processing mechanism. To think otherwise is illogical, and hence foolish.

"And the metaphysics of the Game of Being made it clear why fundamental change was necessary if humanity was to survive the growing crises which challenged it in the early 21st Century. The teaching that the inevitable *always* happens, that is, that whatever happens, happens inevitably, was key. Here in America it made people realize that the poverty, the crime, the mass killings, the rising tide of intolerance and hatred, the divisiveness, all of these dynamics were not random, happenstance occurrences; rather, they were the *inevitable consequences* of the political and economic structures then in place. These problems were not 'bugs' in the system. They were features *of the system*, and could never be alleviated as long as those structures remained in place.

"An aphorism widely attributed to Albert Einstein stated that the definition of insanity is to do the same thing over and over again and to expect different results. By the third decade of the 21st Century dissatisfaction with the outputs which the current

mechanism of western societies was delivering became more and more widespread. For the first time in American history, the young were facing a lifetime situation in which they would be less secure than their parents had been. The threat of global warming became impossible to ignore. It was clear that if human civilization was to survive, fundamental changes were required. The difficulty lay in determining what those changes should be.

"There have been some who considered the original Framers of the American Constitution to be excellent social psychologists. According to this view, the Framers knew that democracy had an Achilles' heel because it depended on the collective judgment of the people, and democratic communities are subject to, as James Madison wrote, "the turbulency and weakness of unruly passions." The key to designing a sustainable republic, therefore, was to build in mechanisms to slow things down, cool passions, require compromise, and give leaders some insulation from the mania of the moment while still holding them accountable to the people periodically on Election Day. In his essay, "Federalist No. 10," Madison wrote about the innate human proclivity toward "faction," by which he meant our tendency to divide ourselves into teams or parties that are so inflamed with "mutual animosity" that they are "much more disposed to vex and oppress each other than to cooperate for their common good." Further on in that essay Madison notes that people are so prone to factionalism that "where no substantial occasion presents itself, the most frivolous and fanciful distinctions have been sufficient to kindle their unfriendly passions and excite their most violent conflicts." (313)

"This jaundiced view of human nature and human relations was certainly not unwarranted," Sophia continued. "All of recorded history demonstrated the human proclivity for factionalism. It was not unreasonable for the Founding Fathers to assume that it would always be so, and to therefore design the structure of the governance of the new nation on the basis of that assumption. However, as the nation matured, the structure of its governing institutions not only allowed for the *possibility* of

factionalism, it also increased the *probability* of its occurrence.

"The twentieth-century philosopher Isaiah Berlin spent much of his life arguing that we can't have it all. In any weighty societal matter, worthwhile values invariably clash: liberty and equality, justice and mercy, impartiality and love. Such collisions, Berlin wrote, are 'an intrinsic, irremovable element in human life,' and realizing some ends 'must inevitably involve the sacrifice of others.' But he also argued that we can soften the impact of this 'value pluralism.' Our aim should be to 'maintain a precarious equilibrium that will prevent the occurrence of desperate situations, of intolerable choices - - - that is the first requirement for a decent society.' (314)

"By the year 2020 in America, Berlin's equilibrium had become more precarious than at any time since the Civil War. Two powerful events converged which threatened to shatter the nation's social and political equilibrium: the rise of social media, and the appearance of a man on the national political stage who was in thrall to a serious addiction to power and fame, Donald Trump.

"Social media both magnified and weaponized the frivolous and the fanciful. Its primary effect was the continual chipping-away of trust within the body politic; a constant fraying of the edges of an increasingly tattered national equilibrium. An autocracy can deploy propaganda or use fear to motivate the behaviours it desires, but a democracy depends on widely internalized acceptance of the legitimacy of rules, norms, and institutions. Blind and irrevocable trust in any particular individual or organization is never wise. But when citizens lose trust in elected leaders, health authorities, the courts, the police, universities, and the integrity of elections, then every decision becomes contested; every election becomes a life-and-death struggle to save the country from the other side. Social media amplified political polarization, fomented populism, especially right-wing populism, and was responsible for the spread of misinformation. Social media acted like a universal solvent, breaking down bonds and weakening institutions everywhere it

reached.

"The author Martin Gurri noted that in the pre-digital era there was a single mass audience, all consuming the same content, as if they were all looking into the same gigantic mirror at the reflection of their own society. But the digital revolution shattered that mirror, leaving the public to inhabit the broken pieces of glass. So the public could no longer be thought of as a single entity. It had become highly fragmented, and the fragments were basically mutually hostile. Communications on social media were mostly people yelling at each other and living in bubbles of one sort or another. Facebook, Twitter, You-Tube, and a few other large platforms unwittingly dissolved the mortar of trust, belief in institutions, and shared stories that had held a large and diverse secular democracy together. (315)

"An expert on the spread of misinformation and disinformation on the internet, Renée DiResta, described the state of affairs bluntly. She wrote that 'We are immersed in an evolving, ongoing conflict: an Information World War in which state actors, terrorists, and ideological extremists leverage the social infrastructure underpinning everyday life to sow discord and erode shared reality.' (316) In other words there were many entities whose goal was to destroy western liberal democracy, and whose primary tactic was the same as Steve Bannon's: 'flood the zone with shit.'

"Into the midst of this social and political landscape in disarray strode the benighted figure of Donald Trump," said Sophia. "Thirsty for fame and power, dishonest, and lacking in ethical standards, he was the first politician to master the dynamics of the new mode of communication in which outrage was the key to virality and stage performance crushed competence. (317) Gifted with the knack of telling people what they want to hear, Trump employed the well-worn tactics of all would-be authoritarians, casting himself as the protector of the interests of the common man and portraying his political foes as less than human, as vermin and scum who needed to be exterminated.

“Demonizing 'the other side' is a bad idea, but in a healthy democracy the real demons don't get a side. Armed gangs and warlords, who have decided much of human history, don't get a voice. Mussolini ceased to be a politician when he marched on Rome. In a liberal democracy we have to be prepared to have debates, and to lose, on questions that may at the moment seem to us matters of life and death - - - on abortion or mass incarceration or gun sanity, say. We are compelled to bargain with people who believe, however crazily, that guns promote social peace. But when they pull out guns the bargaining ends. A man who brings a machine gun to a Monopoly game is not playing a 'disruptive' form of Monopoly. He is no longer playing Monopoly at all. Laws, in this sense, are the rules on the box that allow real social bargaining to happen. That is what made Trump such a very distinctive danger to democracy. He was a threat to the very rules themselves. To say that Trump presented a mere political challenge was silly: he was voted out, and he refused to go. At that moment, his part in the 'civic conversation' ended, and the rules on the box took over. In the game of democracy, there is no Free Parking. The offending player gets to go directly to jail. (318)

“Wait a minute,” he said. “Are you telling me that Trump will lose in the 2020 presidential election?”

“Yes, brother,” Sophia replied, sighing. “I have inadvertently given you fore-knowledge of a specific event in your future. I advise you to place the largest bet you possibly can on a Joe Biden victory in 2020. The winnings will allow you to quit your job as a carpenter so that you can concentrate on writing The Game of Being.”

“That's a very interesting idea,” he said. “Very interesting indeed.”

Returning to her history lesson, Sophia went on, “Although the appearance of Trump on the political landscape was a near-disaster for the nation, it did have the salutary effect of opening the eyes of many Americans to just how undemocratic their democracy actually was. Strictly speaking, American government had never

been a government 'by the people.' (319) By the turn of the 21st century, the effects of the anti-democratic elements that the Founding Fathers had designed into the structure of the system - - - the Senate and the Electoral College - - - were compounded by the fact that politics in America had been wholly 'colonized' by capital. Its legislative assemblies were filled with rich people who mainly talked to other rich people. (320)

"Nowhere was this more evident than in the struggle to limit the emissions of greenhouse gases. The political system was dominated by corporate money in general and fossil-fuel money in particular. In 2021, the oil-and-gas industry reportedly spent a hundred and twenty million dollars lobbying Washington, and it probably spent a great deal more via front groups. It was therefore naive to imagine that policies that cut into fossil-fuel profits would be enacted. And even if they were, they couldn't solve the essential problem, which was that Adam Smith's 'invisible hand' of the market always grasps for more. If it wasn't more oil, it would be more lithium to build batteries, and if it wasn't more lithium it would be more cobalt, mined from the bottom of the sea. Jason Hickel, an economic anthropologist at the Autonomous University of Barcelona, wrote that 'When it comes to global warming, we know that the real problem is not just fossil fuels - - - it is the logic of endless growth that is built into our economic system.' In keeping with Einstein's aphorism that problems cannot be solved with the same thinking that created them, climate change couldn't adequately be dealt with using the tools of capitalism, because it was a product of capitalism. It could be dealt with only by throwing off capitalism in favour of something else - - - a system aimed not at growth, but at 'degrowth.' (321)

"But in order to change the economic system, it was necessary to first change the political system. The fundamental problem was that even when the political system worked the way it was designed to work, and everyone who was eligible to vote actually voted, the government that resulted did not reflect the popular will. It was not unreasonable for the Framers to be wary of

direct democracy. A nation cannot be governed by plebiscite, and true representative democracy, in which everyone who might be affected by government policy has an equal say in choosing the people who make that policy, had never been tried. So they wrote a rule book, the Constitution, that placed limits on what the government can do, regardless of what the majority wants. In so doing, they prioritized the rights of the individual over the wishes of the majority. They also countenanced slavery and the disenfranchisement of women, and excluded from the electorate groups whose life chances certainly might be affected by government policy. And they made it extremely difficult to tinker with those rules. In the two hundred and thirty years since the Constitution had been adopted, the rules had been changed by amendment only nine times. (322)

"But in The Game of Being you pointed out the error in the belief that men are endowed by an almighty God with certain unalienable rights. You argued that God is neither almighty, that is, God is not omnipotent; nor does God intervene in the playing of the Game, which means that the Creator could not have endowed men with anything. When, on August 26, 1920, women in America were finally granted access to the ballot, there were no newspapers published the next day bearing the headline: 'God Appears. Grants Women the Right to Vote.' Thus in the 21st century so-called 'rights' came to be recognized for what they actually were: privileges, extended by members of a society upon one another for the benefit of all. Therefore it was determined, quite sensibly, that the beneficial well-being of society-at-large should be prioritized over the privileges of the individual, but that, at the same time, the privileges of the individual citizen should not be unduly restricted.

"In America this change in focus required a major shift in people's attitudes towards one another. Historically it had been the case that getting along with the people who agreed with you was the easy part of democratic government. The hard part was building a superintending architecture that wins the consent even of those you hate. (323) But the primary lesson of the Game of Being

was that it is inappropriate and unwise to hate those with whom you might disagree. It taught that because all persons are direct manifestations of the Mind of God, the logic of love requires that *we choose, deliberately,* to love our fellow human beings despite any differences we may have with them. When it is put into effect, the logic of love acts to make love, acceptance, and compassion the bedrock of human relationships. The gradual acceptance of the logic of love in American society made possible changes to the nation's political structure. These changes needed to be codified in a new constitution; a document in which the focus was the beneficial well-being of society-at-large, rather than the imagined 'rights' of individual citizens.

"In response to this necessity," said Sophia, "the Citizens' Constitutional Convention was convened in Philadelphia in the autumn of 2026. In order to be a delegate to the Convention certain basic qualifications had to be met. Delegates were required to be U.S. citizens, 18 years of age or older, be fluent in the English language, and have matriculated from high school. Each potential delegate's application had to be accompanied by a document containing the names, addresses, phone numbers, and signatures of ten people who were willing to vouch for the applicant as being a person of sound mind and good character. Each state's delegates were chosen by a state-wide lottery, half the delegates to be men, and half to be women. The number of delegates allowed for each state was determined by a sliding scale. States with a population of under one million residents were allocated 6 delegates each, while the states with the largest populations - - - California, Texas, Florida, and New York were granted 20 delegates each. The indigenous peoples of America were represented by 10 delegates chosen by the National Congress of American Indians. Delegations also represented Washington DC, Puerto Rico, and U.S. holdings in the Pacific. Each state was also allowed 2 alternate delegates who acted as observers and who could step in to replace any delegate who was unable to attend for some reason. Altogether some 700 people assembled in Philadelphia in September of 2026 to draw up

a new constitution.

"Each delegate/alternate was given a prepaid credit card to cover the costs of travel, food, and accommodation. In addition, each delegate was paid a stipend of $1,000 per week so that persons from across all the economic strata of America could afford to be a delegate. The convention was chaired by the then vice-president of the United States, and a panel of constitutional scholars was assembled to advise and guide the Convention in its deliberations.

"The Convention was in session for most of the next three and a half months. Each article and amendment was discussed in detail and voted on one at a time. On January 1, 2027, the Convention voted to approve the final draft of the proposed constitution which was to be presented to the American public, and voted upon in a national referendum to be held in the spring of 2028. A massive campaign to educate the citizens of the nation about the proposed constitution was undertaken by the federal government. Booklets written in both English and Spanish containing the original constitution and the newly proposed constitution were mailed out for free to anyone who requested one. Both documents were made available on-line as well. Over the next year people gathered in groups in communities all across the nation to discuss and learn about the proposed changes. A renewed faith in the democratic process, which had been cast into doubt during the Trump era, swept the nation. People felt empowered by the knowledge that they held the future of the country in their hands.

"Enshrined in the new constitution was what came to be called the Statement of Guiding Principles, which was lifted directly from The Game of Being and was worded as follows:

1. Any privilege, the exercising of which interferes with the reasonable exercising of a privilege of another member of society, shall not be granted.
2. Any privilege, the exercising of which results in chaos

and/or mayhem, shall not be granted.
3. Any privilege, the exercising of which is deemed, by a duly constituted authority, to be contrary to the beneficial well-being of society-at-large, shall not be granted
4. Any privilege, the exercising of which does not contravene any of the foregoing three stipulations, shall be granted.

Sophia went on, "The original constitution was used as a template but many significant changes were made. All references to 'rights' were stripped out and replaced with the language of 'privileges.' For example, the original wording of the Fourth Amendment stated that 'The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the person or things to be seized.'

"Now, the very idea of 'rights' was introduced in the Declaration of Independence with the famous line 'that all men are created equal, that they are endowed by their Creator with certain unalienable Rights.' Given that some of the Framers owned slaves, the hypocrisy of that declaration is breath-taking. Furthermore, as we have already seen, the theology of the Game of Being denies that the Creator has the capacity to intervene in the playing of the Game, and thus is incapable of endowing men (or zebras or whales or any other manifestations) with anything at all. Even more to the point, the word 'alienable' is an adjective used to describe an object, the ownership of which can be transferred. Therefore if something is truly 'unalienable,' then the ownership of that thing is evidently non-transferable; the ownership of that thing, whatever it may be, be it a piece of property or some postulated 'right,' is absolute. But the wording of the Fourth Amendment made it clear that 'the right of the people to be secure . . . against unreasonable searches and seizures' is not absolute. Under certain circumstances, searches and seizures can be carried out against the wishes of the owner of the

property being searched and seized. The key word here is 'unreasonable,' and what is unreasonable is a matter of opinion. The owner of a property may consider *any* search of his property to be unreasonable. But the Fourth Amendment made it clear that in certain circumstances a duly constituted authority can authorize the search and potentially the seizure of the property in question. Thus if you are building bombs in the basement of your house or storing Top Secret documents in your bathroom, the authorities, acting on behalf of society-at-large, can abrogate your 'unalienable right' against the search and seizure of your property, no matter how unreasonable you may think that search to be. The point here is that you do not in fact possess some 'unalienable right;' a right that cannot be transferred or abrogated. Unalienable rights were a myth. What the individual citizen actually possessed was, and is, a privilege; a privilege bestowed upon the individual by society-at-large, and, being a privilege, it can be suspended if the privilege is being abused.

"Thus the changing of the language of 'rights' in the constitution to the language of 'privilege' was more than just a matter of semantics. It made explicit in the new constitution that which had only been somewhat tenuously implicit in the original: that the general well-being of society-at-large should have primacy over the interests of the individual citizen, and that the privileges granted by society-at-large to individual citizens can be suspended if a citizen exercises any privilege in an irresponsible or unlawful manner.

"Another major change in the new constitution was that it banned the involvement of political parties at all levels of government. The motivation for this change was a desire to reduce 'politics' and 'politicking' to as minimum a level as possible. The Prussian military strategist Carl von Clausewitz stated that 'War is nothing but a continuation of politics with an admixture of other means.' This aphorism can be turned on its head to say that politics is a continuation of war by other means, which makes it clear that politics, like war, is a struggle for power and control.

"The nature of politics is to be permanently stressful. In the Land of Oz, once the house had dropped on the witch, Dorothy would discover that the Mayor of Munchkinland and the Leaders of the Lollipop Guild (not to mention the oppressed women of the Lullaby League) had violent differences in values and views, which the witch did not cause, though she might have exploited them. Politics, as opposed to pure power grabs, involves an acceptance of the truth that these conflicts can never be cured but only contained, and made as peaceable as humanly, or as Munchkinly, possible. Politics is stress. The objective of practising it should be to keep the stress from turning into cardiac arrest. (324)

Sophia continued, "Early in the year 2021 the American political system suffered a cardiac arrest, and while democracy in America did not die, it was placed on life-support. The Republican Party under the leadership of Donald Trump made it clear that in their view politics was indeed the continuation of war by other means, and an extreme but significant portion of the Party voiced their belief that violence in pursuit of political goals could be justified.

"In the face of these developments the drafters of the new constitution sought to lay the groundwork for a political system in which the emphasis was not merely to constrain the struggle for power and control to peaceable means, but to replace that struggle and the societal stresses which accompany it with a political structure in which the emphasis would be on cooperation, conciliation, and consensus. Their goal was to create a truly democratic republic, the foundation of which would be the logic of love. Political parties came to be seen as the formalization of self-serving and self-perpetuating factions. The continued participation of the two major political parties in the electoral system was seen as a huge impediment to the achievement of the goal the drafters of the new constitution wished to realize.

"A large majority of Americans were dissatisfied with the limited options available under the two-party system. According to one poll, 85 percent of Americans were in favour of major electoral

restructuring. In a 2022 *New York Times* poll, 68 percent of respondents said they believed that the government 'mainly works to benefit powerful elites,' not 'ordinary people.' That view led to distrust, disaffection, and exclusion among potential voters. In many elections the largest demographic was neither Democrats, Republicans, nor independents, but non-voters. (325)

"One of the most acute critics of the two-party system was the political commentator Walter Karp. Writing in the last decades of the 20th century, Karp firmly believed that the actions of party leaders could be explained only if one understood that they are primarily motivated by the pursuit and retention of power; any suggestion that national interest, or even ideology, drives their decisions he considered delusional. Karp once wrote that 'we can judge the character of public men only by what they actually do,' which all too often involved betraying the platform that got them elected, almost always to further their own political fortunes. In his estimation, Democrats and Republicans therefore had much in common: by prioritizing their own rule, the two parties operated on a principle of collusion - - - 'for without it neither party organization could long survive.' Overall, he argued, the enduring goal of our dominant political institutions was to maintain control of the parties, a goal that could supersede even their supposed objective of winning elections. 'The whole purpose of party organizations at every political level,' he wrote in his 1973 book Indispensable Enemies, 'is to sift out, sidetrack and eliminate men of independent political ambition, men whom the party bosses cannot trust.' Karp described America's political leaders as 'oligarchs' and 'bosses' servicing self-perpetuating 'machines.' His theses was that all political decisions, even when labelled as acts of statesmanship, were adopted to serve the interests of the relevant players, and that oligarchs, bosses, and machines were rampant in the nation's political system. (326)

"During the Trump era the two-party system closed in on its inevitable and dangerous denouement. Party politics infected every level of society and the debates about every conceivable topic.

Although there were many Americans who were members of neither party, a rigid political divide gripped the country's governance. Many Republicans, having adopted the belief that politics is the continuation of war by other means, came to view members of the Democratic Party not as fellow citizens with whom they had a political disagreement, but as enemies who must be destroyed for the good of the nation.

"The Game of Being teaches that the universe is logical, and that for every effect there is a cause. Identity politics was tearing America apart, and was threatening to provoke a violent confrontation. Since the existence of the two political parties was so manifestly divisive, the logical solution was to do away with the two-party system," said Sophia. "So America went from being a two-party system to being a no-party system. This change came about as a result of asking the question: what are the supposed purposes of a political party?

"The first answer to this question," said Sophia, "was that political parties provide a forum in which like-minded people can join together and draw up a cohesive platform of proposed actions to present to the electorate for its approval. The second purpose of political parties was that they provided a winnowing process for the selection of candidates for public office. A third purpose of political parties was that they provided an organization to coordinate the raising of funds for the candidates representing the parties to spend during elections. The fourth purpose of political parties was that they provided an organization which could be used to get out the vote; a vehicle for making sure that the supporters of the party's candidates went to the polling stations and cast their ballot on election day. So the question became: was it possible to devise a system that could function to fulfill those purposes which did not require the existence of formal political parties?

"The goal of the delegates to the Constitutional Convention was to devise a system that would provide a governing structure which was efficient, competent, transparent, and less prone to dividing the body politic into two mutually antagonistic groups,

while at the same time functioning in a democratic manner. By maintaining a theoretical picture of what constitutes any system: a set of inputs, a structure which processes those inputs, and a set of outcomes, and it being clear that the current system was producing outcomes with which a majority of the American people were dissatisfied, the delegates concluded that change - - - radical change - - - to the inputs and the processing structure of the country's political system was required.

"In order to make the nation's government more democratic, the first radical change the Convention made was to abolish the Senate. The Senate was an almost comically malapportioned body that gave Wyoming's five hundred and eighty thousand residents the same voting power as California's thirty-nine million. The District of Columbia, which had ninety thousand more residents than Wyoming and twenty-five thousand more than Vermont, had no senators. After the 2020 election even though the Senate was split fifty-fifty between the two parties, Democratic senators represented forty-two million more people than did Republican senators. Half the nation's population was represented by eighteen senators, the other half by eighty-two. The Senate also packed a parliamentary death ray, the filibuster, which would allow forty-one senators representing ten percent of the public to block legislation supported by senators representing the other ninety per cent. (327) As an institution the Senate had become nothing more than a tool wielded by the minority of the population in the country to frustrate the will of the majority. If the tensions in the country were to be soothed, the continuation of such a highly undemocratic institution was simply untenable.

"Moreover," Sophia continued, "as an institution the Senate was moribund and inefficient. The experience of Mitt Romney, who was the Republican Party's candidate for president in 2012, is illuminating. Romney was elected to the Senate in 2018. In one early meeting, a fellow senator who'd been elected a few years earlier levelled with him: 'There are about 20 senators here who do all the work, and there are about 80 who go along for the ride.'

Romney wanted to accomplish things as a senator and had an ambitious agenda, but he quickly became frustrated by how much of the Senate was built around posturing and theatrics. Legislators gave speeches to empty chambers and spent hours debating bills they all knew would never pass. They summoned experts to appear at committee hearings only to make them sit in silence while the senators blathered some more. Romney joked to friends that the Senate was best understood as a 'club for old men.' There were free meals, on-site barbers, and doctors within a hundred feet at all times. But there was an edge to the observation. The average age in the Senate during Romney's tenure was 63 years old. Several members, Romney included, were in their 70s or even 80s. And he sensed that many of his colleagues attached an enormous psychic currency to their position - - - that they would do almost anything to keep it. Job preservation, in this context, became almost existential. Retirement was death. The men and women of the Senate might not need their government salary to survive, but they needed the stimulation, the sense of relevance, the power. One of his new colleagues told him that the first consideration when voting on any bill should be 'Will this help me win reelection?' The second and third considerations the colleague continued, should be what effect it would have on his constituents and on his state. (328)

"Once Americans took a hard and unsentimental look at the Senate, it became clear that in a truly democratic society there was no place or need for a blatantly undemocratic institution full of self-serving political cronies who spent most of their time ineffectually flapping their gums at taxpayer expense. The powers and responsibilities of the Senate, such as the confirmation of Presidential appointments, were simply transferred to the more democratic House of Representatives. Thus under the new constitution, America's bicameral legislative branch became unicameral.

"There were structural changes to the House of Representatives as well. First, the terms for the members of Congress were increased from two years to six, as they had been in

the now abolished Senate, with one-third of the congressional seats up for election every two years. This was done so that the members could spend more of their time doing the people's business and less time campaigning for the next election. Term limits of four terms were introduced, which meant that a member of Congress could serve for a maximum of twenty-four years. By law, Congress was to be in session five days per week, and five weeks out of every six, with two additional weeks in recess in the months of July and August.

"Congressional salaries were substantially increased from $175,000 per year to $200,000 per month for a first term member. Each time an incumbent member was successfully reelected they received a salary increase of $50,000 per month, so that if a member is elected for the maximum of four terms, they are paid $350,000 per month during their last term. Many people thought this level of spending on congressional salaries was exorbitant, but there were many good reasons for it. The responsibilities and workload of a member of Congress is heavy, and the job requires sacrifices in terms of family and recreational time. Members of Congress are prohibited from having any other source of income while in office. There is very little in the way of job security to being a member of Congress; not only is there the possibility of being fired every six years - - - something that occurs much more frequently now that political parties have been excluded from the electoral process - - - the new constitution contained a provision for the potential recall of a member by his or her constituents in the third or fourth year of any term. Furthermore, the members of Congress are the upper level of management of the 'corporation' of the United States, and their remuneration should be equal to what top level management in the private sector receives for a similar level of responsibility. Given all this, it was felt that if the job of being a member of Congress was going to attract the brightest and the best applicants that the country has to offer, then this level of salary was required.

"Every two years at the beginning of a new Congress a

Speaker and Deputy Speaker are elected by the assembled members. Both offices are elected by a simple majority, but can only be removed from office if 60% or more of the members vote to remove them. There is no limit to how many terms an individual may be the Speaker, but he or she must be a sitting member of Congress. The Deputy Speaker receives a salary of $350,000 per month, and the Speaker's salary is $400,000 per month.

"Together the Speaker and the Deputy Speaker choose the chairs and vice-chairs of the various committees of Congress. Then those four people choose who else gets to sit on the respective committees. By tradition membership on the various committees goes to the most senior members of the House, but there is a rule which requires that a minimum of 20% of the members of any committee be selected from amongst members who are in their second term, and a minimum of 10% be selected from members who are in their first term. Members do not receive any extra money for serving on a committee.

"The Office of the Speaker is responsible for the scheduling of bills to be placed before the members of the House for debate and voting. The Speaker gets to choose which bills are placed before the House, but if a bill is signed onto by 20% or more of the members, the Speaker is required to place that bill before the House for debate. As always, debates and voting on the floor of the House are public.

"Significant structural changes to the executive branch were also established under the new constitution," said Sophia. "After the near-death experience American democracy suffered during the Trump era, it was widely recognized that steps had to be taken to ensure that no single person could threaten the entire system in such a manner again. In the establishment of a new system for choosing the nation's executive branch, the citizenry had to be reminded of the purpose of such a system. The purpose was not to choose one 'team's' leader over its rival 'team's' leader in some political game. The choosing of the nation's chief executive was not some sporting event where the goal was to score more points

and to defeat the other guys, which was basically what it had become. Such a format was inevitably divisive, and by 2020 it had become dangerously so. The purpose of a system for choosing the nation's chief executive is to provide the nation with competent and uncorrupt - - - and incorruptible - - - leadership; leadership that will have, prior to its ascendancy to the executive level, already clearly demonstrated that their chief concern is the welfare of the citizenry and the security of the nation, and that they possess the necessary experience and leadership skills to fulfill the requirements of the job; for it is a *job*, not a prize to be won in some sporting contest.

"With this goal clearly in mind, the delegates to the Constitutional Convention proposed radical changes to the structure of the executive branch. Bearing in mind Lord Acton's dictum that power corrupts, and wishing to minimize the possibility that the nation's leader might succumb to power's invidious temptations, the unitary presidency of one person wielding executive power was replaced with a five person "Executive Council," made up of a President and four Vice-Presidents. While the President remained the country's Chief Executive, Chair of the Executive Council, the authority who signs into law the legislation passed by Congress, the Commander-in-Chief of the armed forces which, of necessity, gives the president sole responsibility for the decision of whether or not to launch a retaliatory nuclear strike, and spokesperson for and primary representative of the country on the world stage, decision-making power at the executive level was vested in the Executive Council. The enactment of decisions at the executive level, including the power to grant pardons and the power to veto legislation, now requires the support of a majority vote by the members of the Executive Council, and each member, including the president, has one vote. Neither the deliberations of the Executive Council nor the recording of its votes are part of the public record. The Executive Council meets regularly once per week, with additional meetings held as the need arises. The presence of four members of the Council is required to establish a quorum, and any motion which results in a tie vote is not

considered to have been approved.

"In addition to their duties as members of the Executive Council, each vice-president serves two year terms as the Secretaries of the most important departments of the federal government. The purpose of this arrangement is to provide the vice-presidents with the direct experience of managing a large bureaucracy and to acquaint them with the details of the functions of the most crucial parts of the government's operations. The fourth vice-president serves as Secretary of the Treasury, the third vice-president serves as the Secretary of Defence, the second vice-president serves as Secretary of Foreign Affairs, and the first vice-president serves as the Secretary of National Happiness and Satisfaction. The first vice-president thus spends a large portion of their time travelling around the nation, consulting with individuals and various interest groups and listening to their concerns, and then relaying what they have learned back to the Executive Council. In this manner the Executive Council is kept well informed about the state of affairs in the country and is able to respond accordingly. The first vice-president is also responsible for coordinating the decisions of the Council with the decisions of the House of Representatives, and thus works closely with the Speaker of the House.

"The purpose of this structure is to ensure that by the time an individual assumes the office of the President, their experience as government officials is deep and well-rounded. Remuneration for members of the Executive Council ranges from $600,000 per month for the fourth Vice-president, up to $1,000,000 per month for the President, which is the largest amount of money that any salaried individual in the nation can earn. Thus the size of the salary rises as the members of the Council gain experience and take on heavier responsibilities.

Sophia further explained, "On the input side, since political parties were to be excluded from the electoral process because they had become dangerously divisive and were unresponsive to the wishes of a majority of the nation's citizens, an alternative to the

system of party primary elections to choose candidates for public office had to be devised. The Constitutional Convention delegates settled on a lottery system for choosing candidates for the House of Representatives. The goal was to devise a system in which any citizen with the necessary qualifications who was a resident in the congressional district could enter the lottery, while at the same time making the procedure difficult enough that only those individuals who were serious about the process would make the required effort to have their name entered into the lottery.

"To this end a non-refundable fee of $3000 is required to enter, and their nomination papers have to have been signed by one-quarter of one percent of the district's total population according to the most recent census. At the time this system was introduced, this meant in practical terms that each potential candidate in the average congressional district was required to obtain the signatures of approximately 2,000 citizens in order to have their name entered in the candidate lottery. Any person 18 years of age or older who is a resident of the district can sign a prospective entrant's nomination papers, and are required to supply their name, address, phone number, and date of birth in addition to their signature. People are allowed to be a signatory to more than one prospective entrant's nomination papers, but if any two entrants' nomination papers have more than 20 percent of their total signatories in common, both prospective entrants are disqualified. This last stipulation was included to prevent political organizations from 'gaming' the system, and because of it most prospective entrants ask people whether or not they have already signed the nomination papers of someone else. A person does not have to be a citizen of the United States in order to become a signatory to a potential entrant's nomination papers. It is against the law to pay for or to provide some other benefit in order to obtain a person's signature. Contravention of this law results in disqualification.

"In addition to their nomination papers, each prospective entrant must also provide the following: proof that they have been a U.S. citizen for at least 5 years; proof that they have been a

resident of the district for at least 2 years; proof that they will be at least 30 years of age on or before the election day of the election in which they wish to be a candidate; and proof that they have obtained a minimum of a bachelor's degree from an accredited college or university.

"Official nomination papers must be obtained from the office of the Chief Electoral Officer for each congressional district, and become available to prospective entrants two years prior to the date of the next election. The completed nomination papers, along with the fee of $3000 and the other required documentation, must be submitted to the Chief Electoral Officer no later than one year prior to the next election. The office of the Chief Electoral Officer then reviews the documents to make sure that they are all in order, performs a random audit of the nomination papers to ensure that all the signatures are authentic, and verifies that the prospective entrant possesses the minimum educational requirements to be a candidate.

"The lotteries are held on the first Monday in May of the year of the election in each district. To ensure the legitimacy of the process, each qualified entrant personally places his or her 'ticket' into the container from which the winning tickets are to be drawn. Two lotteries are actually held, one for male candidates and one for female candidates. In an election year in which there is no incumbent running for reelection, two names are drawn in each lottery. If there is a male incumbent running for reelection, then one name is drawn in the male lottery, and two in the female lottery. If the incumbent is female, it is the other way around. Thus there are always four candidates, two men and two women, running in each congressional district election. This requirement has resulted in a much more balanced representation of men and women in the House of Representatives.

"This method of choosing candidates for Congress has several advantages over the 'primaries' method which was controlled by political parties. Not only has it resulted in a much more gender-balanced Congress, it has freed candidates from the

pressures to conform to a party platform. Now candidates are chosen on the basis of their qualifications, character, opinions and beliefs, and their demonstrated capabilities, not their identification with or their adherence to the platform of a political party. Members of Congress can now vote on proposed legislation as they think best for their constituents and the nation, without fear that they will be 'primaried' in the next election by an extreme wing of the party they represented. This was a very serious problem during the Trump era. Many Republican members of Congress at that time despised Trump in private, but were forced to support him in public, because of that fear. Now no president can wield that kind of malign power or influence over individual members of Congress ever again. Furthermore, the electorate is now provided with a range of choices for whom they prefer to represent them, rather than the restrictive binary choice available under the old party dominated system.

"In all districts across the nation elections for Congress now use the ranked-choice voting method of casting ballots," Sophia explained. "This is a voting method that sequentially eliminates candidates in a series of rounds until a winner emerges. In this system, voters rank candidates in order of preference. If no candidate receives a majority of first-choice votes, the candidate with the fewest first-choice votes is eliminated, and their votes are redistributed according to the voters' next preferences. This process continues until one candidate receives a majority of the ballots cast. (329)

"An additional feature of the ballot system now in use is the option for the voter to cast their ballot in favour of 'none of the above.' There were two reasons for this. First, this option was provided to allow for the possibility that a majority of the electorate finds that none of the candidates running in a given election deserve their support. If the number of 'none of the above' votes is greater than the number of first choice votes received by the candidate receiving the most first choice votes, then the election is considered to have been 'inconclusive,' and no winner is declared.

In these situations, which are rare but not unheard of, four more candidates are drawn from the remaining entrants in the lottery held the previous May, and another election is held on the second Monday of June of the next year.

“The second reason for the 'none of the above option' is that citizens are now required by law to vote in the congressional elections in their district. It is considered to be a fundamental responsibility of every eligible citizen to participate in the democratic process. What was once considered to be the right to vote has now become the obligation to vote. If a citizen does not discharge this responsibility they are subject to an automatic $500 fine. Since voting is now considered to be a mandatory task that must be completed by every eligible-to-vote citizen, it was deemed reasonable to allow the voter the option of indicating that none of the candidates for Congress in a given election were worthy of that voter's support.

“An additional requirement of each congressional candidate is that they conform to what became known as the 'Santos Rule.' This rule was named after George Santos, a man who successfully ran for Congress but was later revealed to be an utter fraud. Candidates are required to publish their detailed resume in every daily and weekly newspaper published in their district within six weeks of being chosen as a candidate. Failure to fulfill the requirements of this rule results in disqualification. The candidate's website must also include their resume. The resume must include their educational achievements, a detailed work history, and a list of any organizations they have ever been a member of or any political affiliations they may have had.

“Another important change to the electoral process instituted by the Constitutional Convention was the public funding of elections. Each congressional candidate is given a budget of one million dollars to spend on the running of their campaign. This money is for the rental of office space, the hiring of staff and consultants, and advertising and signage. In addition, from this fund each candidate is allowed to pay themselves a stipend of

$6000 per month over the course of the election season. This provision was included so that even persons of modest means can afford to take time off from their jobs to run for Congress."

"Hold on," he interrupted. "Didn't the public object to all this taxpayers' money being spent on politicians?"

"At the beginning there was some grumbling," replied Sophia, "but the benefits clearly outweighed any objections. In the first place, when the big picture is taken into account, we're not talking about that much money. Under this system the federal government spends $580 million every two years on elections, which amounts to $290 million per year to ensure that the nation's electoral process is fair and democratic. This figure is a minuscule percentage of total annual federal spending and is considered by most citizens to be money well-spent. Following the election each candidate's campaign spending is thoroughly audited to ensure that the funds were only used for permissible purposes. Any money unspent is returned to the government.

"Also, because congressional elections are now publicly funded, candidates are prohibited from accepting campaign donations from any individuals, political action committees, unions, corporations, or any outside entity whatsoever. Thus the corrupting influence of money has been entirely removed from the electoral process. An important consequence of this was that now members of Congress were able to concentrate their efforts on the peoples' business, not on raising money for future elections. Under the old system, for certain periods of the election cycle - - - which was then only two years long rather than six - - - members of Congress would spend up to 50% of their daily schedule in Washington performing as telemarketers, working the phone lines in offices equipped by the Democratic and Republican parties, essentially begging people for cash. The parties even held contests to see which members could raise the most money. The situation was simply scandalous, and a serious misuse of the members' time.

"Now congressional elections are even-handed with no candidate having a financial advantage over any other. Of course,

individuals and organizations are still allowed to exercise their first amendment privilege to speak out on issues of the day in whatever way they wish. They are allowed to advertise, support particular points of view, and expressly criticize the position or record of the candidates. Individuals are permitted to publicly endorse a particular candidate, but organizations such as political associations, unions or corporate entities are barred from doing so. This rule was specifically written into the new constitution to prevent political parties from continuing to influence the electoral process.

"And," said Sophia, "to your original point about spending the taxpayers' money on politicians, that objection is simply no longer germane, because there are no longer any taxpayers. No one pays income taxes anymore."

"What!" he exclaimed. "How is that possible? Where does the government get its money?"

"We'll get to that," replied Sophia, smiling. "Before we deal with that topic however, I must finish explaining to you the other changes the new constitution made to the ways in which America chooses its presidents.

"To begin with, the Constitutional Convention delegates understood the necessity of making explicit the assumption implicit in any so-called 'democratic' system of governance: that any given process of choosing a democratic society's leadership, whatever the particular mechanics of that process may be, will result in the choice of a leader whose leadership, if not actually *supported* by every member of the society, will at least be *accepted* by every member of the society, as legitimate. After the 2020 presidential election this assumption could no longer be relied upon in America. A significant percentage of Republicans refused to accept the election of Donald Trump's successor, Joe Biden, as legitimate. The discarding of the validity of this assumption by a sizable portion of the electorate threatened the very foundations of American democracy. A chief task of the Constitutional Convention therefore, was to find a way of restoring the validity of

this fundamental assumption in the mind of every American citizen, since this assumption is integral to the survival of any democratic system of governance.

"So the task confronting the Convention was to design an electoral system which would restore the faith of all Americans in that fundamental assumption. To that end, the delegates asked the question: in a democratic society, what is the purpose of an electoral system? To which they answered that the purpose of an electoral system is to provide the nation with leadership which is sound, ethical, competent, experienced, transparent, and, most importantly, capable of uniting the members of the society in an effort to achieve common and beneficial goals.

"When the Convention examined the then current system of choosing a president, which involved a long drawn-out program of presidential primaries during which the Democrats and Republicans in each state would choose their favoured candidate from amongst a number of possibilities, culminating in an electoral contest between the two party representatives who had won the most primaries - - - a contest which itself was not necessarily won by the candidate who won the popular vote across the nation but, rather, by the candidate who garnered a majority of the votes of the delegates to the Electoral College (a situation which, by the way, occurred twice in the period from the year 2000 to 2016) - - - it found that system to be not suited to its purpose, and to be no guarantee of providing leadership with the qualifications previously outlined.

"Since 1960, that system of choosing a president had brought the country Vietnam, Watergate, the Iran-Contra scandal, the disastrous Iraq and Afghanistan wars, the 2008 economic melt-down and, in a triumph of showmanship over competence, the election of Donald Trump, a man whose pursuit of personal power so divided the nation that it fomented a violent insurrection. By the third decade of the 21st Century the presidential electoral process in America was no longer even nominally the means by which its citizens chose the leadership which they thought could best unite

Americans in an effort to achieve common and beneficial goals; rather, it had descended into a desperate and divisive struggle whose only goal was to beat the other side and thus retain power. This sorry record was clearly less than satisfactory.

"The solution arrived at by the Constitutional Convention," said Sophia, "was to do away entirely with the practice of having each citizen vote for the presidential candidate of their choice, a system which was inherently divisive on a nation-wide basis. The rise of Trumpism exploited this inherent divisiveness and cast James Madison's concerns about democracies into sharp relief. Donald Trump inflamed in his followers "the turbulency and weakness of unruly passions," and encouraged in them an animosity towards those who opposed him such that they became "much more disposed to vex and oppress [the] other than to cooperate for their common good." Trumpism made it clear that the era of modern communications systems had done little to lessen the susceptibility of the average citizen to falling prey to the prevarications and propaganda of the unscrupulous. In fact, many argued that it had made it worse. Thus the delegates to the Constitutional Convention chose to eliminate from the electoral process altogether the two primary vehicles by which this animosity and divisiveness were manifest: political parties and nation-wide presidential elections.

"In their place," Sophia continued, "the new constitution provides for the election of members of Congress by the method I have already discussed; and for the members of Congress, who are somewhat insulated from the turbulence of day-to-day political passions by their six year terms, to choose, on behalf of their constituents, the membership of the Executive Council. This is a power that, *in extremis,* Congress already possessed. Under the old system, if both presidential candidates received the same number of Electoral College votes, the winner of the election was determined by Congress. In that situation each state was allowed one vote, and that vote was determined by whichever political party held the majority of congressional seats in that state. Under the new

constitution, each member of Congress casts a ballot for the candidate they think is the most qualified to serve on the Executive Council.

"The requirements for becoming a candidate for the Executive Council are straightforward and strict. To qualify as a candidate that person must have been elected as a member of Congress at least twice; or, been elected, and then reelected, to the position of the governor of a state of the union. These requirements were instituted to ensure that the candidate already has a certain minimum amount of experience as a government official; that the candidate has previously demonstrated their willingness to dedicate a significant portion of their life to public service; and that they have done a good enough job as a public servant that a majority of their constituents were willing to return them to office at least once. Only those individuals who meet these requirements are permitted to be candidates for the Executive Council.

"Prospective candidates for the Executive Council must file their nomination papers with the Office of the Speaker of the House. The nomination papers must have been signed by a minimum of five percent of the current members of Congress. On the third Monday of every second November, the members of Congress gather to choose which candidate will become the next 4th Vice-president of the Executive Council. There is no limit to how many candidates may run in any given such election. If no candidate receives a majority of the votes cast, the two candidates who receive the most votes face each other in a run-off election held on the first Monday in December. This gives each candidate a period of time to lobby the members of Congress individually to try to gain their support.

"This highlights another advantage of having the executive branch chosen by members of Congress rather than by the nation's citizens as a whole. In the case of where a candidate for the Executive Council is a member of Congress, those who will be choosing whether or not to vote for that candidate will have had the

benefit of being able to observe the candidate at work and up close over a period of several years. While under the old party system the average voter most often cast their presidential ballot on the basis of whether a candidate had a D or an R beside their name, under the new system independent members of Congress cast their vote for membership on the Executive Council based on an informed assessment of the candidate's character, intelligence, ability to debate, collegiality, voting record and demonstrated leadership capability. The new system provides a much more secure guarantee that those who are elected to positions of great power and responsibility will possess the necessary qualities for wise leadership, which should be, of course, the actual purpose of an electoral process in a democratic society," said Sophia.

"The former system of choosing a president was more akin to a team sport, in which two teams (the Democrats and the Republicans) vied for possession of the ball (the power to govern) in a contest of political gamesmanship. The new system is more akin to the structure of a corporation, in which the elected representatives (the independent members of Congress) of the shareholders (the citizenry) select the Board of Directors (the Executive Council) from among the most highly qualified candidates available. The new system has proven much more likely to consistently provide the nation with leadership which possesses the skills necessary to govern wisely.

"So, during each six year term, each member of Congress will have voted in three elections for a new member of the Executive Council. As with all congressional votes the votes are public and recorded. During the period leading up to the election for membership on the Executive Council, members of Congress often conduct polls of their constituents to get a sense of which candidates for the Executive Council are favoured by the public, although they are not bound to cast their vote in line with the polling results. If a member's constituents are unhappy with the candidates the member has supported, they can vote the member out of office when the member's term is up, and thus members of

Congress are held accountable to their constituents for the choices they make.

"Thus every two years, after serving a total of ten years on the Executive Council, the current President resigns and all the Vice-presidents step up one level in seniority, with the First Vice-president assuming the office of the presidency. The system was deliberately constructed in this manner so as to provide each president with a limited exposure to the poisonous temptations of power. History has repeatedly demonstrated that the wielding of great power is like being exposed to the radioactive gas radon, which can lead to lung cancer. Over time it seeps into the human psyche, poisoning the mind and tempting those who wield it into believing that only they are capable of wielding it responsibly. This is particularly true of those who possess great ambition, and it requires no small amount of ambition to rise to the level of the office of President of the United States. The Executive Council model of the executive branch of government effectively limits the possibility of this occurring, while at the same time ensuring that the holder of the office of the presidency is experienced in governance at the national level and has a significant record of public service.

"So technically, under this system," Sophia said, "no one ever actually votes for a new president. Congress only chooses new 4th Vice-presidents who, after having served an 'apprenticeship' of eight years, will in due course become the President. Thus for a period of ten years members of the Executive Council hold considerable power, and are not directly accountable to the electorate for how they wield it. The upside of this is that the Council can make difficult decisions which they deem to be in the national interest but which may not be popular, without worrying about the effect those decisions might have on their chances of being reelected. The downside is that there is the potential for three of the members of the Council to form a cabal, and to take executive action which is unlawful and injurious to the well-being of the nation. However, such an event has never occurred and is

thought to be unlikely. Unlike the vice-presidents under the old system, each member of the Council is an independent agent and is not beholden in any way to any other member. If each member of the Council aspires to eventually ascend to the presidency - - - and clearly they do or they would not have stood for election to the Council in the first place - - - it would not serve their interests to enter into a plot with the current president to carry out actions which are unlawful or unconstitutional such as, for instance, if the current president refused to resign at the end of their term in an effort to cling to power. Perhaps most importantly, under this system when the time comes for them to leave office no president can claim, as Donald Trump did, that they are the victim of a rigged election, because no election has been held. Presidents know when they assume office that their term is limited to two years, and that their resignation two years hence is an inevitable outcome of the system.

"Furthermore," Sophia continued, "as under the former constitution, the powers of government are balanced between the executive, legislative, and judicial branches such that each branch may act as a check on the power of the other two. Also, the House of Representatives retains the power of impeachment. Any member of the Executive Council can be removed from office for high crimes and misdemeanours if sixty percent of the members of Congress vote to convict under the articles of impeachment. To be presented by the Speaker to the entire House of Representatives for consideration, articles of impeachment must be endorsed by no less than twenty-five percent of the members of Congress.

"So, under the new constitution the election of capable people to be members of the House of Representatives has assumed much greater importance. Every six years citizens are responsible for choosing someone to represent them who will not only have a direct say in the choice of at least three future presidents, but who could conceivably become president themselves.

"These two reforms: the banning of political parties from the electoral process, and the election of a five-member executive

branch by the members of the legislative branch, went a long way towards healing the breaches in a perilously divided nation. The reforms did not by any means eliminate all opposing points of view, but they resulted in the dissipation of the institutionalized rancour which had gripped the populace and which was threatening to tear the country apart. The electoral reforms brought to an end the era of politics as a team sport, which inevitably led to a winning and a losing side. Since there are no more 'sides,' there is no possibility of creating a nation-wide segment of the population which feels embittered and aggrieved because their side lost an election, and the reformed structure of the executive branch has made a repeat of the Donald Trump fiasco highly improbable.

"However, the framers of the new constitution recognized that certain issues would arise on which individual citizens had opposing and strongly-held opinions. The issues of abortion and gun control were hot-button issues in the 2020's. The delegates to the Constitutional Convention concluded that when it came to deciding single issue debates such as these, it was possible and appropriate to rely upon a system of direct democracy, and so the new constitution allowed for nation-wide votes on single issues to be held via so-called 'ballot initiatives.' For a single issue proposition to make it onto a national ballot, its proponents are required to collect signatures from at least 5 percent of the voters registered to vote in the last gubernatorial election in each of at least two-thirds of the states of the union. Voting on a national ballot initiative is held on the same day in every second November on which elections for Congress are held, and as with congressional elections the casting of a ballot in a ballot initiative by every registered voter is mandatory. Those who fail to fulfill their civic duty are subject to a financial penalty. This requirement ensures that the outcome of a ballot initiative truly reflects the will of the American people. If a ballot initiative succeeds, Congress is required by the constitution to draft and pass the legislation required to make the initiative the law of the land, and the president is similarly required to sign the bill. Any law created as a result of

a national ballot initiative is the law of the land for a minimum period of twenty-four years, after which a fresh ballot initiative may be introduced to change or reverse the law. This allows for a period of stability while at the same time providing for the possibility that society's attitudes about certain controversial issues may shift over time.

"On Monday, May 1, 2028, Americans voted on whether to approve the new constitution. Since the law requiring citizens to vote had not yet come into effect, it was not mandatory for people to vote in that referendum, but the date was declared a national holiday to encourage the participation of as many citizens as possible. In the end over 90 percent of those qualified to vote cast their ballot, and a large majority of the votes cast were in favour of its approval. In order to maintain continuity a transition period of several years was required before all of the constitutional changes could be implemented, but by 2036 all of the new constitutional requirements had come into effect."

Chapter Fifty-two

THE 'SPENT DOLLAR' ECONOMY

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“So,” he said, “over a period of about ten years the American political system evolved from a system which had been dominated by a struggle for power between two political parties, into a system in which the peoples' elected representatives are independent agents who are free to support those policies which they consider to be the most beneficial for society-at-large. It's amazing to me that such a profound change could be accomplished non-violently over such a short period of time.”

“It was a testament to the power of asking the question: what is its purpose?” replied Sophia. “This approach was equally effective when it was applied to the other pillar of modern societies, the economy.

“You said earlier that nobody pays taxes anymore,” he said. “How does that work?”

“To understand how that is possible,” said Sophia, “we need to begin by dropping down several levels. At the most basic level humanity had, as Ariel Dorfman suggested, to radically redefine our purpose as a species. The effect of the global dominance of

capitalist ideology for close to two centuries had been to convince humans that the purpose of their existence was to accumulate as much personal wealth as possible, and to structure their societies accordingly. This had not always been the case. When humans had existed as small tribes of hunter-gatherers an individual's wealth was limited to what they could carry, so that property was quite literally a burden. In hunter-gatherer societies all the members of the tribe had at least some experience in all the different tasks that helped the tribe to survive. The effort to produce the necessities of life was shared by all and the fruits of that effort were shared by all.

"This began to change with the dawning of agriculture, which allowed tribes to settle down into discrete locations. Since they no longer had to carry around everything they owned with them wherever they went, humans started to accumulate stuff and the notion of personal property began to develop. The fact that humans now lived in permanent abodes and could store their belongings in them resulted in a demand for consumer goods such as cooking utensils, food storage containers, and articles of clothing. In response to this demand people began to specialize. In the new settled communities humans began to develop particular skills and instead of sharing the fruits of their labours with the rest of the tribe, they began to trade what they produced in exchange for the goods produced by others who had developed different skills. This was the earliest stirrings of the idea of the division of labour, and of the idea that some products were of greater value than others.

"The planting, tending, harvesting, and storage of crops required a higher degree of organization within the tribe than had the hunter-gatherer lifestyle. Long-range planning was now required. Somebody had to be in charge, to direct and ensure that the necessary work was performed when it needed to be. In hunter-gatherer societies the tribal leaders - - - those who had the most experience - - - personally participated in the hunt, sharing in the danger and the physical effort required to feed the tribe. But in

settlements tribal leaders gradually began to take on a more administrative role, directing others in the planting and harvesting of crops and the tending of livestock, rather then performing such tasks themselves. As job specialization became more prevalent, the egalitarian structure of hunter-gatherer societies was supplanted by the creation of hierarchies. Effective administrators, often through force of arms, morphed into tribal chieftains. Kinship ties gave rise to the notion of hereditary leadership. In return for a portion of the harvest, chieftains rewarded those who supported their rule with gifts of land and control of the crops the land produced. Some of these landowners relied on hired help or slave labour to work the land and produce the crops. The idea that it was possible to obtain the necessities of life through the labour of others and with minimal effort on one's own part - - - the idea of profit - - - entered the human psyche.

"The assumption that the ability to profit is beneficial for society-at-large lies at the basis of capitalist ideology," said Sophia. "But that ideological foundation crumbled when it was confronted with the question: what is its purpose? What was the purpose of capitalism? The answer is that the purpose of capitalism was to make rich people richer. In its essence, capitalism is a process that permits people who possess more money than is required to meet their immediate needs to invest that money in some enterprise in the hope that the amount of money invested will grow into an even larger amount of money, with minimal effort on their own part; that is, that they will profit. This was true when the first major chartered joint stock trading companies were established in England in the 1550's and was true of capitalism in the early 21st Century. As the founder of a one-time nine-billion-dollar hedge fund reportedly said, the purpose of a hedge fund is to turn a pile of money into an even bigger pile of money. (330) And in terms of its ability to achieve its purpose, capitalism was wildly successful. It did an excellent job of making rich people richer, but this success came at a considerable cost, for it did a terrible job of distributing wealth equitably. In America in 2020, the richest nation in the

history of the world, roughly one in nine Americans lived in poverty. (331) In 2023, a majority of American families were living pay-cheque to pay-cheque, unable to meet the costs of a major car repair or the medical bills from a sudden illness without going into debt. One-half of all American families had no retirement savings. (332)

"Capitalism relied on the acceptance of two assumptions about the nature of society. The first, as I have already mentioned, was that the ability to profit is beneficial to society-at-large. But the very notion of profit - - - effortlessly increasing one's personal wealth - - - necessarily involves the exploitation of some human beings by other human beings. And since the purpose and the effect of capitalism is to make rich people richer, over time the system evolved of its own accord into a situation in which the many were being exploited by the few.

"The second assumption underlying the ideology of capitalism," Sophia continued, "was that competition was good for society-at-large and that everyone would benefit if people were required to compete with one another. But what is the purpose of competition? The purpose of a competition is to produce a winner and a loser. That is its purpose. It does nothing else. And the dynamics of capitalism being what they were, those who did manage to achieve a win were more likely to continue to win some more, while those who suffered a loss were more likely to continue to lose. This led to massive inequality in America. In 1980, C.E.O.s were paid about forty-two times as much as the average employee; in 2016, they were paid three hundred and forty-seven times as much, and the three million people who made up the wealthiest one per cent of Americans were collectively worth more than the two hundred and ninety-one million who made up the bottom ninety per cent. (333) Even more importantly, the notion that competition was the wise choice as the basis of a successful society completely ignored the fact that what had made humans the dominate species on the planet was their ability to cooperate with one another, not their ability to compete.

"The effect of structuring society on the basis of those two assumptions was to divide society into two groups: a small group of exploiters and winners, and a large group of exploited and losers. Since humans are highly emotional manifestations, a lifetime of exploitation and losing tends to make them angry, bitter, and resentful. Not only does this state of mind make them susceptible to the self-serving messages of the Donald Trumps of the world, it means that God, who experiences be-ing through those human manifestations, experiences anger, bitterness, and resentment, which is contrary to God's quest for happiness.

"By the third decade of the 21st Century it was evident to many that humanity's behaviour was unsustainable; that human civilization was digging its own grave, but that we didn't know how to stop digging. Cynicism and despair were widespread, particularly among the young who could see no viable future for themselves. The author and poet Michael Robbins spoke for many when he wrote:

> "We could build a free society that doesn't view the planet as a profit engine. I just really doubt that we will. Climate disaster, economic collapse, war, resurgent fascism and nationalism, assaults on basic political freedoms, mass violence: all these mutually reinforcing in a sinister feedback loop, the structural stresses of capital's death throes accelerating ecological catastrophe and exacerbating reactionary forces, which in turn further stress the structure. The collapse won't be a single event, but a slide into what the world-systems analyst Giovanni Arrighi calls 'systemic chaos.' Late-capitalist society is a coyote suspended above an abyss, believing he still stands on solid ground. We are in the interval before he notices he's supported by thin air and plummets to the canyon floor." (334)

“That is a very apt metaphor,” he interjected. “I remember those Saturday morning television cartoons. They were funny, back then.”

Sophia continued, “It was becoming increasingly clear that if utter chaos was to be avoided, systemic change had to be implemented. But nobody could figure out what that change might be. Although true Marxist communism had never actually been put into action, as an alternative to capitalism communism was viewed as a failure and was widely discredited. Socialism of various degrees was successful in some nations, particularly in the Baltic countries, but it had been so thoroughly demonized in the U.S. by the political right that many Americans were reflexively antagonistic towards any proposal that smacked of its tenets. Yet desperate times called for desperate measures. Then this book,” she said, touching the book sitting on the bench between them, “came along, and showed humanity how it might tunnel out of the hole that it was so frantically digging.”

“You say that I will write this book,” he said, “but I have no idea what's in it. If I understand you correctly, you are now saying that it contains a solution to the crisis of capitalism. That strikes me as preposterous. I'm a carpenter, not an economist. How is that possible?”

“You came up with a deceptively simple idea,” Sophia replied. “You invented the idea of the 'spent dollar' economy.

“The spent dollar economy?” he said. “What is that? How does that work?”

“In the spent dollar economy, when a consumer spends a dollar purchasing a good or a service, that dollar is 'spent,' that is, it is used up. It ceases to be. It is taken out of circulation and no longer exists. Let me use my purchase of your coffee and muffin as an example. When I paid for those items, $9.50 was debited from my bank account. But that amount was not credited to a bank account of the Starbucks Coffee Company. That $9.50 has been 'spent,' used up. It has disappeared from the economy. Neither Starbucks nor any other company has a bank account that has

actual money in it. Companies never handle money. In the spent dollar economy the purpose of a company is to provide a good or a service, not to 'make money.' Companies no longer earn money. Only human beings earn money. This is because only human beings need money. We need money for food, shelter, clothing, transportation, and a whole range of other consumer goods and services. But companies do not need any of those things, so they do not need money."

"Wait, wait, wait," he interrupted. "I'm confused. Businesses purchase goods and services from other businesses, don't they? Starbucks has to pay someone for the paper cup they put my coffee in, right? And how does Starbucks pay its employees if it doesn't make money?"

"Those are two different questions," she answered, "and they have two different solutions. But first we must clarify some basics. The most basic thing to understand is that cash is no longer in use in any country on Earth. All financial transactions are now carried out digitally. Today every person on the planet has an unique alpha-numeric identifier that is assigned to them at birth which attaches to them for life, and which becomes their bank account number and is used for all financial transactions and in other situations, such as accessing medical care. In America, that identifier is made up of the initials of the state in which you were born, the time and date of your birth, your initials, your mother's initials, and a random string of other numbers and letters.

"Similarly, each business has a unique alpha-numeric identifier. Now, just because Starbucks doesn't handle any money doesn't mean that they don't have any revenue. My purchase of your coffee and muffin was recorded, automatically and electronically of course, as revenue in that particular Starbucks' Commercial Transaction Database. In addition to the amount and the time and date of the transaction, the source of the revenue, that is, my bank account identification number, is also recorded. This is done so that, if need be, Starbucks can prove to the government that the transaction actually occurred. This requirement is in place

so that the government can determine that any given business is in fact a legitimate business with actual customers, who are paying for its goods or services, and not a front for some nefarious purposes. I don't have to worry about the fact that my personal identifier is on the books of the various businesses of which I am a customer, because my bank account can only be accessed by a scan of the palm of my right hand, or via a password that only I know. In your day when people used a debit or credit card to make a purchase, the card was inserted into a card reader and then the purchaser entered a 4-digit 'pin' number that only they knew so that the system knew that the purchase was being made by the legitimate owner of the card. My palm, since it is unique, serves as both card and pin number.

"You asked how, if that Starbucks outlet has no money, how do they pay for the paper coffee cups they sell their coffee in? The process starts with them sending a purchase order by e-mail to the paper cup supplier. A few days later the paper cups arrive at Starbucks accompanied by an invoice which details the purchase and which includes the supplier's identification number. The Starbucks' bookkeeper accesses the company's Commercial Transaction Database which requires a password, and enters the supplier's ID number into the payee column along with the number of the invoice. The name of the supplier automatically appears. The bookkeeper then authorizes the transfer of an amount equal to the amount of the invoice to the revenue account of the supplier. The Bank of America branch which handles that Starbucks' Database then automatically sends a funds transfer authentication number to the bookkeeper's phone, which the bookkeeper immediately enters into the Database. Upon receipt of that number the bank transfers the funds to the supplier's revenue account, thus completing the payment. The amount of the payment is automatically entered into the Starbucks' expenditures account, which keeps a running total of all the expenditures that Starbucks has made in that fiscal year. The bookkeeper then sends an e-mail to the supplier notifying them of the time and date of the payment.

In due course the supplier sends a receipt by e-mail to Starbucks, the number of which is entered into Starbucks' Database.

"The technology to do business this way was widely available in the early 21st Century, but there are four crucial differences between the way businesses operated then and the way they do now. First, in our example of the payment made by Starbucks to the paper cup supplier, no money actually changes hands. The 'funds' transferred into the supplier's revenue account are simply an acknowledgement by Starbucks that the supplier supplied Starbucks with some goods of that particular value. The supplier cannot withdraw any funds from its revenue account to spend, because the 'funds' are a purely digital bookkeeping device; in and of themselves they have no value. The amount recorded in the supplier's revenue account is simply evidence of the fact that the company sold an item valued at the amount recorded to Starbucks. That amount is automatically added to a running total of the value of all the goods the company has sold in that current fiscal year.

"Second," said Sophia, "if the 'funds' to purchase the paper cups did not come from Starbucks' revenue account, you may be wondering where they came from."

"Yes," he replied. "How does that work?"

"The answer is that those 'funds' are also merely a digital bookkeeping device recorded in Starbucks' expenditures account. They are not tangible. They are literally made out of nothing. All they are are digits on a computer screen. The amount recorded in Starbucks' expenditures account is merely evidence of the fact that the company purchased an item valued at the amount recorded from the paper cup supplier. This amount is automatically added to a running total of all the goods and services - - - excluding its employees payroll - - - which the company has purchased in the current fiscal year.

"The amount of 'funds' which can be recorded in the Starbucks expenditure account is, in theory, unlimited. Any goods or services that the business needs to operate are purchased in the

manner which I have just described. This system is open to potential abuse. It is possible for anyone who knows the company identification number, as well as the password to the company's Commercial Transaction Database, and who is in possession of the company phone, to purchase items from other businesses by using the Starbucks expenditure account. For instance, the company bookkeeper could use the expenditures account to purchase airline tickets to the Bahamas. However, while it is possible to commit this crime, it is not possible to get away with it. When a purchase is made and the funds are transferred by the bank, the bank automatically enters the amount of the purchase and the relevant data into the company's expenditures account. This record is permanent, and cannot be deleted by the bookkeeper or anyone else. All Commercial Transaction Databases, and company expenditures accounts in particular, are regularly audited by an automated computer program which looks for any unusual purchases. If it detects an anomalous or suspicious purchase in the expenditures account, it flags it for investigation by the bank's department of audits. If the audit finds evidence of fraud, the bank contacts the legal authorities who conduct an investigation and lay criminal charges where warranted. Since it is bound to be detected sooner or later, this kind of fraud is very rare.

Sophia then went on, “A more difficult crime to detect and prevent is a combination of fraud and outright theft. Say an owner or manager or bookkeeper of a bar - - - anyone who has access to the necessary information - - - uses the company expenditures account to purchase a case of wine and has it delivered to their home address. It is possible that the seller of the wine might question why a purchase by a business is being shipped to a residential address, but the bank's automated fraud detection computer system would probably not deem that purchase to be suspicious. The detection and prevention of this type of crime would depend upon the sophistication of the bar's internal inventory control system. Of course, this type of theft is not unique to the 'spent dollar' economy and is possible under any type of

accounting system, which is why it is important for businesses to hire trustworthy managers and bookkeepers.

"This brings us to the third important difference between how businesses operate in the spent dollar economy compared to how they operated in your day. You asked me how companies pay their employees if the companies have no money. Companies do not directly pay their employees, although they do determine how much their employees will be paid. Companies cannot pay their employees because companies have no money with which to pay them. It is impossible for a company to transfer 'funds' from its expenditures account into the personal bank account of one of its employees. If the company bookkeeper tried to transfer 'funds' from the Starbucks expenditure account to his own personal bank account, he would receive a message saying, "This transfer of funds is not authorized. This type of transaction is illegal. Do not attempt." The system will permit companies to transfer 'funds' only to other companies, not to individuals. Individuals, however, can transfer funds to other individuals.

"So if employees are not paid by the company they work for, where does their income come from?" he asked.

"It comes from the government," Sophia replied. "When a person is hired by a company their personal identification number is entered into the company's Commercial Transaction Database in the payroll column. The details of their monthly salary or hourly wage rate are entered. These amounts are negotiated between the company and its employees, but when the 'spent dollar' economy was first instituted, the government passed a law setting a minimum wage of $20.00 per hour across the entire nation for all types of employment. This has risen since then of course. Once a month - - - different companies have different paydays - - - the payroll department of the local branch of the Bank of America where a company's Commercial Transaction Database is maintained, which is itself a branch of the U.S. Treasury Department, enables the transfer of funds from the Treasury Department into the company's employees' personal bank accounts

in accordance with the data recorded in the company's database, which has been entered by the company's bookkeeper. The entire payroll system is fully automated and is operated by a sophisticated computer program, and its accuracy depends upon the accuracy of the data entered by each individual company's bookkeeper.

"But what is the source of the money paid out by the Treasury Department? " he asked. "You told me earlier that no one pays taxes anymore. From where does the government get the money? And how can it possibly finance the payrolls of every company in the nation?"

"Before I answer your questions, we must first reach an understanding of the two big problems that governments of nations whose economies were based on capitalism regularly encountered. These were the problems of inflation and recession. Economic inflation is defined as a decrease in the purchasing power of money, caused by a general increase in the price of goods and services in the economy. There are four main theories that seek to explain the underlying causes of inflation.

"The first of these theories is known as the 'quantity theory of money,' which argues that inflation is determined by the money supply. According to this theory, an increase in the amount of money in circulation will directly cause a proportional increase in the price of goods and services over time.

"A second theory of inflation is called the 'demand-pull' theory of inflation, which states that the cost of goods and services rises when demand is greater than the available supply. This model of supply/demand imbalance reflects one of the most common definitions of inflation: 'Too much money chasing too few goods.'

"The third theory of inflation is known as the 'cost-push' theory, which attributes inflation to the rising cost of production - - - whether raw materials or wages - - - amid a steady flow in demand. An increase in these 'input costs' will likely decrease a manufacturer's bottom line. To compensate, some manufacturers may decide to transfer these extra costs to the consumer by charging higher prices for the same unit of goods.

“The fourth theory of inflation is the 'structural theory,' which describes a type of inflation that often prevailed in so-called 'developing countries.' It says inflation is caused by 'structural' weakness in a country's capacity to produce goods or maintain an adequate flow of supply. Poor infrastructure, outdated technologies, or inefficient supply chains can contribute to general underproductivity, creating imbalances between supply and demand. Inflation that stems from structural issues may not be easily changed by monetary policy. (335)

“All of these theories,” continued Sophia, “are predicated on the twin assumptions upon which capitalism rests: that the purpose of human existence is to acquire as much wealth as possible, and that the purpose of commerce is, in the pursuit of that purpose, to make a profit.

“The first two of these theories are really saying the same thing, summed up by the statement that inflation is caused by 'Too much money chasing too few goods.' This can arise through two different processes. It can be caused by having too much money in circulation in the economy; or by the supply of goods being insufficient to meet demand. Too much demand arises in those situations because the spending power of consumers exceeds the ability of the economy to produce goods at a rate sufficient to satisfy that demand. Under capitalism, both of these situations are interpreted by the suppliers of goods and services as a signal to increase their prices, because the situation provides an opportunity to increase their profits, which is, according to capitalism, the purpose of commerce. Thus in these two situations, the underlying cause of inflation is the motivation to increase profits.

“The typical response of governments - - - through their central banks - - - to these first two types of inflation is to raise interest rates. By increasing the cost of borrowing, the costs of big-ticket items such as housing and transportation rise substantially, leaving consumers with less money with which to buy other goods and services. In theory, this will bring about a reduction in demand across the economy in general, which will result in the providers of

those goods and services reducing their prices, thus bringing the inflationary forces under control. This response to demand-pull inflation is, at least in mature economies, generally effective, but it is a blunt tool which takes a considerable period of time to have the desired effect, and the financial pain it causes is not evenly spread across the economy. The wealthy - - - those who are mortgage-free and have money to lend - - - do very well under high interest rate regimes, for they get a bigger return on the money they lend. But for most of the citizenry the higher costs of borrowing force cutbacks in other areas of their lives, including essentials such as food, medical care, transportation and home heating. Frequently these essentials are paid for by going further into debt, a dynamic which further benefits those who have money to lend.

"The 'cost-push' theory of inflation," Sophia went on, "while sound in one respect, is partially based on a widespread misapprehension concerning the 'costs' of raw materials. Raw materials, in and of themselves, do not 'cost' anything. The lumber from trees, nickel and copper ores, fields of wheat, none of these things can properly be said to cost anything. They have no inherent value. None of these things receive a paycheck, nor have a bank account, nor can they spend money. All of the value typically associated with these things and all other so-called raw materials, arises purely from the amount of labour that human beings, who do spend money, have put into producing and processing them, plus however much value the owners of the raw materials place upon them, which, typically, is as much as they think the market for the raw materials will bear. No money goes to the raw materials. The idea that raw materials 'cost' something is a myth. All of the money associated with the so-called 'costs' of raw materials ends up, sooner or later, in the pocket of a human. In other words, all of the true cost of any particular product is actually based on the total value of all the human labour that went into producing it.

"This leads us to the aspect of the 'cost-push' theory of inflation which is quite accurate: the attribution of inflation to the rising costs of production. Obviously, if the true cost of any

particular product is actually based on the total value of all the human labour that went into producing it, then it follows that if the cost of labour rises, and if the goal of producing the product is, at minimum, to recover those costs, then the price of the product must increase, resulting in inflation. Note, however, that there is nothing, in principle, which prevents a product or a service from being sold at a price which is lower than the total cost of all the labour that went into providing it. This observation is important, for it means that, in theory, goods and services can be provided to the consumer at no cost at all; that is, they would be free.

"Cost-push inflation, as long as it is not excessive, is (by capitalists) generally regarded as a good thing, being seen as a vital component of a healthy, 'growing' economy. Cost-push inflation results in an increase in the Gross Domestic Product (GDP) which capitalism regards as a positive outcome. Their fascination with quarterly GDP reports distracted capitalists from the truth that endless growth is an unsustainable fantasy.

"The type of inflation caused by the fourth theory of inflation, the structural theory, is the most difficult type of inflation to overcome," said Sophia. "In some cases it is brought about through a combination of the first two types of inflation we have discussed. In an effort to curry favour with the populace, politicians in developing nations had been known to hand out subsidies for particular goods such as fuel or bread. These subsidies amounted to an injection of cash into the economy, increasing the money supply. The increase in the money supply resulted in the growth of demand-pull inflationary pressures across the economy. The infrastructure of less developed countries was often unable to meet the increased demand for products that the increase in the money supply had created, which, in a capitalist economy where the goal for producers was to make as much profit as possible, drove up prices, and a vicious cycle of hyperinflation (defined as a period of time in which the monthly inflation rate exceeds 50%), such as that experienced by Zimbabwe and Venezuela, was the result.

“This brings us to the topic of recessions, the other economic problem which regularly confronted capitalist economies,” Sophia continued. “In the United States, a recession was defined as a significant decline in economic activity spread across the market, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales. (336) Historically, recessions could be brought on by a variety of so-called 'shocks' to the economy, but they most often occurred following a period in which central banks had raised interest rates in an effort to reduce inflation. Some recessions were mild, while others were quite deep and caused significant economic pain in the form of increased unemployment and decreased value of investment portfolios. As was always the case in capitalist societies, the brunt of that economic pain was felt by the middle and lower economic classes. The wealthy, as usual, were generally able to ride out the storm without suffering a significant decline in their standard of living.

“So, in mature capitalist economies the so-called 'business cycle' came to be accepted as the inevitable norm. Periods of relative stability with mild cost-push pressures and low inflation, would eventually be followed by periods of high inflation and high interest rates, only to be followed by recessions featuring high unemployment and a reduction in asset values. It was widely assumed that this was the natural order of things, and, under capitalism, it was.

“The introduction of the 'spent dollar' economic system put an end to this systemic business cycle. The new economic system rests on three main pillars: the idea of the 'spent dollar;' the doing away with the notion of 'profit;' and the disposal of the belief that the fulfillment of economic success depends on the personal acquisition of real estate.

“Formerly, if the government pumped money into the economy, the total money supply would increase. As this increased supply circulated through the economy it would produce inflationary pressures. All money eventually ends up in the pocket

of a consumer. The purpose of money is to facilitate the exchange of goods and services. Under the former system, an individual could spend their money, save their money, or invest their money in the hope that it would grow into a larger amount of money. In the spent dollar system, only the first two of these possibilities are available. Individuals no longer make investments. As we shall see, there is no longer any need for them to do so. Only the government makes investments, and they are not really investments as they were traditionally understood, for the government does not expect a 'return' on its investment. I shall explain this in more detail in a moment," said Sophia.

"The point I am trying to make now is that under the former system, when the government pumped money into the economy thus increasing the total money supply, inflation would result. Under the spent dollar system this doesn't happen. Once a dollar arrives in the pocket of the consumer, and we are all consumers, she can either save it, which does not cause inflation, or she can spend it. But once she spends it, it is 'spent,' used up, and disappears from the economy. So as fast as the government pours dollars into the economy, those dollars are spent and taken out of the economy, so the total money supply only grows by the amount of personal savings accumulated by consumers, which, in and of itself, does not contribute to inflation. So, in theory, the government can pump an almost unlimited amount of money into the economy without setting off a round of inflation.

"However, in practice, no responsible government would do that. It is not the goal of the spent dollar economy to create a society of millionaires who have no reason to work. Nor is it the goal of the spent dollar economy to create a classless society. Karl Marx's ideal society was a classless society in which the rule would be: from each according to his abilities, and to each according to his needs. This is not the case in a society based upon the spent dollar economic theory. To paraphrase Marx, in the spent dollar economic theory the rule is: 'from each according to their ability, and to each according to their accomplishments,' as it supposedly

was under capitalism. In the spent dollar economic system individuals are paid according to a combination of the level of difficulty of their job, the degree of education and the amount of skill required to perform the duties of the job, and the amount of responsibility that the job entails.

"Ultimately," said Sophia, "for businesses that produce goods or provide services, the amount of compensation an individual receives is limited by what their employer calculates it can afford to pay and still remain competitive with other similar businesses. In the spent dollar economy businesses are free to pay their employees at whatever rate they find necessary to attract qualified labour, as long as it meets or exceeds the lawfully mandated minimum wage. Even though I have implied here that businesses 'pay' their employees, keep in mind that because businesses never actually possess any money under the spent dollar economic model, no funds are ever directly transferred from a business to its employees, or to its owners. For accounting purposes the compensation received by the owners of a business is simply recorded as another labour cost in the company's Commercial Transaction Database. When an individual is hired, the employer authorizes the government to compensate, on the employer's behalf, that individual at whatever level the employer and the employee have agreed upon. However, the agreed upon amount of compensation will appear as a cost in the company's Commercial Transaction Database, so in order to remain competitive it behooves employers to try to minimize their labour costs, including the level of their own compensation. This aspect of the spent dollar economy remains the same as it was under capitalism, and therefore there remains a role for unions to represent labourers and to bargain with employers on their behalf.

"Furthermore, it is not the goal of the spent dollar economic system to transfer wealth from the rich to the poor. Under this system those who rise to the top of the economic ladder through hard work and their natural abilities are allowed to keep all of their earnings although, just as there is a minimum wage to ensure that

all workers receive a level of compensation that guarantees the provision of a reasonable standard of living, there is, with certain exceptions I will explain in a moment, a maximum wage of 12 million dollars per year plus a potential annual bonus of up to 10%, which is intended to prevent the creation of the vast disparities in wealth that characterized late stage capitalism. The spent dollar economic system does not produce any billionaires. In the present day, the accumulation of that kind of wealth would be regarded as a symptom of a dangerous addiction, which is unhealthy for the individual who suffers from it and which is also unhealthy for society-at-large. A guiding principle of post-capitalist society is 'moderation in all things,' including the amount of wealth any one individual can accumulate. People at all income levels are allowed to keep all that they earn. As I mentioned earlier, there is no longer any requirement for income or payroll taxes. You asked me where the money the government provides comes from. It has no source. The government simply creates it - - - out of thin air - - - in the amount necessary to keep the economy running smoothly. It can do this without causing inflation because under the spent dollar economic system, dollars are removed from the economy as fast as they are introduced.

"But this is only half of the story," Sophia continued. "It was also the goal of the spent dollar economic system to eliminate poverty, and this goal has largely been achieved. The introduction of the spent dollar economic system permitted the establishment of the Guaranteed Universal Basic Income, known as the GUBI. When the GUBI was first introduced every eligible citizen who was unemployed, including stay-at-home parents, received monthly remuneration in the amount of $1,000. In addition, for each child under the age of twelve parents received a Child Allowance Benefit (the CAB) in the amount of $300 per month. This rose to $350 for children over twelve, and to $400 for children sixteen years of age. When a child reaches the age of eighteen the CAB ends and the child, if unemployed, becomes eligible for the GUBI. When initially introduced, the CAB applied to every child. It was later

amended to apply only to the first two children born into each family. This criteria was eventually adopted worldwide because it is below the natural replacement fertility rate, and the goal was to lower the human load on the Earth's resources. Families were still allowed to have more than two children, but direct government financial support in the form of the CAB is only provided for the first two.

"Inevitably, there were those who decried the GUBI and the CAB as government-funded welfare, and that it would make people dependent and lazy. While this argument was not entirely meritless, the truth was that the people who made it simply resented that their tax dollars were supporting so-called 'welfare queens.' But, of course, under the spent dollar system no one's tax dollars are being used to support those on welfare, because there are no taxes. When the GUBI was first implemented, recipients were allowed to earn up to $640 per month without any reduction in their GUBI payment, so it was possible for a household with two adults on the GUBI and three children under the age of twelve to have a monthly income of just under $4200. This income, plus the Universal Rental Program Subsidy, known as URPS, which I will explain to you more fully in a moment, meant that a household with two unemployed adults with three children could have a fairly comfortable lifestyle. As I mentioned," said Sophia, "there were those who maintained that these programs were open to abuse, and that they would contribute to dependency which, supposedly, was unhealthy for the dependent. And there is no doubt that these programs, particularly when they were first implemented, were taken advantage of by individuals who could have been working for a living. But for every person who abused this form of social generosity there were many more who, for any one of a number of legitimate reasons, could not support themselves through gainful employment, and were thereby lifted out of poverty by these programs. Families thrived under these programs, and childhood hunger in America disappeared. It was widely acknowledged that these programs were expressions of American compassion at its

very best, and that it would be unwise to let the irresponsible behaviour of a small minority prevent the implementation of programs that had the potential to benefit so many. After all, those who used the GUBI to sit at home drinking beer, eating pizza, and watching television all day long were harming nobody but themselves. To the extent that this was a problem in the beginning, it has greatly diminished. Children are now taught from an early age that their society guarantees that their basic needs will always be met, but that in return it is incumbent upon each individual - - - one might say that it is their patriotic duty - - - to make a contribution to society-at-large to the best of that individual's ability, and that they will be rewarded for doing so.

"The benefits of these social programs were spread widely across American society. The GUBI and CAB programs immediately increased the income of all single-earner two parent families with three children by at least $1900 per month. Along with the large decrease in housing costs facilitated by URPS, this meant that many families in America saw a significant increase in their amount of disposable income. This resulted in a significant and sustained boost to the entire economy, and unemployment fell to historic lows.

"We come now to the fourth major difference between how businesses operate in the spent dollar economy compared to how they operated under the capitalist system. In an economy based on capitalism, in which the purpose of commerce was to maximize profits, this increase in demand would have led to demand-pull inflationary pressures. But in the spent dollar economy, the purpose of commerce is to produce a good or supply a service, and the economic goal of every business enterprise is not to 'turn a profit,' but to produce that good or supply that service at a price which is equivalent to the actual cost of producing the good or supplying the service.

"In the spent dollar economy, any particular business is considered to have been successful if, in any given fiscal year, its revenues are equal to between 95% and 105% of its costs. If a

company's revenues fall within that range, every employee receives a 2.5% bonus for that year. If a company's revenues fall between 97% and 103% of its costs for that year, every employee receives a 5% bonus. And if a company's yearly revenue falls between 99% and 101% of its costs for that year, every employee receives a 10% bonus. Bonuses are not entered as costs in the company's Commercial Transaction Database; they are cost-free incentives paid out by the government to encourage companies to be as efficient as possible, while at the same time keeping their prices at the lowest level required to cover their costs.

"When a company's revenues for a year are below its costs," Sophia continued, "it is a signal to the company's management that they must reduce its costs through the elimination of inefficiencies or by a reduction in its labour costs; or they must increase revenues by raising the prices of its products. When a company's revenues are in excess of its costs, that is a signal to its managers to reduce revenues by decreasing the price of its products, or to raise the wages of its employees and thus increase the company's costs. In any event, the financial goal of every business in any given year is not to turn a profit, but to break even. Companies that consistently fail to have their revenues fall within the 95% to 105% range of their costs and which fail to respond to revenue / cost signals face consequences. The government can step in and demand a shake-up of top management. If over a sufficient period of time a company continues to fail to match its revenues to its costs, the viability of the company can be called into question and its business license can be suspended, forcing it to cease operations."

"What about shareholders?" he asked. "How were the people who had invested in publicly-traded corporations affected by all this?"

"Everyone's financial interests were protected," Sophia responded. "No one lost money as a result of the shift to the spent dollar economy, but there were major structural changes. Like the Internal Revenue Service, the entire financial services industry

became a thing of the past. On Valuation Day, the day on which the spent dollar economy officially came into effect, which was on January 1, 2038, all stock markets and commodity trading markets closed permanently and the trading of all stocks and bonds ceased. This was because there was no longer any social need for these institutions; their supposed purpose had been dissolved by the new economic system. Under capitalism the ostensible purpose of stock markets was two-fold: one, it was a way in which corporations could raise capital to establish or expand their operations; and, two, it provided those with money to invest an opportunity to increase the value of their holdings. This latter function was sold to the public as a way of providing financial security for people after they had retired from the workforce. Both of these purposes were supplanted by the introduction of the spent dollar economy.

"Say that you came up with an idea to produce some new product or provide some new service," Sophia said to him. "Under capitalism you would go to an investment bank or to a venture capitalist with cash to invest to obtain the necessary start-up funds. You would agree to pay a certain rate of interest on the money borrowed, or, perhaps, agree to share a certain percentage of your company's future profits with your investors. You would then use the funds you had borrowed to set up the infrastructure and hire the workforce necessary to actualize your idea. If your idea was successful, or at least looked like it would be successful, you could then create shares in your company that could be sold to the public in an 'Initial Public Offering.' You would get to decide how many shares would be available for sale, what their initial asking price would be, and importantly, how many shares you would give to yourself. If the shares sold at an IPO price of $15/share, and you had given yourself 2 million shares, then you instantly had assets on paper of $30 million dollars. Neat trick, eh?" Sophia grinned, shaking her head. "Investment bankers, who played a vital role in this game and who were well rewarded for that role, referred to this process as 'putting lipstick on the pig.' All the financial risk in this game was assumed by the members of the public who purchased

the shares in your company. If your company's success did not materialize, or if there was a general economic downturn and the value of its shares tanked, you were not out of pocket, for your shares had been free. And the investment bankers had already been paid their handsome fees, taken their lipstick and moved on. This scam, which was perfectly legal, was repeated over and over, and the average investor, ever eager to take advantage of the prospect for some easy profit, never seemed to mind too much that they were being played.

"The other purpose which the stock market supposedly fulfilled, a way for the average citizen to provide for their retirement, was also a bit of a con. Financial services companies advertised heavily on television, always promising wise investment advice. But the unstated message was always the same: 'GIVE US YOUR MONEY. GIVE US YOUR MONEY! We'll take YOUR money and invest it for you. If we make smart choices and if things in general go well - - - things over which we have absolutely no control - - - then over time the amount of YOUR money that you have given us to play with in the stock market casino will increase. But if we place bad bets, or if the economy goes into a slump, and your investment decreases or even disappears altogether, well, brother, too bad, but that's the nature of risk. In the meantime, we will have been well-paid for our advice while we sat around in our cushy offices moving pixels around on the screens of our computers.'

"But the introduction of the spent dollar economic system closed the doors of the stock market casino for good. Its two supposed purposes: the raising of capital for corporate expansion, and the provision of retirement income, were fulfilled by other, less risky means.

"Valuation Day was a Friday," said Sophia, "so the last day of trading was on Thursday, December 31, 2037. At the close of business on that day, the value of all stocks was fixed for all time. From that day forward, stocks could only be sold to the Bank of America, at that day's closing price. Just when those stocks were

sold was up to the owner of the stocks, but the death of the owner automatically triggered the sale of the stocks with the proceeds of the sale being added to the owner's estate. Thus stocks could not be passed on to future generations. The Bank of America was able to purchase all the stocks that were offered for sale because, under the spent dollar system, the Bank, which is an arm of the government, has an infinite amount of dollars at its disposal.

"There were basically two types of shares: shares that paid dividends, and shares that did not. People who held dividend-paying stocks continued to receive quarterly dividend payments from the Bank of America in the amount equal to the dividends paid by the corporation in the last quarter prior to Valuation Day. To stop companies from gaming the system, this amount had to be consistent with the dividends paid out by the corporations over the last several fiscal years. After Valuation Day, the total amount of dividends paid out by the Bank on behalf of any given corporation had to be carried as a cost in that company's Commercial Transaction Database. Over time, as those shares were bought up by the Bank, those costs decreased and thus exerted a steady downward pressure on prices.

"After Valuation Day, many investors sold their non-dividend-paying stocks to the Bank, since they could no longer increase in value, although some people hung on to them as a non-cash asset which could be saved for a rainy day. However, most investors hung on to dividend-paying stocks since, for as long as the company remained in business, they were a guaranteed source of income for the life of the owner of the shares.

"After purchasing shares the Bank destroyed them, and so, over a period of time - - - it took about 75 years - - - even as no individual person's financial interests were harmed, the profit motive was slowly squeezed out of the economy. Late stage capitalism, which was based upon the profit motive, *evolved* into the non-profit spent dollar economic system."

"What about all the stockbrokers and investment bankers and other people who were employed in the financial services

industry?" he asked. "Weren't their financial interests harmed by these changes?"

"No," replied Sophia. "Obviously, like others in the past whose jobs had been made redundant by technological change, they were required to find new professions. Some went to work for the Bank of America, which is a large bureaucracy which required their kind of knowledge and skills. But many struck out on new paths. However, all persons who were laid off as a result of the Valuation Day changes to the economic system were guaranteed two years of salary at the rate at which they had formerly been paid, whether or not they were employed. This period of time could be extended for those who had returned to school to be retrained for a new profession. Furthermore, no matter what the wage scale of their new profession was, if it was less than what they had previously been paid, they continued to be paid their former rate of pay. So, say a stockbroker who had been making $200,000 per year prior to Valuation Day became a carpenter, like you. A journeyman carpenter working full-time might earn some $80,000 to $90,000 per year, but the former stockbroker would continue to be paid $200,000 per year, even as an apprentice, even though on the books of the company which he worked for the cost of his wages would be recorded at the industry standard. There were some who complained that this was unfair, but the goal was to obtain the cooperation of all sectors of the economy as it transformed into the spent dollar model. To achieve this goal, it was imperative that no persons suffered economically as a result of the shift. Those who thought this unfair were encouraged to look upon workers such as the former stockbroker-turned-carpenter in the same way that they might view someone who won a lottery - - - someone who got lucky. It turned out that many of the former financial sector workers welcomed the changes to their vocation. The workers in this sector were well educated and of above average intelligence. They had been drawn towards those jobs by the financial rewards that they promised, but often had become disillusioned by the daily grind of the satisfaction-devoid-process

of shuffling numbers around on a computer screen, and of trying to think up ever-new clever ways of separating people from their money. Many found their new careers as teachers, health care specialists, journalists, tradesmen, gardeners, and so on to be much more psychologically satisfying. They came to realize that their former professions had been a vast waste of human potential."

"Okay," he said. "So if I come up with a fresh new idea that I think can be successfully marketed, where do I go to get the start-up funds?"

"For that, you go to a BOBA," Sophia replied.

"What's a BOBA?" he asked.

"A BOBA is a Board of Business Approvals," she said. "Every state has at least one of these Boards, which are a branch of the Bank of America, and which are staffed by people who specialize in the assessment of entrepreneurial proposals. For the budding entrepreneur the process is the same as it would have been formerly if they had been trying to get a venture capitalist to give them start-up funds, except that they don't have to demonstrate to the BOBA that their idea will be profitable. They only have to demonstrate that they will be able to sell their product at a market price which will cover the cost of its production. To that end the entrepreneur will present to the BOBA a detailed business plan, laying out projected labour and material costs, costs associated with the construction of any necessary infrastructure such as factories or warehouses or renovations to existing buildings, an estimate of the potential market, an assessment, if applicable, of the proposed enterprise's environmental impact, the availability of a workforce with the necessary skills, how the product will be marketed, what experience the applicant has, and so forth.

"If the entrepreneur's business plan convinces the BOBA that the proposed venture has a reasonable chance of success, and that it will be a positive addition to the economy and to society, the entrepreneur is granted a business identification number and its Commercial Transaction Database is set up at the branch of the Bank of America which is nearest to where the business is to be

situated. This basic process is the same for setting up a hair salon, or opening a new restaurant, or for a company which plans to manufacture airplanes. No set amount of 'start-up' funds are granted. Remember that once a Commercial Transaction Database is established, any authorized person can use the company's business identification number to purchase whatever is necessary for the operation of the business. The costs of major purchases such as buildings, manufacturing equipment, computer systems, vehicles and so on are amortized over the appropriate period of time in accordance with general accounting principles.

"The BOBA does set the initial level of compensation the new business can pay its owner. The amount of compensation depends upon a combination of the projected revenue the new company will bring in; the number of employees the company will have; and the level of compensation paid to the owners of similar businesses. If, in the future, the company's revenues exceed its costs, the owner can increase her compensation to the point where costs are equal to revenue, thereby reaping the benefits of managing a successful venture. But, as I mentioned earlier, the maximum salary any company can pay to any of its employees - - - including the company's owner - - - is $1 million dollars per month.

"So the creation of BOBAs are how the spent dollar economic model replaced one of the two purposes of the stock market under capitalism," said Sophia. "The government - - - through the BOBAs - - - decides what new businesses can be created. Once a new business has been given the green light by a BOBA, all the necessary funds to get the business off the ground are automatically in place. To prevent abuse of the system, it is expected that by the end of its second year in operation, any given enterprise will have revenues that are at least 75% of its costs, and that by the end of its fourth year in operation its revenues will fall within the 95% to 105% range of its costs that is the hallmark of a well-run business. In general, entrepreneurship is encouraged because it stimulates the economy by creating new jobs and by increasing the range of products and services that are available to

society. The system accomplishes this goal without any persons risking their personal savings as was the case under capitalism.

"The other supposedly legitimate purpose of the stock market casino - - - the provision of an opportunity for citizens to save for their retirement - - - has also been replaced by the spent dollar economic model with a risk-free alternative. There is no longer a social security fund which people pay into over the course of their working lives. People are now allowed to retire at the age of 56. At that age they are eligible for a pension that pays out 80% of their average monthly income over their entire careers, or they are eligible for the GUBI, whichever is greater. Every additional year that they remain in the workforce adds another 5% of their average monthly income to their pension, so that if they retire at 60, they receive a pension equal to 100% of their average monthly income. Every additional year that they work adds another 5% to their pension, so that if they wait until they are 65 or older to retire, their pension will be equal to 125% of their average monthly income. The pension plan was structured in this way so as to encourage experienced workers to remain in the labour force for as long as possible. The maximum pension benefit is $10,000 per month.

"Where does the money for this largess come from you might be wondering," said Sophia. "Like all the rest of the money in the economy, it is simply created by the government in the amount necessary. Other than money which is saved, all the money the government creates which is used to purchase goods and services is removed from the economy at the point of sale, so inflationary pressures are kept to a minimum. And because people are secure in the knowledge that they will have an adequate pension when they retire, they are less inclined to save money while still in the workforce. The steady rate of spending which results helps keep the overall economy on an even keel.

"I mentioned earlier that there are certain exceptions to the rule that the maximum yearly earnings an individual can earn is capped at $12 million plus potential bonuses. This is known as the

professional athlete and creatives exception. 'Creatives' are defined as those people who are engaged in the arts, such as actors, artists, authors, musicians and the like, as well as inventors. Since the value of such individuals' contributions to society-at-large is determined by the popularity of their work, there is no straight-forward way to determine in advance what level of compensation they should receive. Furthermore, it was deemed to be unwise to give to the government the power to determine which artistic messages are acceptable and which are not.

"The way that such individuals are compensated works as follows: say a baseball pitcher signs a ten-year contract with the Los Angeles Dodgers for $20 million per year. This incredible amount of money works out to about $6,000 per pitch, but fans were quite willing to pay the ticket prices necessary to support this level of compensation if the pitcher was able to consistently throw a good curve ball. Like other corporations, the Dodgers are not able to directly pay individuals; they are only allowed to transfer funds to other corporations. So professional athletes and creatives form what are known as PAC corporations. These special corporations are allowed to transfer funds to individuals' personal bank accounts in excess of $12 million per year. In my example, the pitcher will have formed a PAC that has its own company identification number and Commercial Transaction Database. Every so often, based on the terms of the pitcher's contract with the Dodgers, his PAC will submit an invoice to the Dodgers corporation, which will be treated just like any other invoice the Dodgers receive. After the funds have been transferred, the PAC, unlike a regular corporation, is authorized to distribute the funds to the pitcher's personal bank account. Once the money is in the pitcher's account he can, just like anyone else, transfer money to the personal bank accounts of other individuals, his agent for example.

"There is a bureaucratic wrinkle connected to PACs," said Sophia. "From the point of view of the government, the owner of a PAC is unemployed, and is thus eligible for and receives the GUBI.

Remember that those persons who are receiving the GUBI are allowed to earn up to $640.00 per month without any reduction in their GUBI payment. This works out to $7,680 per year. Every PAC is audited at the end of its fiscal year. For every dollar of revenue paid to the PAC over $7,680 in that year, the government claws back $1.00 of the GUBI payments that the owner of the PAC received. Obviously, the millionaire baseball pitcher is not relying on the GUBI to survive. But that may not be the case for the fledgling artist or musician or writer who is just starting out on their career; for them the GUBI may be a necessity."

"I'm beginning to grasp the broad outlines of how the spent dollar economy functions," he said. "In a way it resembles communism without actually being communism."

"Well, yes and no," Sophia replied. "It resembles communism to the extent that what is considered to be beneficial to society-at-large takes precedence over the wishes of the individual, and in the fact that most citizens' incomes are paid to them directly by the state. But at the same time the goal is to maximize the potential for each citizen's life satisfaction. The goal of the system is to create conditions that promote the possibility of happiness for all, as opposed to conditions which depend on the exploitation of the many. While the government has a say in which businesses exist, it is not engaged in any way in the day-to-day operation of any of those businesses. The success or failure of any business depends upon the leadership capability of its management, the skills and dedication of its employees, and the quality of its product. As I mentioned earlier, the goal of the spent dollar model has not been to create a classless society. Individual initiative, talent, and hard work are rewarded with financial success. Because the government is the source of almost all forms of monetary compensation, and because the government has a virtually unlimited power to create money, the achievement of desired social goals is no longer limited by the availability of capital, but by the availability of qualified labour to produce the desired goods or services. Where shortages in the supply of qualified labour appear,

steps are taken to address the problem in the form of increased availability of training programs and the incentive of higher wages for that sector.

"There is another major sector of the economy which I have not yet included in our discussion, and that is what used to be known as the public sector, but which are now known as non-business entities or NBEs. NBEs include all municipal, state, and federal government bureaucracies, the health care industry, journalistic enterprises, a portion of all pharmacies, educational institutions, and the Bank of America. Basically, NBEs are organizations in which it is not expected that revenues, if any, will be equal to the costs of their operation. Each NBE, for instance every municipal government in the nation, has an identification number and its own NBE Transaction Database which it uses to purchase goods and services. To prevent abuse, all NBE Transaction Databases are publicly available. Just as there are no longer any income or payroll taxes, there are no longer any property taxes, so, apart from licensing fees, and speeding and parking tickets and so on, municipal and state governments do not generate much in the way of a revenue stream. Their major cost outlay is in the form of their payroll for employees such as police, firemen, teachers, municipal workers, bureaucrats, elected officials and so on. The salary levels for these personnel are federally mandated.

"Under the spent dollar system," Sophia continued, "all medical care is completely free. Each hospital, each doctor's office, each physiotherapist's office, etc., has its own NBE Transaction Database. When you go to the doctor's office, a palm reader will record the fact that you have had a consultation but you are not charged for it. Doctors' salaries are federally mandated and depend on the number of years of experience each doctor has. Doctors are not paid on a per patient basis. Surgeons are in general the most highly paid medical practitioners, and doctors who situate their practice in rural areas are paid a bonus.

"The rise of social media in the early 21st Century sounded

the death knell for journalism's business model. The bulk of local media's advertising revenues simply melted away, and small town newspapers went out of business in droves. This resulted in the creation of 'news deserts' all over America in which there was no longer any reporting on local issues, nor any local perspectives on state-wide or national issues. This news vacuum was soon filled by rumours and misinformation, which only served to further divide communities. In response to this situation, the Fourth Estate was deemed to be a vital organ in the body of a healthy democracy, and thus journalistic enterprises came to be qualified as non-business entities. Once this step was taken, local journalism quickly reestablished itself, and now most towns in America that have a population of 2500 or more are once again served by a local newspaper.

"Pharmacies," said Sophia, "are businesses which have a department which has NBE status, and other departments which don't. Pharmacists themselves and the medications they dispense are considered to be part of the health care system, and thus the services they provide are cost-free. Any physician-prescribed drug is dispensed to the public at no charge. But most pharmacies have staff and sell products for which the revenue from the sale of the product is supposed to be equal to the cost of the product. The solution to this problem is that pharmacies have two separate expenditure accounts in their Commercial Transaction Database, one for the purchase of everything from shampoo to perfumes to cameras to computers, and one which has NBE status for the purchase of medications from the manufacturers of pharmaceutical products. Essentially there are two different types of enterprises doing business under the same roof. In one the palm reader facilitates the sale of an item just as it does in any other business. In the other, the palm reader serves to record the transaction so that the system can keep track of which drugs have been dispensed to whom, and to make possible the gathering of statistics regarding the usage of particular drugs on a nation-wide basis.

"Another important sector of the economy which we have

not yet touched upon is agriculture. The business part of operating a farm is much like the running of any other business. Each farm has an identification number which is used to make necessary purchases, and a Commercial Transaction Database which keeps track of expenditures and revenue. Farmers are paid an annual salary which is based upon the number of acres the farm has under cultivation, plus a bonus when the yield per acre exceeds certain benchmarks in any given year. This means that through good years and bad, farmers are assured of a certain basic income. To set the price of his product, say, wheat, the farmer adds up the various costs of producing his harvest - - - labour, fuel, fertilizer, seed, the amortized cost of the farm's machinery and so forth - - - and divides it by the number of bushels of wheat harvested. The figure arrived at is the price the buyer of the wheat records as an expenditure in his Commercial Transaction Database. Because conditions can vary from farm to farm, the price per bushel the buyer records may vary as well. When the buyer sells the wheat to a flour mill, he will sell the wheat at an average of the prices he has paid for it, plus a portion of the overhead costs of running his grain-buying business, including the cost of his own labour. Remember that this process does not include any money actually being transferred; it is all just entries on a spreadsheet. The bonuses paid to individual farmers for exceeding yield benchmarks are not included in the determination of the market price of the product produced. All the way along the chain, from farm to grain wholesaler to flour mill to the local bakery to the purchaser of a loaf of bread, all salaries are paid monthly by the Bank of America. When people use those salaries to purchase goods and services, the money spent is 'spent,' used up, and is removed from circulation in the economy.

"Another important sector of the economy which underwent major revision with the implementation of the spent dollar model was that of housing," continued Sophia. "Post-capitalist society made a commitment to its members that each and every resident in the country is entitled to an adequate, affordable, residence. The

goal of this new commitment was two-fold: to put an end to homelessness, and to greatly reduce the cost of housing for all.

"To accomplish this, it was necessary to expose the 'con' at the centre of the American Dream - - - the notion that the measure of an individual's success in life is determined by the value of the real property that they own. The idea that home ownership is the epitome of success was perhaps the most successful scam every perpetrated by the wealthy on the rest of society. Through the selling of the idea that owning one's home meant the achievement of the American Dream for the common man, the wealthy shrugged off all responsibility for the provision of housing for the rest of society. The selling of the American Dream off-loaded onto the middle and lower classes the costs of constructing housing, the costs of maintaining those properties, and the costs of the property taxes which were attached to those properties. And the wealthy no longer had to go through the hassle of collecting the rent each month. Instead of investing in housing, the wealthy invested in mortgages, which guaranteed an effortless return on their money which was completely secure. The 'American Dream' scam was the epitome of profit-making schemes.

"The introduction of the spent dollar model brought radical change to the whole problem of providing housing for everyone. To begin with, the charging of interest on loans was outlawed. Like the other two historical monotheistic religions, Islam's understanding of the nature of God was somewhat flawed; but nevertheless Islam made three important contributions to post-capitalist societies in the western world. These were: the wisdom of conversing with God on a daily basis; the proposition that wherever we look we see the face of God; and the idea that it is unwise (Islam said 'sinful') to allow individuals to charge interest on money loaned. Before Muhammad, Aristotle taught that money should not breed. The charging of interest on money loaned leads to avarice, corruption, and sloth, none of which are good for individuals, nor for society-at-large.

"The solution to the country's housing crisis was to make

the government the nation's landlord. The scope of the Department of Housing was greatly increased, and it is now the largest department within the federal bureaucracy. A law was passed which said, in effect, that you don't have to sell your house, but, if you do sell your house, you have to sell it to the Department of Housing. The price that the government paid for your house was the price you paid for it, adjusted for inflation; or, the assessed value of your house for property tax purposes on Valuation Day; or, the price paid for a similar property in your neighbourhood in the months leading up to Valuation Day; whichever was greater. So if you purchased your house in 1990 for $200,000, it would have been worth at least $500,000 in 2040. The goal was to make sure that no homeowner would lose money through the sale of their home, and that people would want to sell their homes to the government.

"Many people were hesitant about this idea when it first came into effect," said Sophia. "The American Dream 'con' was deeply embedded within the American psyche. But that was all right, and there was no pressure to sell. The government had time on its side; sooner or later all homes would come up for sale. Moreover, the economic arguments for selling one's home to the government were overwhelming.

"Once the Department of Housing assumed ownership, it leased the property out, often to the former owner, at a rate of $1.00 per square foot per year, so the rent on a 2400 square foot residence would be $2400 per year, or $200 per month. Assuming that a young family moved into that house at age 30 and lived there for 55 years, their total lifetime housing costs under the Universal Rental Program Subsidy would come to $132,000. This is much less expensive than the cost of purchasing that house under the old system.

In December, 2023, the median price of a house in the United States was about $400,000. Assuming that our 30 year old couple had managed to save $80,000 as a down payment, they would need a mortgage of $320,000 to complete the purchase. For

a mortgage with a 30 year term at a very conservative 3.5% interest rate, their monthly payments would be $1,436.94, and the total interest paid over the 30 years would come to $197,299.48, equal to almost 50% of the actual price of the house itself, for a total lifetime housing cost, before upkeep and maintenance and property taxes, of $597,299.48. Renting that same house from the Department of Housing under URPS would have saved that family over $465,000 over their lifetime. And that was the median price of a house in 2023, at an interest rate which was then unattainable. The price of a house in most major cities, and hence the lifetime housing costs for the average family, was considerably higher.

"In addition to the direct savings that URPS provided, there were other benefits. First, there was no longer any need for the seller of the property to pay a commission out of the proceeds of the sale to a real estate agent. The government does require that the seller of a property to the Department of Housing hire a lawyer to review the sale contract, to ensure that the seller's interests are protected. The lawyer's fee for this service was set at $1500.

"The new housing policy basically put an end to the real estate industry. Like the members of the financial services industry, real estate agents for the most part became redundant. Some went to work for the Department of Housing as presenters of available properties to prospective renters, or found other positions within the bureaucracy where their knowledge of the housing market was useful. As with those who were formerly employed in the financial services sector, any real estate agents who found themselves out of work were guaranteed two years' salary while they looked or trained for a new line of work, with the promise that no matter what their new jobs paid, they would never earn less than they had as a real estate agent.

"A second benefit to renting a property from the Department of Housing is that the Department became responsible for the costs of maintenance. Leaky faucet,, broken waterline, leaky roof, etc.; the costs for all kinds of maintenance problems are now borne by the Department.

"A third major benefit under the new system is that a majority of houses were outfitted with solar panels and, where practicable, a battery for energy storage, and a heat exchanger, at no cost to the renter. This policy gave a huge boost to the solar panel industry which, since solar panels last about 30 years, became a self-sustaining industry. It also gave rise to the solar panel recycling industry and the solar panel cleaning and maintenance industries. Furthermore, it often made sense to replace the roofing of a house before installing solar panels, so the roofing industry has also benefited from this policy. Altogether, this policy has resulted in a field which provides steady employment for tens of thousands of people, while at the same time moving the nation significantly closer to its net-zero energy emissions goal.

"There are other benefits as well. Houses owned by the government are eligible for periodic interior and exterior repainting. Some houses become eligible for kitchen and bathroom upgrades. In some locales a certain number of hours per month of gardening services are provided by the Department. All of these benefits are provided free of charge to the renter. From the point of view of the Housing Department, it makes sense to maintain and update its housing stock so that it lasts as long as possible, and a well-maintained property makes the renters happy. And of course," said Sophia, "these policies resulted in the creation of thousands of good-paying jobs."

"How is it decided who gets to rent which house or apartment?" he asked.

"Yes, that's an important part of this system," she replied. "It works like this: those who earn the most get the first choice of the available properties for rent. In any given jurisdiction, two lists are prepared each month. One is a list of the properties that will become vacant in the next month, and the other is a list of potential renters, with the households with the highest incomes at the top. The household with the highest income gets the first choice of available properties in the coming month; the household with the

second highest income gets to choose second; and so on. If there is no suitable property available when it comers to your turn to choose, you can pass and put your name on the list for the next month, and hope for a better choice. The only rule is that if you do choose a property to rent, you must sign a three-year lease which can only be broken if you are required to move for employment or education purposes. Leases are renewable at the option of the lessee, provided that they have been responsible tenants.

"What about those people, like me, who were renters under the old system? What happened to them?" he asked.

"Oh, that was straight-forward," Sophia replied. "The Department of Housing simply assumed the lease on the rental property, agreeing to pay the owner of the property whatever the monthly rent was on Valuation Day. The Department then sublet the property to the renter at the standard rate of $1.00 per square foot per year. Everybody was a winner under this system. Landlords loved it because they were guaranteed that the rent would always be paid on time. Renters loved it because it radically reduced their housing costs. Owners of rental properties of course remained responsible for the upkeep and maintenance of their properties, and retained the ability to determine who their tenants would be.

"When the owner of a rental property wishes to sell the property, the rule is the same as for a private residence - - - they have to sell to the Department of Housing, with the criteria for establishing the sale price being the same as for a private residence, as I described earlier. If the owner of a property has failed to properly maintain it and costly repairs are required, for instance if a new roof is needed, then the sale price is adjusted accordingly.

"Despite the overall popularity of this housing policy, there remained those who were philosophically opposed to the idea of the government being the nation's landlord. Such individuals are not allowed to sell their property to another individual or company, but they are allowed to bequeath their property to another person as part of their estate. So, to this day, a hundred years after the URPS

came into effect, there are still some properties which have been handed down from generation to generation which have not become the property of the Department of Housing. But those hold-outs are dwindling over time, and today more than 90% of all residential properties are owned by the government.

"You said that it is now against the law to charge interest on loans," he said. "Does this mean that people can no longer borrow money?"

"No, of course not," Sophia replied. "Individuals can and do loan money to other individuals, but it is true that it is against the law for the borrower to be charged interest on the loan. Most people, though, do their borrowing through the Bank of America. The Bank will loan money to its customers for almost any legitimate purpose, from a vacation to new furniture to a new vehicle or whatever, and because repayment is guaranteed no collateral is required. Repayment is guaranteed because the borrower agrees to allow the Bank to automatically deduct the monthly loan payment from the borrower's account every payday. The same goes for the individual's rent. In this manner the Bank always ensures that every individual meets their financial obligations. The only restriction is that the Bank limits loan payments to a maximum of 30% of an individual's monthly income, so that borrowers cannot become overburdened by debt.

"Another major goal of the spent dollar economic model was to eliminate, or at least greatly reduce, financial crime. The end of the use of cash as a means of exchange meant that it became much more difficult for criminals to hide the proceeds of their criminal behaviour. As of Valuation Day, January 1, 2038, businesses could no longer accept cash as a payment for goods or services provided. From that point onward, all business transactions were enabled by a palm reader. Individuals were given one year from then to deposit, on a no-questions-asked basis, any cash they had in their possession into their government-sanctioned account with the Bank of America. On January 1, 2039, all personal and business accounts other than those held by the Bank

of America were officially closed, and all other banking institutions either ceased operations or became branches of the Bank. This has resulted in a single centralized banking institution in which each member of society is allowed to have only one single account, and which maintains a record of every financial transaction in the nation. Because of this, it has become next to impossible for criminals to hide the financial proceeds of criminal behaviour from the authorities, and so crimes like fraud, extortion, and money-laundering are now rare. Even petty theft is relatively unusual, for a record of the sale of stolen items is created when the stolen objects are sold, and is therefore traceable. So the overall crime rate in post-capitalist societies is quite low.

"So, brother," said Sophia, "all this came about as a result of your suggestion for an alternative method of how to divide up the economic pie. Profit-making and exploitation have been tossed on the trash-heap of history. International cooperation was of course required to create this system, but governments everywhere quickly saw the benefits the spent dollar model would bring to their citizens. The challenge was to rapidly establish the technological infrastructure this system requires in all nations around the world. Governments came to see that their task was not to enable profit-making, but to provide gainful employment with a livable wage for as many of the citizens of their nation as possible, with the goal of making every worker feel that they are being adequately compensated for the contribution they make to the well-being of their society, as well as to provide a reasonable standard of living for those who are unable to be employed."

Sophia paused, and glanced at her watch. "O my gosh!" she exclaimed. "Look at the time. I have to go. I have a seminar to teach this evening." She put the newspaper back into her rainbow-striped bag and, picking up the bag and the book, rose to her feet. He stood up as well. "I'm sorry to leave you here so abruptly, but I'm going to be late. Here," she said, holding out the book for him to take. "I want you to have this."

"I can't take this," he protested. "You said it is your most

precious possession."

"It is," she said softly, pushing the book into his hands. "But I think you need it now more than I do."

"How can I ever thank you," he said, "and . . . and what do I do now?"

She gently placed her right hand on the left side of his face and, leaning forward, kissed him on his right cheek. "Choose love, Michael." she said. "Just choose love." She then turned and quickly walked away.

He looked down at the book in his hands, staring at his name on the cover, dumbfounded and numb. Then he looked up and cried out, "Sophia! Wait! What about . . ." But it was too late. She had already passed through the gap in the hedge and vanished.

Chapter Fifty-three

RE-ENTRY

* * * * * *

He awoke with a sudden start. He looked around the darkened room, baffled and confused, wondering where he was and how he had got there. The blare of a car's horn coming through the window centred him. He was in his apartment, sitting upright on his bed. What a dream. Had it been a dream? Sophia! She had seemed so real. He turned his head to check the time on his radio-alarm clock. By the red light glow of the numbers, he could see the smoke from his still-lit joint curling upwards. As he looked, the numbers changed from 12:00 to 12:01. Only one minute! It had seemed like hours. Suddenly he really had to pee. He swung his legs over the edge of the bed and stood up. He immediately felt very dizzy and he put his hand onto the bedside table to steady himself. Somehow - - - this was the only way he could describe it - - - the darkness around him seemed to pulsate, as if waves were flowing through it. First dancing hedges, and now this. Very trippy. That weed of Manny's was something else. Through the wall he could still hear Leonard singing. “I've seen the nations rise and fall, I've heard their stories, heard them all, but love's the only

engine of survival." At the end of the dream, what was it that Sophia - - - she had been so beautiful - - -what was it that she said? "Choose love, Michael." That was it! "Just choose love." He really had to pee. He half-staggered through the billowing darkness into his tiny bathroom and flicked on the light. He leaned heavily on the sink and stared at his reflection in the mirror. And there, on his right cheek, outlined in bright red lipstick, was the perfect imprint of Sophia's lovely lips.

EPILOGUE

* * * * * *

Let me begin by stating emphatically that the story recounted in Part Four should in no way be interpreted by the reader as an endorsement of the idea of time travel. Time has no phenomenological presence within the Field of Play, and therefore cannot be travelled through, mental time travel notwithstanding. The inclusion of time travel in the plot of Part Four is merely a literary device, employed so that I could draw a rough outline of a possible future, should humans change their behaviour and choose to structure their societies in accordance with the principles of the logic of love.

I believe that the universe has given me a message to deliver to humanity. Lest the reader suspect that I am indulging here in some sort of messianic grandiosity, let me hasten to assure you that this is not the case. It is simply a recognition of how the Game of Being functions. Every manifestation of the Game of Being sends messages about itself out into the Field of Play to be received by other manifestations. Humans, having invented and developed the tool of language, are highly prolific message senders. Over the course of my lifetime, I have received many messages from writers, philosophers, scientists, historians, poets and others. Each one of these messengers was a direct manifestation of the Mind of God; a presence within the Field of

Play; their message an element of the universe. I have absorbed these messages, contemplated them at considerable length, and refashioned them into the message contained within these pages. Some messages are more significant and consequential than others. I sincerely believe that my message is more significant than most; how consequential it will be remains to be seen. What does seem clear is that the time has come for humanity to leave behind its adolescent fantasy of eternal life and to accept this Game of Being as it is, and to recognize that it is not as some human manifestations wish it to be. Humans must re-purpose the organization of their societies towards the goal of maximizing the happiness of all in *this* life. It is the only life we get. 'All beginnings must have an ending' is the iron law, and humans are not exempt from its imposition.

I have five heroes in my life: manifestations whose messages I deem to be more significant and consequential than most. These are: the Chinese sage and author of the Tao Te Ching, Lao-Tzu, for his gentle wisdom; the visionary Jesus Christ, for his message of brotherly love; the peerless philosopher Benedictus de Spinoza, for his metaphysical grasp of the nature of being; the physicist Albert Einstein, for his powerful imagination; and the humanist Mohandas K. Gandhi, for his courageous commitment to the principle of non-violence.

Legend has it that Lao-Tzu, discouraged by the direction he perceived his society to be taking, departed his post as the Zhou Dynasty Official Archivist and travelled into the mountains of the west. At a mountain pass the Keeper of the Pass begged him to write down his ideas in the form of a book, which Lao-Tzu did. He then disappeared into the wilds and the mists of time.

It is my firm intention, and deep desire, to emulate my hero by slipping unnoticed back into the obscurity from which I have, this book in hand, momentarily emerged. So, to those manifestations known as homo sapiens sapiens, 'the wise men,' I bid you adieu. May your path be traced by wisdom, so that you come in time to live up to the moniker which you have bestowed

upon yourselves. I hope that my ruminations on the nature of God, on the nature of space and time, and my suggestions for the political and economic structure of your societies may prove to be of some beneficial utility to you. Obviously, *I* believe that the widespread adoption of these ideas would be advantageous for your kind. But this is not up to me. It is up to you. Your fate is in your hands. It is not my responsibility to decide for humanity what it should do. I have merely dropped by to proffer some friendly advice; what you do with it is up to you, though I confess to a belief that you ignore it at your peril. Above all else, just remember: to survive and flourish you must *choose* love. Fare thee well.

Messenger
September 21, 2025

NOTES

1. Douglas Adams *Mostly Harmless* (1993) p.217
2. G.M. Edelman and Giulio Tononi *A Universe of Consciousness* (2000) p.9
3. Sir James Jeans in Peter Tompkins and Christopher Bird *The Secret Life of Plants* (1973) p.56
4. Gary Zukav *The Dancing Wu Li Masters* (1979) p.148
5. Georges Lemaitre in Dan Hooper *At the Edge of Time* (2019) p.49
6. Dan Hooper *At the Edge of Time* (2019) p.49
7. Lawrence M. Krauss *The Greatest Story Ever Told - - - So Far* (2017) p.290
8. Donald Goldsmith *The Runaway Universe* (2000) p.54
9. ibid p.52
10. ibid p.58
11. ibid p.56
12. George Smoot and Keay Davidson *Wrinkles in Time* (1993) p.81
13. ibid p.278
14. Dan Hooper op cit pp.135-36
15. Albrecht Folsing *Albert Einstein A Biography* (1997) p.384
16. Gary Zukav op cit pp.184-85
17. Paul Davies *About Time* (1995) p.139
18. Leah Crane *New Scientist* (3/26/22) p.10
19. Dan Hooper op cit p.127
20. Dan Hooper ibid p.135
21. George Smoot op cit p.286
22. Dan Hooper op cit p.128
23. Arthur Zajonc *Catching the Light* (1993) p.39
24. ibid p.20

25. ibid p.21
26. ibid p.25
27. ibid p.29
28. ibid p.30
29. Gary Zukav op cit p.61
30. James Clerk Maxwell in Arthur Zajonc op cit p.149
31. Arthur Zajonc ibid p.148
32. George Smoot op cit p.3
33. Robert Hooke in H. Turnbull (ed) *The Correspondence 0f Issac Newton Vol. 1* (1959) pp110-11 in Michael White, *Issac Newton The Last Sorcerer* (1997) p.177
34. Gary Zukav op cit p.129
35. Arthur Zajonc op cit p.149
36. Gary Zukav op cit p.130
37. Gary Zukav ibid p.130
38. Lawrence M. Krause op cit p.246
39. Gary Zukav op cit p.53
40. Gary Zukav ibid p.53
41. Gary Zukav ibid p.53
42. Arthur Zajonc op cit pp.294-96
43. Arthur Zajonc ibid p.296
44. Lao-Tzu *Tao Te Ching* Translation by John Minford (2018) p.72
45. Albert Einstein *Aether and Relativitatstheorie* (1920) trans. W. Perret and G. B. Jeffery *Side Lights on Relativity* (1922) (reprinted in *Physical Thought from the Presocratics to the Quantum Physicists* by Shmuel Sambursky New York, Pica Press, (1975) p.497 in Gary Zukav op cit p.134
46. Albert Einstein in Arthur Zajonc op cit p.278
47. Freeman Dyson in J. Cornwell (editor) *Nature's Imagination* (1998) in Lord Martin Rees *Just Six Numbers* (1999) p.110
48. Leah Crane *New Scientist* (2/5/22) p.16)
49. Dan Hooper op cit p.39

50. Dan Hooper ibid p.40
51. Donald Goldsmith op cit p.91
52. Donald Goldsmith ibid p.29
53. Donald Goldsmith ibid p.33
54. Donald Goldsmith ibid p.34
55. Donald Goldsmith ibid pp.10-11
56. Lord Martin Rees *Just Six Numbers* (1999) pp.104-05
57. Lord Martin Rees ibid pp.106-07
58. Eric J. Lerner *The Big Bang Never Happened* (1992) p.21
59. Paul W. Hodge *Concepts of Contemporary Astronomy* (1974) pp. 478-80
60. Lord Martin Rees op cit p.103
61. Lord Martin Rees ibid p.60
62. John Gribbin *In The Beginning* (1993) p.246
63. Dan Hooper op cit p.92
64. Dan Hooper ibid p.95
65. George Smoot op cit p.286
66. Eric J. Lerner op cit p.25
67. Eric J. Lerner ibid p.28
68. George Smoot in Lerner ibid p.32
69. Donald Goldsmith op cit p.39
70. Donald Goldsmith ibid p.218
71. Lord Martin Rees op cit pp.72-73
72. Lord Martin Rees ibid p.73
73. Donald Goldsmith op cit (p.8)
74. Donald Goldsmith ibid p.10
75. J. McFadden *New Scientist* 12/18/21 p.70
76. Eric J Lerner op cit p.32
77. George Smoot op cit p.155
78. Eric J. Lerner op cit p.35
79. Eric J. Lerner ibid p.39
80. Leah Crane *New Scientist* 1/15/22 p.12
81. Roy A. Gallant *National Geographic Picture Atlas of Our Universe* (1980) pp.116-17
82. Albert Einstein *New York Post* 11/28/72 in Menas

Kafatos and Robert Nadeau *The Conscious Universe, Part and Whole in Modern Physical Theory* (1990) p.113
83. Karl Marx *The Eighteenth Brumaire of Louis Bonaparte* in Rebecca Mead *The New Yorker* 8/30/21
84. Ronald J. Parsons *The Veil of Names* National Spiritual Assembly of the Baha'is of Canada (1994)
85. Amit Chaudhuri *Harper's Magazine* (April, 2021)
86. Paul Valéry *The Atlantic* (October, 2020)
87. Robinson Jeffers *Harper's Magazine* (September, 2020)
88. G.M. Edelman and Giulio Tononi op cit p.38
89. G.M. Edelman and Giulio Tononi ibid p.54
90. Vladimir G. Karamav in Peter Tompkins and Christopher Bird op cit p.67
91. Virginia Morell *The Sensitive Plant* Lapham's Quarterly (Volume XIII, Number 1, Winter 2020) p.195
92. Virginia Morell ibid p.200
93. Heidi Appel *New Scientist* 9/25/21
94. Clare Wilson *New Scientist* 7/31/21
95. Rowan Harper *New Scientist* 5/1/21
96. Rowan Harper ibid
97. Menas Kafatos and Robert Nadeau *The Conscious Universe, Part and Whole in Modern Physical Theory* (1990) p.64
98. Menas Kafatos and Robert Nadeau ibid p.9
99. Menas Kafatos and Robert Nadeau ibid p.10
100. Menas Kafatos and Robert Nadeau ibid p.9
101. Menas Kafatos and Robert Nadeau ibid p.178
102. G.M. Edelman and Giulio Tononi op cit pp.210-11
103. Henri Bergson *Mind and Matter* (1919) p.303 in Will Durant *The Story of Philosophy* (1943) p.339
104. Will Durant *The Story of Philosophy* (1943) p.205
105. Gary Zukav op cit p.313

106. Daniel Dennett in Jim Holt *Why Does The World Exist?* (2013) p.257
107. J. Haidt *Psychological Review*, 108 (2001) pp.813-34 in Steven Pinker *the blank slate* (2002) pp.265-66
108. Steven Pinker *the blank slate* (2002) p.260
109. Lieh-tzu *The Book of Master Lie* in *Tao Te Ching* Translation by John Minford (2018) p.92
110. Gary Zukav op cit p.236
111. Karen Armstrong A History Of God (1994) p.17
112. Karen Armstrong ibid p.91
113. Rachel Aviv *The New Yorker* 11/7/22 p.42
114. Jacob Needleman *The Heart of Philosophy* (1982) p.210
115. Sam Harris *The End Of Faith* (2005) p.221
116. Sam Harris ibid pp.217-18
117. Padmasambhava *Self-Liberation Through Seeing With Naked Awareness* Translated by J. M. Reynolds Station Hill Press (1989) p.12 in Sam Harris ibid p.216
118. Sam Harris ibid p.214
119. Will Durant op cit p.285
120. Huston Smith *The Illustrated World's Religions: A Guide to Our Wisdom Traditions* (1994) p.22
121. Huston Smith ibid p.47
122. Huston Smith ibid p.49
123. Huston Smith ibid p.55
124. Huston Smith ibid p.53
125. Huston Smith ibid p.53
126. Huston Smith ibid p.61
127. Huston Smith ibid p.90
128. Huston Smith ibid p.77
129. Huston Smith ibid p.77
130. Huston Smith ibid p.77

131. Huston Smith ibid p.77
132. Huston Smith ibid p.78
133. Huston Smith ibid p.75
134. Huston Smith ibid p.82
135. Huston Smith ibid p.85
136. Huston Smith ibid p.84
137. Huston Smith ibid p.85
138. Huston Smith ibid p.97
139. Huston Smith ibid p.109
140. Huston Smith ibid p.109
141. Huston Smith ibid p.110
142. Huston Smith ibid p.110
143. Huston Smith ibid p.110
144. Huston Smith ibid p.110
145. Huston Smith ibid p.110
146. Huston Smith ibid p.111
147. Huston Smith ibid p.111
148. Huston Smith ibid p.111
149. Huston Smith ibid p.111
150. Huston Smith ibid p.111
151. Huston Smith ibid p.117
152. Huston Smith ibid p.113
153. Huston Smith ibid p.114
154. John Minford op cit inside front cover
155. Huston Smith op cit p.131
156. Huston Smith ibid p.126
157. Huston Smith ibid p.126
158. Huston Smith ibid p.126
159. Huston Smith ibid pp.128-29
160. Huston Smith ibid p.135
161. Huston Smith ibid p.136
162. Huston Smith ibid p.131
163. Huston Smith ibid pp.132-33
164. Huston Smith ibid p.143
165. Karen Armstrong op cit p.109

166. Karen Armstrong ibid p.78
167. Karen Armstrong ibid p.78
168. Huston Smith op cit p.174
169. Karen Armstrong op cit p.243
170. Richard Tarnas *The Passion of the Western Mind* (1991) p.183
171. Karen Armstrong op cit p.217
172. Will Durant op cit p.183
173. Will Durant ibid p.248
174. William H. Barnes in *The Oxford Companion to the Bible* (1993) p.303)
175. Richard Dawkins *The God Delusion* (2008) p.51
176. Sam Harris op cit p.123
177. The Qur'an in Sam Harris ibid pp.118-120
178. Sam Harris ibid p.232
179. Immanuel Kant *Critique of Practical Reason* in Pinker op cit p.193
180. Steven Pinker ibid p.187
181. Steven Pinker ibid p.188
182. Richard Dawkins *The Selfish Gene* (1976) in Douglas R. Hofstadter and Daniel C. Dennett *The Mind's I* (1982) p.131
183. Richard Dawkins op cit pp.246-49
184. Steven Pinker op cit p.318
185. Steven Pinker ibid p.193
186. Steven Pinker ibid p.281
187. Marc Hauser *Moral Minds: How Nature Designed Our Universal Sense of Right and Wrong* (2006) in Richard Dawkins op cit p.255
188. Mohandas K. Gandhi in Eknath Easwaran *Gandhi the Man* (1973) p.33
189. Johm Gribbin op cit p.172
190. John Gribbin ibid p.173
191. John Gribbin ibid p.185
192. John Gribbin ibid p.178

193. John Gribbin ibid pp.178-79
194. Lord Martin Rees op cit p.25
195. Lord Martin Rees ibid p.2
196. Lord Martin Rees ibid p.35
197. Lord Martin Rees ibid p.2
198. Lord Martin Rees ibid p.119
199. Lord Martin Rees ibid p.128
200. Lord Martin Rees ibid p.128
201. Lawrence M. Krauss op cit p.121
202. Katie Mack *The End of Everything (Astrophysically Speaking)* (2021) p.140
203. Steven Pinker op cit p.189
204. Lord Martin Rees op cit p.166
205. in Menas Kafatos and Robert Nadeau op cit p.111
206. Lawrence M.Krauss op cit p.300
207. Lee Smolin in Johm Gribbin op cit p.252
208. John Gribbin ibid p.254
209. Hermann Hesse *Magister Ludi (The Glass Bead Game)* (1970) p.334
210. Katie Mack op cit p.114
211. Katie Mack ibid p.133
212. Katie Mack ibid pp.142-44
213. Katie Mack ibid p.144
214. Katie Mack ibid p.149
215. Katie Mack ibid pp.196-97
216. Lawrence M. Krauss op cit p.5
217. Katie Mack op cit pp.181-82
218. Lawrence M. Krauss op cit p.271
219. Lawrence M. Krauss ibid pp.272-73
220. Paul Davies op cit pp.14-15
221. Dan Hooper op cit diagram titled "The Big Bang" opposite page 1
222. Paul Davies op cit p.23
223. Dan Falk *In Search Of Time* (2008) p.94

224. Dan Falk ibid p.91
225. Dan Falk ibid p.91
226. Dan Falk ibid p.91
227. Dan Falk ibid p.4
228. Paul Davies op cit p.30
229. Dan Falk op cit p129
230. Dan Falk ibid p.130
231. Dan Falk ibid p.131
232. Dan Falk ibid p.99
233. Dan Falk ibid p.106
234. Dan Falk ibid p.107
235. Dan Falk ibid p.107
236. Dan Falk ibid p.117
237. Thomas Suddendorf and Michael Corballis in Dan Falk ibid p.115
238. J. J. C. Smart *Time and Becoming* in *Time and Cause* (1980) ed. P. Van Inwagen pp3-15 in Paul Davies op cit p.253
239. David Park in Paul Davies ibid p.255
240. Richard Dawkins *The Selfish Gene* (1976) in Douglas R. Hofstadter and Daniel C. Dennett op cit p.143
241. Paul Davies op cit p.73
242. Paul Davies ibid p.15
243. Paul Davies ibid p.15
244. Albert Einstein *Kyoto lecture,* December 14, 1922, in *Physics Today (*August 1982) p.46 in Albrecht Folsing op cit p.155
245. Dan Falk op cit p.164
246. R. S. Shankland *Conversations with Albert Einstein* in *American Journal of Physics* Vol. 31 (1963) p.56 in Albrecht Folsing op cit p.156
247. Paul Davies op cit p.15
248. Albert Einstein in Albrecht Folsing op cit p.172
249. Albrecht Folsing ibid p.155

250. Albert Einstein in Albrecht Folsing ibid p.172
251. Albrecht Folsing ibid p.172
252. Albrecht Folsing ibid p.176
253. Gary Zukav op cit pp.137 – 39
254. Richard P. Olenick, Tom M. Apostol, and David L. Goodstein *Beyond The Mechanical Universe* (1986) pp. 357 - 59
255. Olenick *et al* ibid p.359
256. Olenick *et al* ibid p.360
257. Olenick *et al* ibid p.361
258. John Gribbin op cit p.223
259. Gary Zukav op cit p.167
260. Albrecht Folsing op cit p.208
261. Albrecht Folsing ibid p.192
262. Albrecht Folsing ibid p.180
263. Dan Falk op cit p.166
264. Dan Falk ibid pp. 168-71
265. Gary Zukav op cit pp.139-40
266. Paul Davies op cit p.59
267. Paul Davies ibid pp.59-60
268. Gary Zukav op cit p.141
269. Paul Davies op cit p.55
270. Paul Davies ibid p.58
271. Paul Davies ibid p.57
272. Paul Davies ibid p.58
273. Dan Falk op cit p.174
274. Paul Davies op cit p.57
275. Paul Davies ibid pp.67-69
276. Karmela Padavic-Callaghan *New Scientist* (December 31, 2022) p.12
277. Lord Martin Rees op cit pp.104-05
278. Paul Davies op cit pp. 99-100
279. Paul Davies ibid pp.100-101
280. Lord Martin Rees op cit pp.104-05
281. Gary Zukav op cit p.195

282. Gary Zukav ibid pp 60-62
283. Christopher De Pree *The Cosmos* (2014) p.14
284. Christopher De Pree ibid p.14
285. Jim Clark *chem.libretexts.org*
286. Guenther Hasinger *Penn State Eberly College of Science website: science.psu.edu*
287. Tom Bridgman *svs.gsfc.nasa.gov*
288. *Space Weather Prediction Centre/National Oceanic and Atmospheric Administration*
289. *phys.org*
290. Mahendra Lal Karna *et al* (2020) *The Astrophysical Journal* Vol. 901 #2
291. Mahendra Lal Karna *et al* ibid
292. *astronomy.swin.edu.au*
293. *vice.com*
294. Leah Crane *New Scientist* (August 26, 2023) p.12
295. Alex Wilkins *New Scientist* (April 8, 2023) p.14
296. From the play *Remember This: The Lesson of Jan Karski* by Clark Young and Derek Goldman, cited in a review by Vinson Cunningham in *The New Yorker* (September 26, 2022) p.84
297. Vinson Cunningham ibid p.85
298. Adrienne LaFrance *The Atlantic* (April, 2023) p.26
299. Jill Lepore *The New Yorker* (January 16, 2023) p.64
300. *news.gallup.com*
301. Richard Rorty cited in the essay *Truth Takes A Vacation* by Mark Emundson *Harper's Magazine* (January, 2023) p.37
302. Megan Garber *The Atlantic* (March, 2023) p.27
303. Claire Messud *Harper's Magazine* (October, 2022) p.70
304. Cited in a book review by Jonathan Dee in *The*

New Yorker (September 11, 2023) p.71
305. David Brooks *The Atlantic* (June, 2023) p.86
306. Katherine Rundell *New Scientist* (October 22, 2022) p.27
307. David Robson *New Scientist* (Jamuary 22, 2022) pp.42- 43
308. David Robson ibid p.43
309. David Robson ibid pp.43-45
310. Arthur C. Brooks *The Atlantic* (March, 2022) pp.26-27
311. Arthur Schopenhauer cited in Arthur C. Brooks ibid p.25
312. Arthur C. Brooks ibid p.28
313. Jonathan Haidt *The Atlantic* (May, 2022) p.58
314. Dhruv Khullar *The New Yorker* (September 26, 2022) p.19
315. Jonathan Haidt op cit pp.58-59
316. Renée DiResta cited in Jonathan Haidt ibid p.64
317. Jonathan Haidt ibid p.59
318. Adam Gopnik *The New Yorker* (October 2, 2023) p.64
319. Louis Menand *The New Yorker* (August 22, 2022) p.65
320. Adam Gopnik *The New Yorker* (September 12, 2022) p.64
321. Elizabeth Colbert *The New Yorker* (November 28, 2022) p.36
322. Louis Menand op cit p.65
323. Adam Gopnik *The New Yorker* (October 2, 2023) p.63
324. Adam Gopnik *The New Yorker* (September 12, 2022) p.69
325. Mathew Hoh *Harper's Magazine* (January, 2023) p.3

326. Andrew Cockburn *Harper's Magazine* (November, 2022) pp.37-38
327. Louis Menand op cit p.66
328. McKay Coppins *The Atlantic* (November, 2023) pp. 68-69
329. *Wikipedia* article titled “Ranked voting”
330. Sheelah Kolhatkar *The New Yorker* (December 19, 2022) p.33
331. Claire Messud *Harper's Magazine* (March, 2023) p.70
332. Harper's Index *Harper's Magazine* (November, 2023) p.9
333. Louis Menand *The New Yorker* (July 24, 2023) p.73
334. Michael Robbins *Harper's Magazine* (December, 2022) p.26
335. *britannica.com* article titled “Inflation”
336. *en.wikipedia.org* article titled “Recession”
337. Olenick *et al* op cit p.370-71
338. Gary Zukav op cit pp.130-33

BIBLIOGRAPHY

Adams, Douglas (1993). *Mostly Harmless.* London: Pan Books Limited.

Armstrong, Karen (1994). *A History of God.* New York: Alfred A. Knopf Inc.

Barrow, John D. (1994). *The Origin Of The Universe.* New York: Basic Books.

Beck, Emily Morrison (ed.) (1980). *Bartlett's Familiar Quotations.* Boston: Little, Brown And Company.

Chopra, Deepak (2008). *Jesus.* New York HarperCollins

Dantzig, Tobias (1954). *Number The Language of Science.* New York: The Free Press.

Davies, Paul (1992). *The Mind Of God.* New York: Simon & Schuster.

Davies, Paul (1995). *About Time.* New York: Simon & Schuster.

Dawkins, Richard (2008). *The God Delusion.* New York: Houghton Mifflin Company

De Pree, Christopher (2014). *The Cosmos.* New York: Penguin Group (USA) Inc.

Durant, Will (1943). *The Story Of Philosophy.* Garden City, New York: Garden City Publishing Co., Inc.

Easwaran, Eknath (1983). *Gandhi the Man.* Petaluma, California: Nilgiri Press.

Edelman, Gerald M. and Tononi, Giulio (2000). *A Universe of Consciousness.* New York: Basic Books.

Falk, Dan (2008). *In Search Of Time.* Toronto: McClelland & Stewart Ltd.

Ferris, Timothy (1988). *Coming Of Age In The Milky Way.* New York: William Morrow and Company, Inc.

Ferris, Timothy (1992). *The Mind's Sky.* New York: Bantam

Books.
Feynman, Richard P. (1988). *QED The Strange Theory of Light and Matter.* Princeton: Princeton University Press.
Feynman, Richard P. (1997). *Six Easy Pieces.* Reading, Massachusetts: Addison-Wesley Publishing Company.
Folsing, Albrecht (1993). *Albert Einstein A Biography.* (Translation from the German by Ewald Osers) (1997). New York: Viking Penguin.
Gallant, Roy A. (1980). *Our Universe.* Washington D.C.: National Geographic Society.
Genz, Henning (1999). *Nothingness.* Reading, Massachusetts: Perseus Books Publishing, L.L.C.
Goldsmith, Donald (2000). *The Runaway Universe.* New York: Perseus Books Group.
Gordon, J. E. (1979). *The New Science of Strong Materials.* Middlesex, England: Penguin Books Ltd.
Gribbin, John (1993). *In The Beginning.* Toronto: Little, Brown and Company.
Hampshire, Stuart (1951). *Spinoza.* Middlesex, England: Penguin Books Ltd.
Harris, Sam (2005). *The End of Faith.* New York: W. W. Norton & Company, Inc.
Hawking, Stephen W. (1988). *A Brief History Of Time.* New York: Bantam Books.
Heinlein, Robert A. (2018). *Stranger In A Strange Land.* U.S.A.: Penguin Random House LLC.
Hesse, Hermann (1970). *Magister Ludi (The Glass Bead Game).* New York: Bantam Books.
Hodge, Paul W. (1974). *Concepts of Contemporary Astronomy.* New York: McGraw-Hill Book Company.
Hofstadter, Douglas R. and Dennett, Daniel D. (1982). *The Mind's I.* New York: Bantam Books.
Holt, Jim (2012). *Why Does The World Exist?* New York:

Liveright Publishing Corporation.
Homer-Dixon, Thomas F. (2001). *The Ingenuity Gap.* Toronto: Random House of Canada Limited.
Hooper, Dan (2019). *At The Edge Of Time.* Princeton: Princeton University Press.
Kabat-Zinn, Jon (2005). *Wherever You Go There You Are.* New York: Hyperion.
Kafatos, Menas and Nadeau, Robert (1990). *The Conscious Universe.* New York: Springer-Verlag.
Kauffman, Stuart A. (2008). *Reinventing The Sacred.* New York: Basic Books.
Krauss, Lawrence M. (2012). *A Universe From Nothing.* New York: Free Press.
Krauss, Lawrence M. (2018). *The Greatest Story Ever Told- - - So Far.* New York: Atria Paperback.
Lao-Tzu (5th Century B.C.). *Tao Te Ching.* (Translation by John Minford) (2019). New York: Penguin Books.
Lerner, Eric J. (1992). *The Big Bang Never Happened.* New York: Vintage Books.
Levin, Janna (2020). *Black Hole Survival Guide.* New York: Alfred A. Knopf.
Lovelock, James (2006). *The Revenge of Gaia.* London: Penguin Books Ltd.
Mack, Katie (2021). *The End Of Everything (Astrophysically Speaking).* New York: Scribner.
Metzger, Bruce M. (ed.) and Coogan, Michael D. (ed.) (1993). *The Oxford Companion To The Bible.* New York: Oxford University Press, Inc.
Meyer, Stephen C. (2023). *Return of the God Hypothesis.* New York: HarperCollins Publishers.
Morris, Desmond (1969). *The Naked Ape.* Toronto: Bantam Books of Canada Ltd.
Morris, Richard (1999). *The Universe, the Eleventh Dimension, and Everything.* New York: Four Walls Eight Windows.

Needleman, Jacob (1986). *The Heart of Philosophy.* San Francisco: Harper and Row, Publishers.
New Scientist (2017). *Where the Universe Came From.* London: John Murray Learning.
New Scientist (2017). *Why the Universe Exists.* London: John Murray Learning.
Nhat Hanh, Thich (1987). *Being Peace.* Berkeley: Parallax Press.
Ohanian, Hans C. (2008). *Einstein's Mistakes.* New York: W. W. Norton & Company, Inc.
Olenick, Richard P., Apostol, Tom M., & Goodstein, David L. (2007). *Beyond The Mechanical Universe.* New York: Cambridge University Press.
Parsons, Ronald J. (1994). *The Veils Of Names.* Canada: The National Spiritual Assembly of the Baha'is of Canada.
Phillips, Kevin (2006). *American Theocracy.* New York: Penguin Group (USA) Inc.
Pinker, Steven (2003). *the blank slate.* New York: Penguin Books.
Pirsig, Robert M. (1980). *Zen And The Art Of Motorcycle Maintenance.* New York: Bantam Books, Inc.
Rees, Lord Martin (2000). *Just Six Numbers.* New York: Basic Books.
Sagan, Carl (1978). *The Dragons of Eden.* Toronto: Ballantine Books of Canada, Ltd.
Sagan, Carl (1997). *Billions & Billions.* Toronto: Random House of Canada Limited.
Saul, John Ralston (1993). *Voltaire's Bastards.* Toronto: Penguin Books Canada Ltd.
Simpkins, C. Alexander & Simpkins, Annellen M. (1996). *Principles of Meditation Eastern Wisdom for the Western Mind.* Rutland, Vermont: Charles E. Tuttle Co., Inc.
Smith, Huston (1994). *The Illustrated World's Religions.* New

York: HarperSanFrancisco.
Smoot, George and Davidson, Keay (2007). *Wrinkles in Time.* New York: Harper Perennial.
Suzuki, David (1998). *Earth Time.* Toronto: Stoddart Publishing Co. Limited.
Suzuki, David with McConnell, Amanda (1999). *The Sacred Balance.* Vancouver: Greystone Books.
Tarnas, Richard (1993). *The Passion of the Western Mind.* New York: Ballantine Books.
Tolle, Eckhart (2003). *Stillness Speaks.* Novato, California: New World Library and Vancouver: Namaste Publishing.
Tompkins, Peter and Bird, Christopher (1973). *The Secret Life of Plants.* New York: HarperCollins Publishers.
Van Flandern, Tom (1993). *Dark Matter Missing Planets & New Comets.* Berkeley: North Atlantic Books.
White, Michael (1998). *Isaac Newton The Last Sorcerer.* Reading, Massachusetts: Addison- Wesley.
Wylie, Christopher (2019). *MINDF*CK.* New York: Random House.
Zajonc, Arthur (1995). *Catching the Light.* New York: Oxford University Press.
Zukav, Gary (1980). *The Dancing Wu Li Masters.* New York: Bantam Books, Inc.

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