

Junction Model of Multiverse: A Possible way of Time travel, Inter-dimensional Travel and travel to another Universe

Shuvadip Ganguli

M.Sc. Student, Department of Physics, Vidyasagar University, West-Bengal, India

ABSTRACT

There are many theories about the origin of the Universe. But the most widely accepted explanation is the Big Bang theory. According to this theory the universe as we know it started with a small singularity. In this paper, I am trying to show a different concept about the shape of our Universe after the Big Bang and an alternate approach to the known Universe and Multiverse theory. I named this model 'Junction Model of Universe and Multiverse' (JUM and JMM). Then I'll show a different technique of time travel, inter-dimensional travel and travel to different Universes by our wave function (or you can say it consciousness).

Keyword: *Universe, CMBR, Multiverse, Parallel Universe, Time travel, Human wave function*

1. Introduction

According to the Big Bang Theory, the whole Universe was compacted into a small point (only a few millimetres wide) with infinite density and intense heat called a Singularity. About 13.7 billion years ago this singularity exploded (called 'Bang') and from this explosion matter, energy, space and time, these four things were created. Now the universe was started to evolve. For better understanding, we can divide this evolution into two eras, Radiation era and Matter era. These theories about the past of our Universe were theorised after so many experimental observations. But the main problem is to determine the future and fate of our Universe, the real structure of this universe or the questions like, is our Universe is finite or it is infinite? if it is finite then where is it's edge? Are there other Universes like us? is these all Universes connected with each other in the Multiverse? And last but not least, can we travel to other Universes, through different dimensions or through time?

Now in this paper, I've started with the concept of famous Hubble's law, Hubble's constant (expansion factor), density parameter and then use it to develop a new structure of our Universe. I'll show the concept of a new level of Universe, 'Junction Level' and how we can travel through different time, different dimensions and different Universes via this level using Einstein-Rosen Bridge or more popularly known as 'Wormhole'. But here comes the real difficulty, we have to travel as a wave, not a matter. This concept has shown in the later part of this paper. So, let's start with the concept of Hubble's Law.

1.1 A brief concept of Hubble's Law

American astronomer Edwin Hubble was the first to describe the redshift phenomenon and used it to understand the concept of expanding universe. After the publication of Albert Einstein's general relativity in 1915, Alexander Friedmann published a set of equations that were derived from general relativity, now known as Friedmann equations. Those equations first showed that the Universe might expand and this expansion has a calculable rate. Then Georges Lemaitre, in a 1927 article, independently derived that the Universe might be expanding. He observed the proportionality between recessional velocity (Recessional velocity is the rate at which an astronomical object is moving away, usually from the earth.) and distance to distant bodies, and suggested an estimated value of the proportionality constant. Later this constant was corrected by Hubble in 1929 and known as Hubble constant.

The Hubble-Lemaitre law, also known as Hubble's law states that the distances between celestial objects are continuously increasing and that therefore the universe is expanding. This is a statement of the direct relationship between the distance to an object and its recessional velocity as determined by the redshift. Mathematically this law can be written as

$$v = H_0 D$$

Here, v is the observed velocity of the astronomical object (say, a galaxy), usually in Km/Sec H is the 'Hubble's constant in Km/Sec/Mpc. D is the distance to the galaxy in Mpc (1 Megaparsec equals to about 30.9 trillion or 3.09×10^{13} kilometres). Also the SI unit of H_0 is Sec⁻¹ but it is mostly used in Km/Sec/Mpc. So, the reciprocal of Hubble's constant is the Hubble time.

In 1929, Hubble estimated the value of this expansion factor (H_0) to be about 500 Km/Sec/Mpc. But after many observations, scientists calculated the value as nearly 71 Km/Sec/Mpc ($\pm 10\%$).

However, obtaining the value for Hubble's constant is very complicated. While in general celestial objects follow the smooth expansion, the more distant ones moving faster away from us. This type of motions caused slight deviations from the line predicted by Hubble's law.

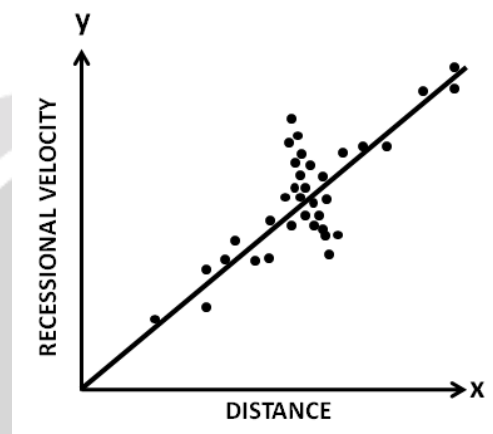


Fig -1 The recessional velocity of a few galaxies plotted against their distance from earth. On this graph the slope of the line is equals to Hubble's constant H_0

The distant galaxies in all directions are moving away from the earth, as seen by redshifts. Hubble's law describes this expansion. But one thing we have to remember that other celestial objects moving away from us does not imply that we are the center of the Universe. No matter where you are located in the Universe, you would see the same phenomenon happening in the same manner. So, there is no center of the Universe. All objects in the Universe are moving away from each other with the expansion of the Universe. This can be understood by a simple balloon analogy. At first, cover a balloon in dots with a marker and try to keep them equidistant. These dots represent galaxies or other astronomical objects. Now blow up the balloon from its wrinkly state. You see that as you blow up the balloon, the dots will appear to be moving away from each other. But the dots themselves are not moving, the surface of the balloon is causing them to move apart. Here the surface of the balloon represents space-time. So, from here we can understand that the galaxies do not move away from each other through space themselves, its space itself that is expanding and carrying the galaxies with it.

1.2 Levels of Our Universe according to previous models

Hubble volume or Hubble sphere is a spherical region of the observable universe surrounding an observer beyond which objects recede from that observer at a rate greater than the speed of light due to the expansion of the Universe.

However, the Observable Universe is larger than the Hubble Sphere. The estimated radius of the observable Universe is $R_{\text{obs}} = 14.25$ Gpc. The Observable Universe consists of the galaxies and other matter that humans can in principle observe from Earth in the present day because light from those objects has had time to reach us since the beginning of the cosmological expansion. The Particle Horizon of the observable universe is the boundary that represents the maximum distance at which events can currently be observed. That's where we have to stop, we cannot observe beyond this level. Here starts our imaginations and hypotheses. In this paper, I'll discuss a very interesting theory that may change your mind about the recent theories about the structure of the Universe and Multiverse.

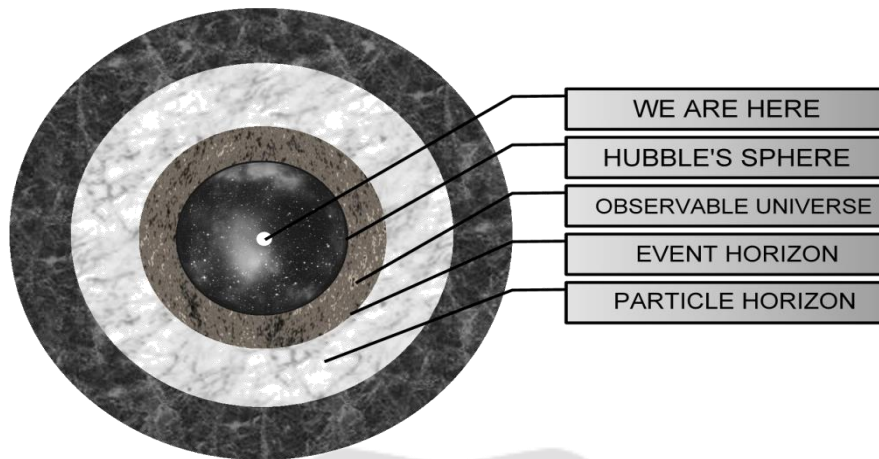


Fig -2 Layers of our Universe according to previous models

2. A New Model of the Universe

2.1 Is our Universe is infinite or finite?

The density parameter Ω (omega) defined as the ratio of the average density of matter of the Universe and energy in the Universe to the critical density (the density at which the Universe would stop expanding). We can write Ω as

$$\Omega = \frac{\rho}{\rho_c}$$

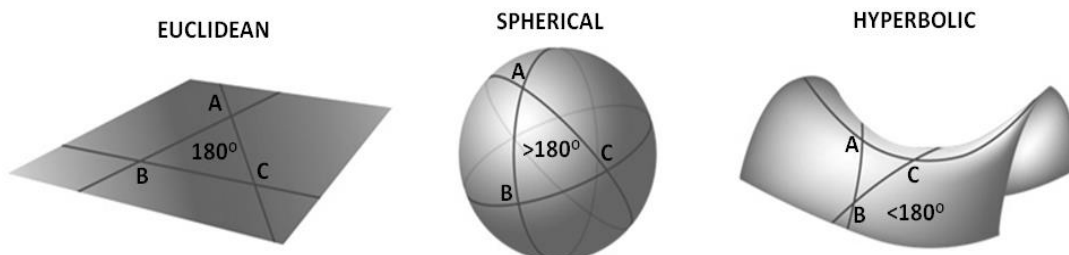
Here ρ is the actual density of the Universe and ρ_c is the critical density.

It is the sum of several different components including normal and dark matter as well as dark energy. We can write it as

$$\Omega = \Omega_B + \Omega_D + \Omega_\Lambda$$

Here Ω_B is the density parameter for normal baryonic matter, Ω_D is the density parameter for dark matter and Ω_Λ is the density parameter for dark energy.

There are three different possible geometries depending on whether the value of Ω is equal to, less than or greater than 1. If Ω is less than 1, the Universe is open and will continue to expand forever. If Ω is greater than 1, the Universe is closed and will recollapse because gravity will overcome the expansion. If Ω is exactly equal to 1, then the Universe is flat and contains enough matter to stop the expansion but not enough to recollapse it. There is also a fourth possibility, if $\Omega = 0$, then the Universe will be called an empty Universe with constant expansion rate. But, as it is nonphysical, we can ignore this one. All the above possibilities are illustrated below in figure 3.



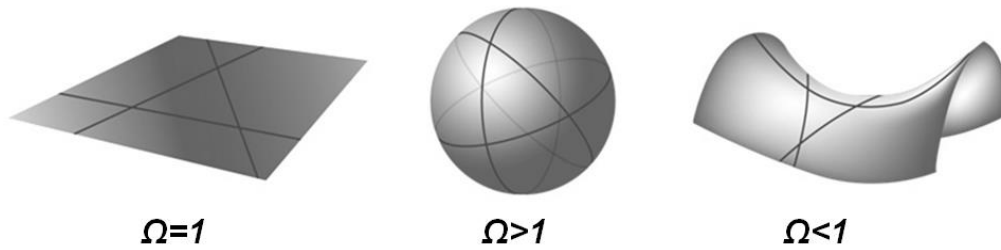


Fig -3 The sum of angles of a triangle is 180 degrees in Euclidean geometry. But, it is very interesting that for hyperbolic geometry, the sum of the angles of a triangle is less than 180 degrees and for Riemannian or elliptical geometry the sum of angles is always greater than 180 degrees.

After knowing these factors, we can predict four scenarios. Those are Big Freeze, Big Rip, Big Crunch and Big Bounce. According to the WMAP’s (Wilkinson Microwave Anisotropy Probe) measurement, the Big Freeze model is most favourable among these theories. Results of the Planck mission released in 2015 show the cosmological curvature parameter, Ω to be 1.00 ± 0.02 (very close to critical density), consistent with a flat, infinite universe.

2.2 A new approach to the shape of our Universe

We know that density parameter

$$\Omega = \frac{\rho}{\rho_c}$$

So to decrease the density parameter the actual density of the Universe (ρ) has to decrease. Current observations suggest that we live in a dark energy dominated Universe with $\Omega_\Lambda = 0.73$, $\Omega_D = 0.23$, and $\Omega_B = 0.04$.

Ω_Λ may not be decreased with time because dark energy seems to be growing stronger as the universe expands because this energy is the property of space itself. When more space comes, more of this energy would appear and it would not be diluted. The density of dark matter in an expanding universe decreases more quickly than dark energy (Specifically, when the volume of the universe doubles, the density of dark matter is halved, but the density of dark energy is nearly unchanged).

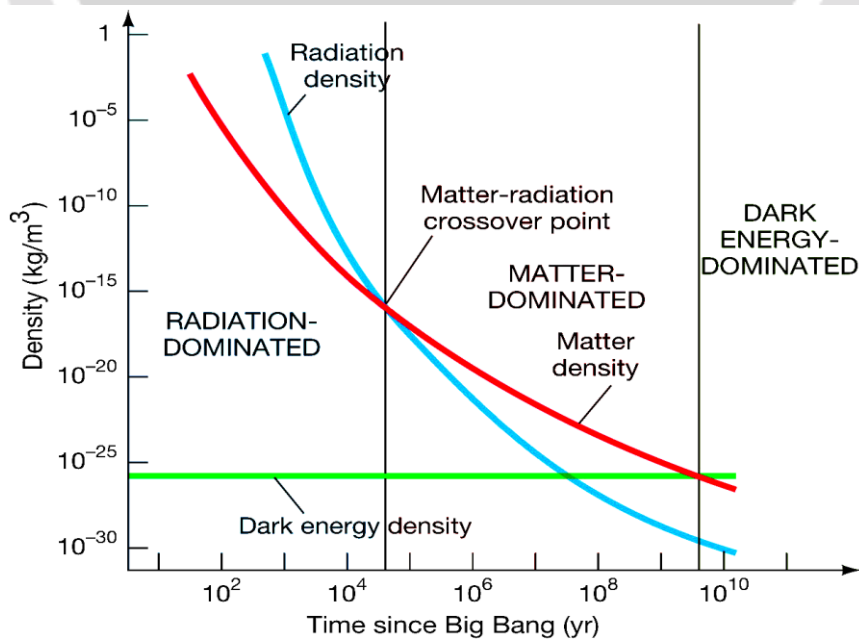


Fig -4 This graph shows the change of Radiation density, Mater density (Normal and Dark matter) and Dark Energy density.

2.3. Junction Universe Model (JUM)

According to my model, the Universe will evolve in this way:

The Universe was created with a Big Bang and now expanding in an accelerating way that we can observe.

After a sudden point, ‘Vanishing point’, it will gain a negative curvature because the density parameter will change in such a way (at this point the baryonic matter and dark matter dilute over time and Ω_B and Ω_D will decrease so much that the $\Omega < 1$ because the Universe will expand at its highest rate).

Then the Universe will expand with a negative curvature. After the vanishing point (temporary big fridge state), spatial geometry is a hyperbolic space. I named this region as ‘Junction level’ and this model as ‘Junction Universe Model (JUM)’. This is a very important region in this model. You’ll understand the significance of this name soon when I’ll discuss the Multiverse theory.

While expanding with a negative curvature after a point the whole Universe will starting converge and at last it’ll converge into a tiny point or singularity.

This singularity will cause another Big Bang and it’ll create a new baby Universe.

Let’s understand this new model with some diagrams in 2D (figure 5) and 3D (figure 7).

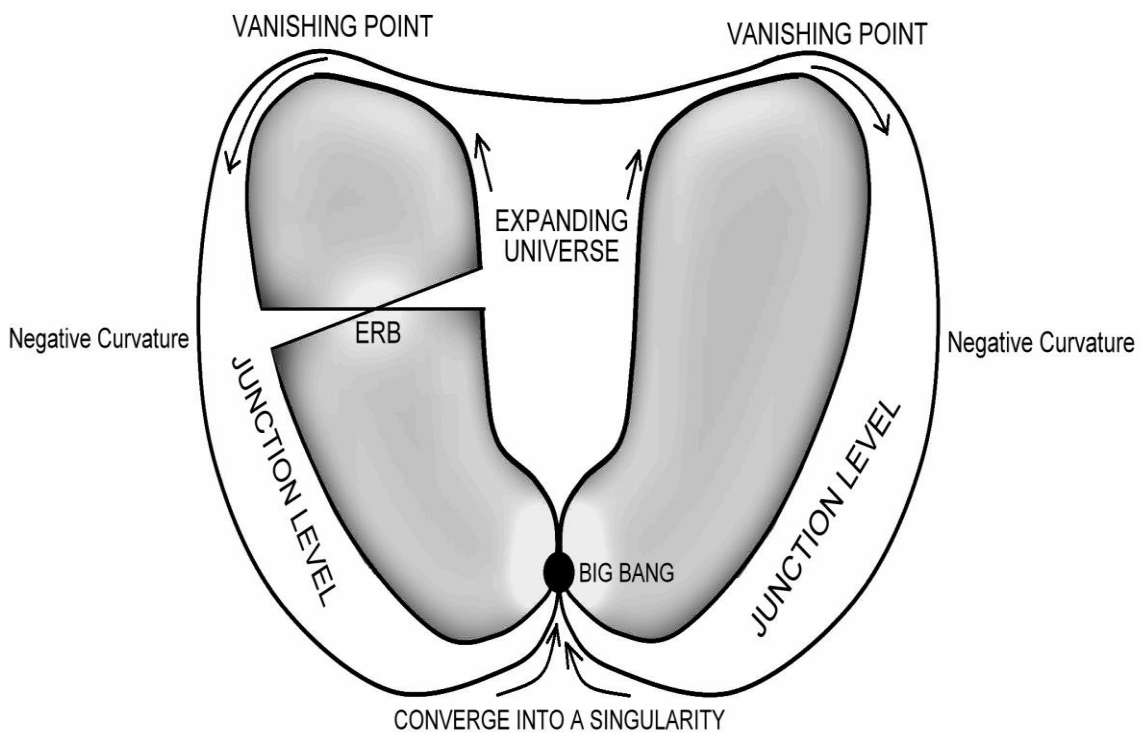


Fig -5 Junction Universe Model (JUM) in two dimensions. After the Big Bang the Universe expands but after a point (Vanishing point) it has a negative curvature. The Universe converges into a singularity and another Big Bang occurs. We can travel to Junction level through Einstein-Rosen Bridge (ERB) or simply known as Wormhole (I’ll discuss this later in the next part of this paper).

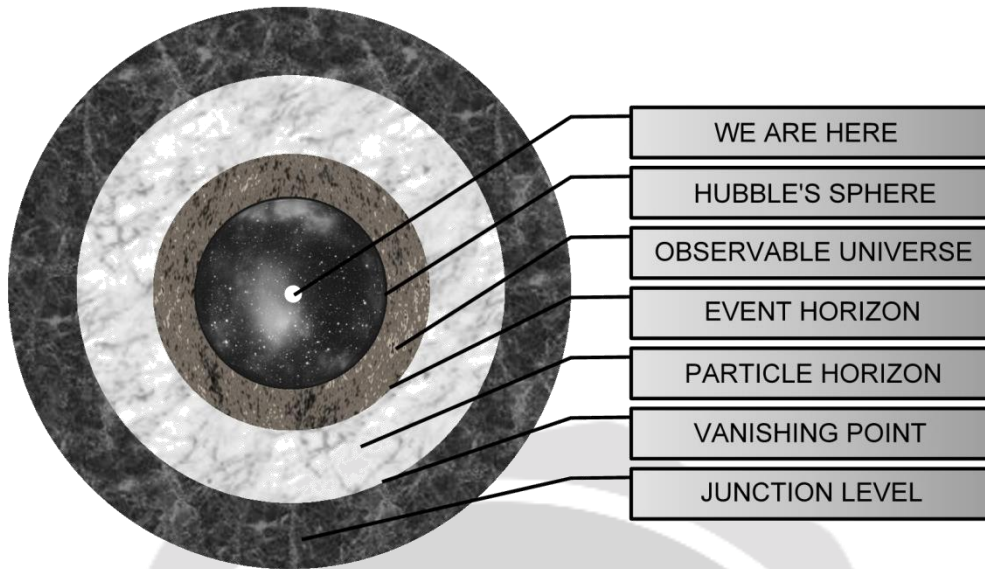


Fig -6 Junction Universe Model (in 2D) with extra two levels. First is the Vanishing Point and the second one is the junction level.

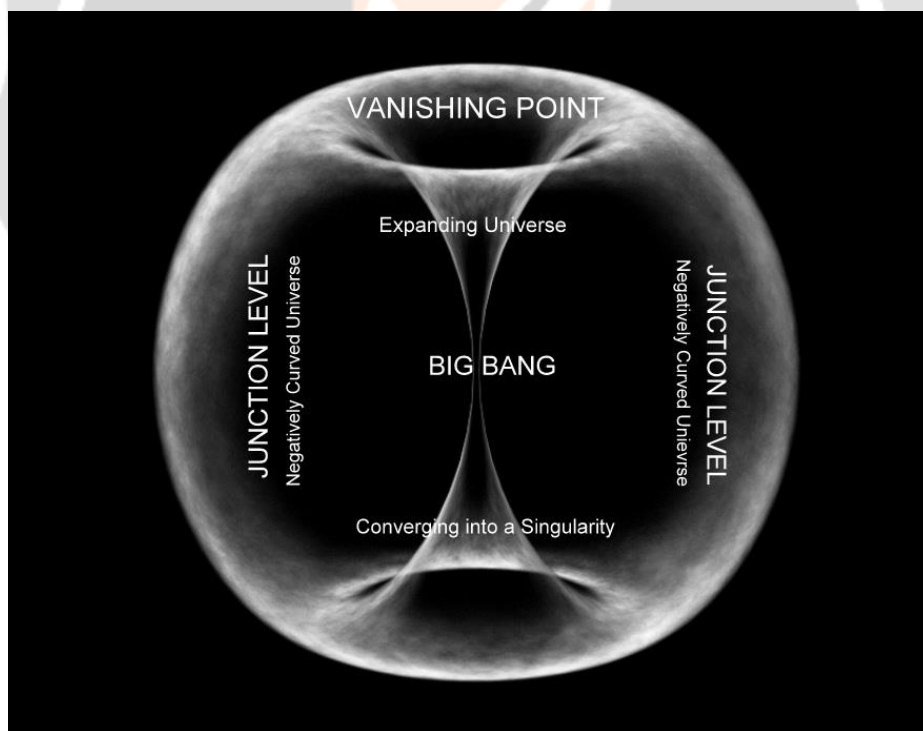


Fig -7 Junction Universe Model in 3D. It looks like a Toroid (more specifically a Horn Torus).

2.4. Junction Level of the Universe (The most important level)

This level is very interesting and important for inter-dimensional travel and time travel (I'll discuss later). Because of its negative curvature, this level linked with all the events and timeline exists in the expanding Universe after the Big Bang. This level covers the currently expanding Universe (the point where we live now) like a bubble. The whole Universe expands within this bubble but all events are separated from it. Here we can compare this level with the 'Elsewhere' region of the Minkowski space-time diagram (figure 8). [1]

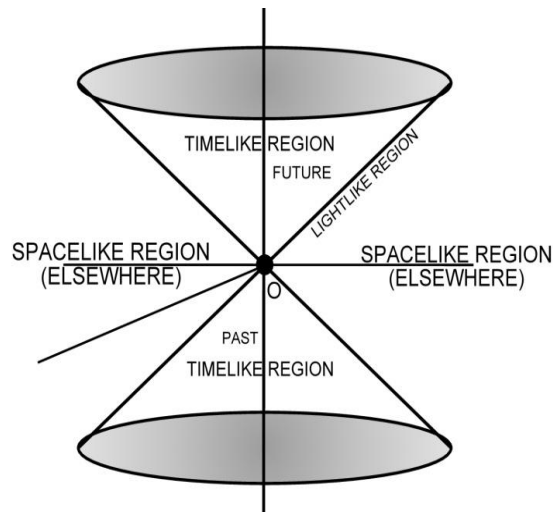


Fig -8 Region of the space-time is outside both past and future light cones. It is a new sort of region that does not appear in pre-relativistic space-times. It is an "elsewhere" region.

It collects all events that cannot be connected to O by timelike or lightlike curves. Its events can only be connected to O by spacelike curves. That is, its events are ‘spacelike separated’ from O.

2.5. Introduction to Multiverse and Parallel Universe

The Multiverse is a hypothetical group of multiple universes. Together, these universes comprise everything that exists: the entirety of space, time, matter, energy, information, and the physical laws and constants that describe them. The different universes within the Multiverse are called "parallel universes", "other universes", or "alternate universes".

But I think ‘Multiverse’ and ‘Parallel Universe’ are two different concepts. It’ll be clear in this discussion. Multiverse means simply the collection of all Universes (we can call it a set of all Universes in the Multiverse). But Parallel Universes are a special type of Universes. Not all Universes are Parallel Universe. If Multiverse M is a set of all Universes

$$M = \{\{U_1, U_2, U_3, U_4, \dots, U_n\}, \{U_{P1}, U_{P2}, U_{P3}, U_{P4}, \dots, U_{Pn}\}\}$$

$U = \{U_1, U_2, U_3, U_4, \dots, U_n\}$ is the set of different Universes.

$U_P = \{U_{P1}, U_{P2}, U_{P3}, U_{P4}, \dots, U_{Pn}\}$ is the set of Parallel Universes.

Here $U \subset M$ and $U_P \subset M$

There are many theories about Parallel Universe but I prefer the ‘Four Level Parallel Universe theory’ [2] of Max Tegmark. According to Max Tegmark we can divide the Parallel Universes into four distinct types.

LEVEL 1 Parallel Universes:

This type of parallel universe is simply a region of space that is too far away for us to have seen yet. The farthest that we can observe is currently about 4×10^{26} meters, or 42 billion light years – the distance that light has been able to travel since the big bang began. (The distance is greater than 14 billion light-years because cosmic expansion has lengthened distances.) Each of the Level I parallel universes is basically the same as ours. All the differences stem from variations in the initial arrangement of matter.

LEVEL 2 Parallel Universes:

This type of parallel universe emerges from the theory of cosmological inflation. The idea is that our Level I Multiverse—namely, our universe and contiguous regions of space—is a bubble embedded in an even vaster but mostly empty volume. Other bubbles exist out there, disconnected from ours. They nucleate like raindrops in a cloud. During nucleation, variations in quantum fields endow each bubble with properties that distinguish it from other bubbles.

LEVEL 3 Parallel Universes:

Quantum mechanics predicts a vast number of parallel universes by broadening the concept of “elsewhere.” These universes are located elsewhere, not in ordinary space but in an abstract realm of all possible states. Every conceivable way that the world could be (within the scope of quantum mechanics) corresponds to a different universe. The parallel universes make their presence felt in laboratory experiments, such as wave interference and quantum computation.

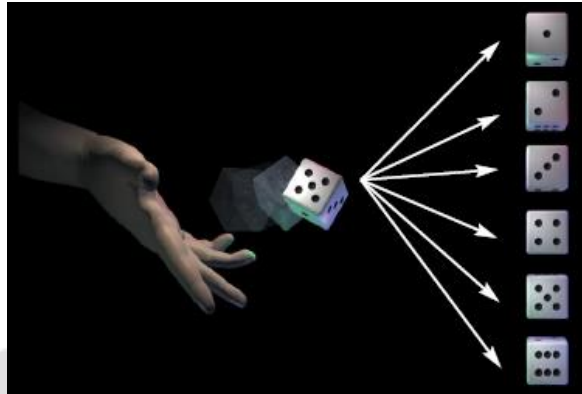


Fig -9 Quantum Dice (Image credit: Max Tegmark / Scientific American, by Alfred T. Kamajian.)

Imagine an ideal dice whose randomness is purely quantum. When you roll it, the die appears to land on a certain value at random. Quantum mechanics, however, predicts that it lands on all values at once. One way to reconcile these contradictory views is to conclude that the die lands on different values in different universes. In one-sixth of the universes, it lands on 1; in one-sixth, on 2, and so on. Trapped within one universe, we can perceive only a fraction of the full quantum reality.

LEVEL 4 Parallel Universes:

The ultimate type of the parallel universe opens up the full realm of possibility. Universes can differ not just in location, cosmological properties or quantum state but also in the laws of physics. Existing outside of space and time, they are almost impossible to visualize; the best one can do is to think of them abstractly, as static sculptures that represent the mathematical structure of the physical laws that govern them. For example, consider a simple universe: Earth, moon and sun, obeying Newton’s laws. To an objective observer, this universe looks like a circular ring (Earth’s orbit smeared out in time) wrapped in a braid (the moon’s orbit around Earth). Other shapes embody other laws of physics (a, b, c, d). This paradigm solves various problems concerning the foundations of physics.

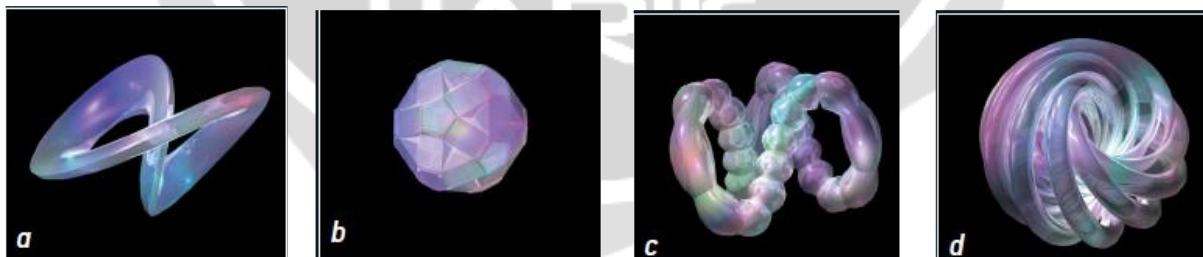


Fig -10 LEVEL 4 Parallel Universe (Image credit: Max Tegmark / Scientific American, by Brian Christie, Alfred T. Kamajian.)

The last two types (LEVEL 3 and LEVEL 4) are my main interest here and in this paper, I’ll extend my Junction Multiverse Model with it and show you an alternate possible way of travel through time and different dimensions.

2.6. Juncion Multiverse Model (JMM)

According to my new model, all the Universes are attached together through their Junction Levels (quantum mechanically). There is no empty space in this infinite creation; there are only infinite numbers of Universes and their overlapping Junction levels.

Here we have to understand three things:

(A) The Multiverse made of infinite number of different Universes and they are attached together as shown in figure 11. All the materials of a Universe (let's call it as Mother Universe) converge into singularity through the Junction level and create another Universe with another Big Bang (let's call it as Baby Universe). But it is not mandatory to create the same types of Baby Universe from their Mother Universe. Because as the Junction levels are overlapping to one another, so, a Baby Universe could born from two or many Mother Universes and can get different laws of Physics (Just like the Universe in Max Tegmark's LEVEL 4 Parallel Universes).

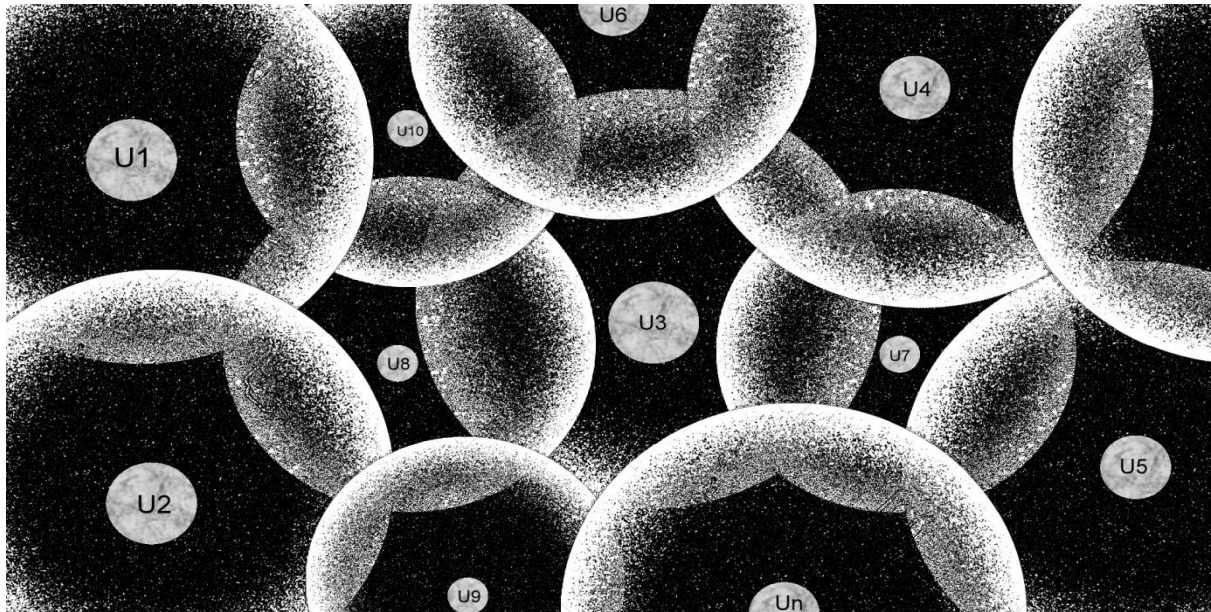


Fig -11 This is a two dimensional model of JMM. U1, U2, U3,.....Un are different Universes in the Multiverse. Junction levels are overlapped with each other. In 3D they will look just like soap bubbles attached together.

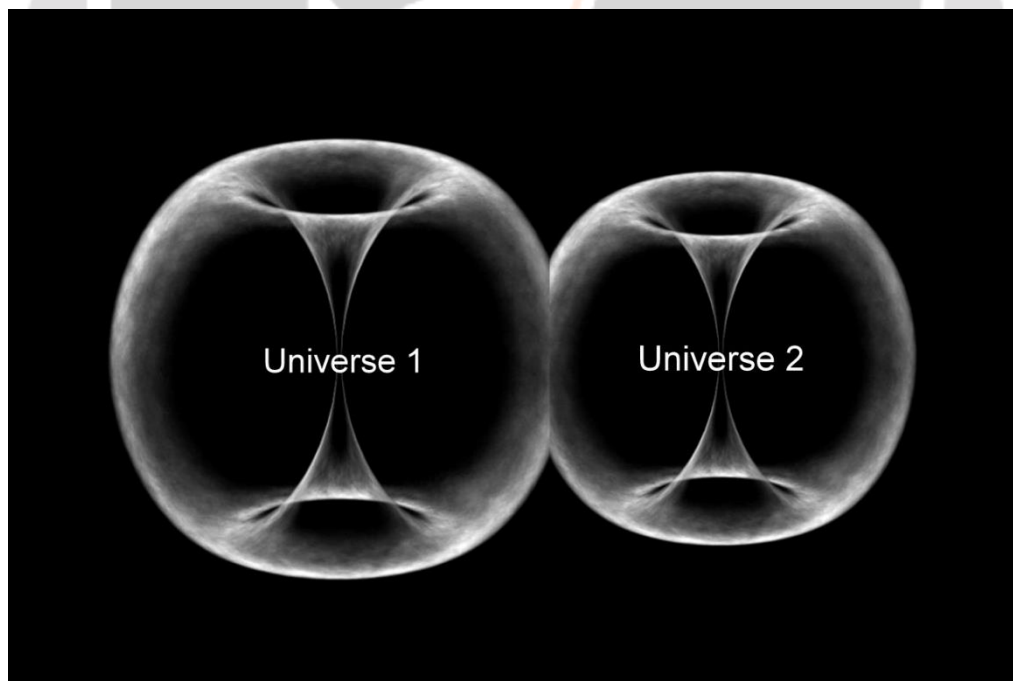


Fig -12 A simple three dimensional view of JMM with only two Universes (but actually there are infinite numbers of such Universes). The Junction levels of two Universes are overlapped.

- (B) Parallel Universes are a part of this Multiverse. They are not different Universe but same Universe like us with different realities born from our quantum decisions. Remember the LEVEL 3 Parallel Universe model of Max Tegmark [2] where it says that when you make certain decisions effectively our world splits into several parallel timelines and these make different Parallel Universes. Okay, as a simple example just imagine you'll propose a girl tomorrow. If the girl accepts your proposal then in this timeline you'll marry that girl. But, there is another timeline creates simultaneously where the girl will reject your proposal and this event happens in a different Parallel Universe where a different reality and future waits for you. So each of your decision makes a different reality and different Parallel Universe. So naturally, they could be of infinite number in this Multiverse.

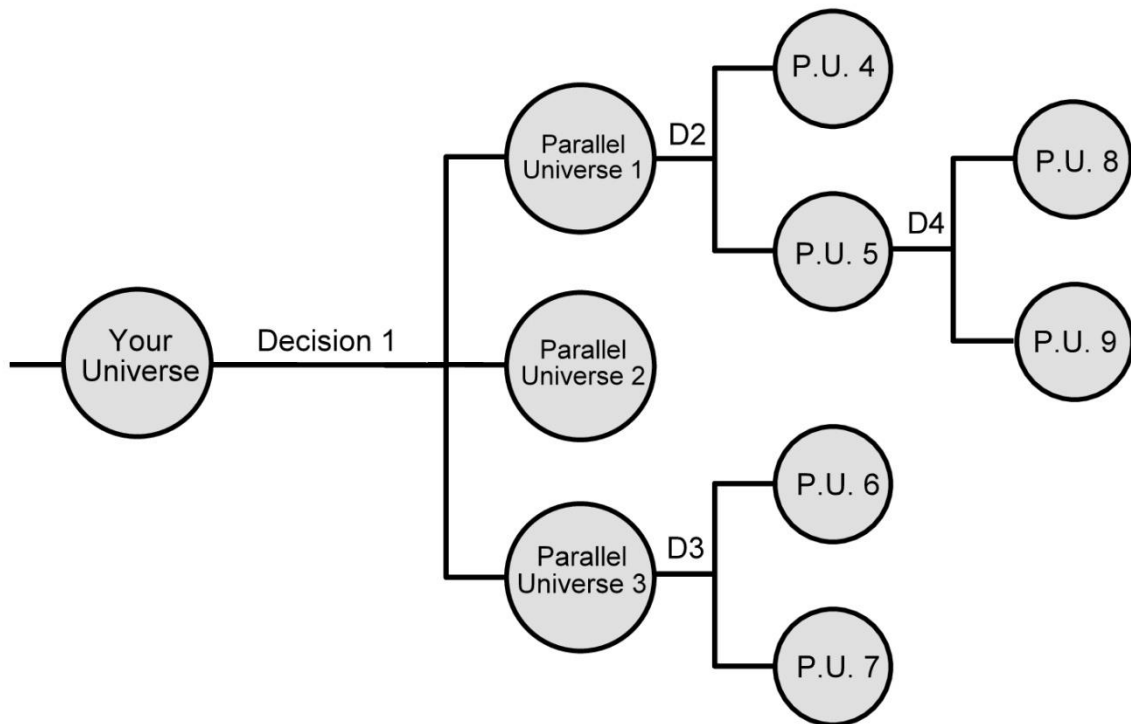


Fig -13 In this figure D's are your different decisions and P.U.'s are different Parallel Universes. When you make certain decisions effectively our world splits into several parallel timelines and these make different Parallel Universes. Infinite Parallel Universes can exist simultaneously.

- (C) Different dimensions in our own Universe are another important concept. Generally we can see three dimensions and if we take time as the fourth dimension then we have total four dimensions. But is it everything? The answer is No!
So, what's beyond these four? According to M theory (M theory unifies all consistent versions of superstring theory) there are another 10 or 11 extra dimensions (Nine space dimensions, one time dimension and one energy dimension) but those are very hard to visualize. These are hidden and make up a larger part of this Universe. So, we can say our Universe has Multi-dimensional nature. (I'll come to this point in the Inter-dimensional Travel part.)

The Junction level is a vital area. This level is connected to all the space, time and dimensions of a Universe and other Universes in the Multiverse. A junction, when discussed in the context of transport, is a location where traffic can change between different routes, directions, or sometimes modes, of travel. In my model, the Junction level does similar work. Junction levels of different Universes can overlap and for time travel and inter-dimensional travel, we can choose the best route through it quantum mechanically.

2.7. Advantages of JUM and JMM Models

- (A) The best thing about my model is that it doesn't rejects or violates previously known theories about the birth and evolution till now of our Universe (like well accepted Big Bang, inflation theory etc.). But it'll able to predict the destiny of the Universe. According to this model, Universe was born with a Big

Bang but it was due to a pre Big Bang contraction of one Universe or more than one Universes. It's like an oscillatory model.

- (B) This model accepts the Inflation Theory. According to this theory a period of extremely rapid expansion of the universe previous to the more gradual Big Bang expansion, during which time the energy density of the universe was dominated by vacuum energy that later decayed to produce the matter and radiation that fill the universe today.
- (C) This model is based on the proportion of Normal matter, dark matter and Dark energy in our Universe and how it changes over time. (Discussed earlier in 2.2 and 2.3)
- (D) The cosmic microwave background (CMB) is electromagnetic radiation as a residue from an early stage of the universe. When we detect CMBR we are looking back about 13 billion years, only a few hundred thousand years after the Big Bang. But we cannot tell what happened before that because at that time Universe was not transparent enough for light or photons. So photons of that time cannot reach us.

This model can predict what happened before that time (a few hundred thousand years after the Big Bang). (More research needed on this). One of the main problems is to explain the Cold Spot in CMBR (figure 14). The Cold Spot is approximately 70 μ K (0.00007 K) colder than the average CMB temperature (approximately 2.7 K). There are mainly three theories to explain this: Supervoid theory, cosmic texture theory and Parallel Universe theory.

Professor Tom Shanks of Durham University said, "Perhaps the most exciting of these is that the Cold Spot was caused by a collision between our universe and another bubble universe. If further, more detailed, analysis of CMB data proves this to be the case then the Cold Spot might be taken as the first evidence for the Multiverse - and billions of other universes may exist like our own."

According to JMM model, the Junction level of our Universe can collide with the Junction level of another Universe (figure 12). This theory can be a solution of Cold Spot problem.

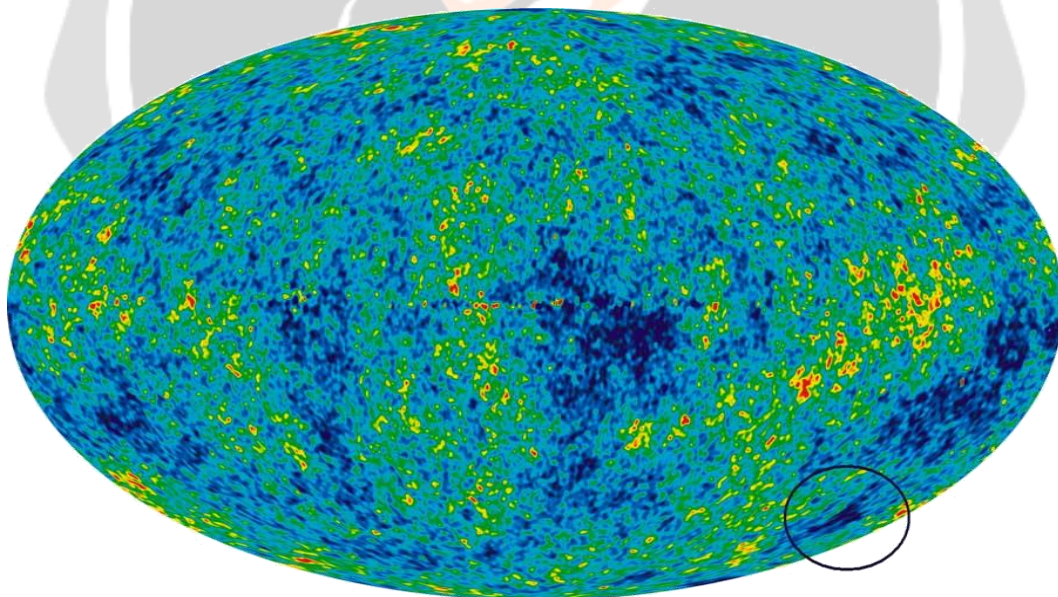


Fig -14 The map of the cosmic microwave background (CMB) produced by the Planck satellite. Red spots represent slightly warmer regions and blue slightly cooler regions. The Cold Spot is shown by the black circle.

(Image credit: NASA / WMAP science team)

- (E) This model can predict what happened to the information that goes into Black holes. Quantum mechanics implies information is never destroyed, so information that falls into a black hole must ultimately escape somewhere, it can't just vanish. This 'somewhere' maybe the Junction level. So, information is always in our Universe without destroying. This supports the conservation of information.

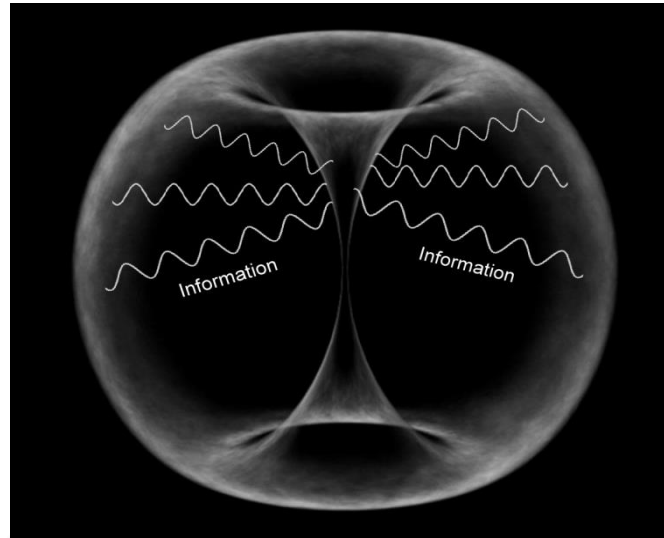


Fig -15 Information travel to the Junction level via Black holes (and Worm holes). They never vanish or destroyed and always present in the Universe. But, there may be a chance to go to another Universe through overlapping Junction levels.

- (F) This model states that the Universe expanding and after a temporary big fridge state it again starts to expand with a negative curvature and at last converge into a singularity which causes another Big Bang and it creates a new baby Universe. This is like a modified oscillatory model.
- (G) This model has an extra level (Junction level) which is connected to every point of space-time and different dimensions. Through this, we can choose where to go at the time of Time travel and inter-dimensional travel. So simply another side of all the Black holes or Einstein-Rosen Bridge (Wormholes) opens at this level. This junction level also attached to other Junction levels of other Universes. So, travel through the Multiverse also possible via it. It may sound bizarre but it can be possible. I'll discuss a possible way of this type of travels in the next part where we can use the Junction level as a 'common platform' for all type of travels (Time travel, Inter-dimensional travel, Travel to other Universes).

3. Time Travel, Inter-dimensional Travel and Travel to other Universes

3.1. Faster than Light Speed Concept (FTL)

Can we contact FTL objects?

Now we see a very interesting concept here. We know the value of Hubble's constant is 71 Km/Sec/Mpc ($\pm 10\%$). It means if a galaxy A at a distant 1 Mpc away from the earth then it should recede from us at a rate 71 Km/Sec. But another galaxy B situated at a distance 2 Mpc from the earth then it should move away from us at a speed 142 Km/Sec which is twice the rate of galaxy A (figure 16).

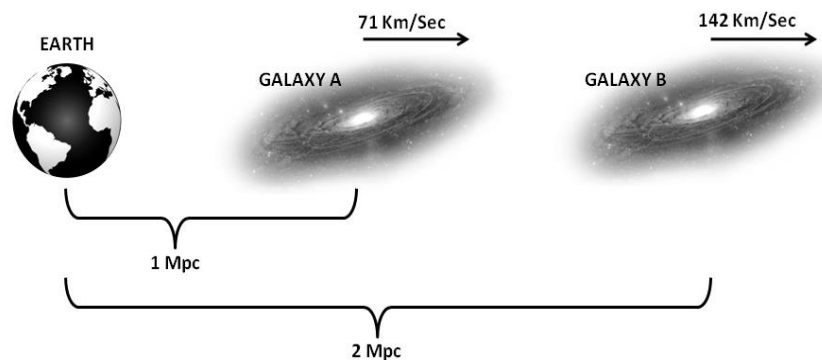


Fig -16

So the distant galaxies or other celestial objects moving away from us at accelerated rate. Note that, this is the speed of receding objects plus the speed of expansion of space. It means after a sudden distance the speed of receding object and expanded space will be greater than the speed of light C (299,792 kilometers per second). We know that the wavelength of the emission and absorption lines from elements of the galaxy are redshifted due to their recessional velocity. So at that point, the redshift should be infinite and the object should vanish or we simply cannot see or contact them. But, it doesn't happen.

Two major implications of Hubble's law are (1) recessional speed increases linearly with distance at any one moment in time; and (2) there is no limit to an object's recessional speed. Not only is faster-than-light recession not prohibited, but it's also what all matter does outside a radius of $D = C/H$.

But how we can prove that we can contact FTL objects? Let's see by a simple thought experiment. [3]

Three observers, A, B, and C, are separated linearly in space, such that the Hubble recessional velocity between A and C is greater than light speed, but the recessional velocities between A and B, and B and C are less than light speed (see figure 17).

Now, suppose A sends a photon to B, and instead of intercepting the photon B lets it pass by. Will A's photon eventually reach C?

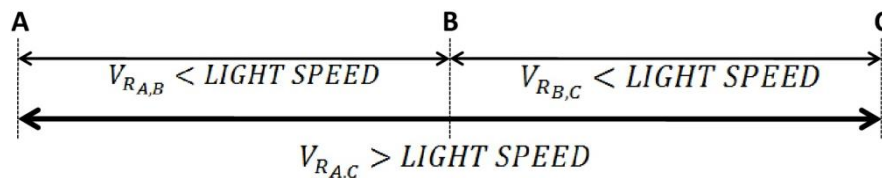


Fig -17 Three observers separated in space.

The distances between observers is such that the recessional velocity (V_R) is greater than light speed for A and C, but less than light speed for A and B, and B and C.

Now, suppose A sends a photon to B, and instead of intercepting the photon B lets it pass by. Will A's photon eventually reach C?

Yes. The photon from A will reach C. If light from B is always able to reach C, and light from A is always able to reach B, light from A will always reach C. And no, this light will not be redshifted an infinite amount. A photon from A will redshift a finite amount as it travels to B and another finite amount as it travels from B to C. In a universe where space expands, light does not recede from its source at a constant speed, but in fact, must accelerate. When the light from A reaches B, it will be receding from A not at the speed of light but the speed of light plus the recessional velocity of B.

$$V_{light} = H_0 D \pm C$$

So no object receding from us at constant or decreasing speed is beyond our observational reach. Light from us will always catch up with such objects and, by symmetry; light from such objects will always catch up with us. This is the simplest way we can understand that we can contact FTL objects.

3.2. Possible ways to travel through Junction level

So if we can manage to travel through Junction level, then we can go to a different dimension (Inter-universe space may have a multidimensional nature. This infinitely dimensional in space and time quantity defines the space-time-universe.) and timeline, or different Universes, wherever we want (But of course not as a physical body, I'll come to this point soon).

But, to travel through this level, at first, one has to enter this level. The main question is how to enter there?

The answer is quite simple. Previously I've said that the Junction level is comparable with the 'Elsewhere' region of the Minkowski space-time diagram. So the events in this level are not connected with us as timelike or light like. It only connected as spacelike.

Gravity may offer a portal to the Junction level. Gravity may hold the key for inter-dimensional or inter-universe space travel due to its multidimensional nature. So there are two ways to enter the Junction level. First is the Black hole and another one is the Einstein-Rosen Bridge (ERB).

3.2.1. Portal through Black hole Concept

We know that, if the gravitational field increases, the space-time curvature also increases. So, space-time curved around massive objects because it has a larger gravitational field. Black holes are like the infinite wells with enormous gravitational pull. Those are incredibly massive and extremely dense but cover only a small region. So, may be the other side of the black hole open in the Junction layer of the Universe. It is like one type of portal through space-time. But it is impossible to go through it safely.

3.2.2. The difficulty of travel through a Black hole

Let's take the example of two persons, you and your friend. Let's think that you fall towards a black hole. you will move into it faster and faster, accelerated by its gravity. Your feet will feel a stronger gravitational pull than your head because they are closer to the black hole. These are called 'tidal forces'. Your elongated body continues to stretch lengthwise and continue to shrink widthwise. Then your body is stretched apart. Your body would be stretched toward the singularity. This stretching is so incredible and so strong that your body is completely torn apart before you reach the event horizon. Scientists call it 'spaghettification' (comes from the word 'spaghetti', a long, thin, solid, cylindrical pasta.) If you fall into a supermassive black hole, your body remains intact, even as you cross the event horizon. But soon thereafter you reach the central singularity, where you are squashed into a single point of infinite density. You have become one with the black hole. Once you reach this point, you would sadly die!

3.2.3. Travel through Einstein-Rosen Bridge (ERB)

Another way is to enter the Junction level is through Einstein-Rosen Bridge. Basically, black hole and white holes attached as depicted in the below picture and it creates a portal through which one may travel one universe to other universes or different parts of the same universe. Yes, Sounds like something out of a science fiction movie. But it is known as 'Einstein-Rosen Bridge' (ERB) or more popularly as 'Wormhole' (figure 18).

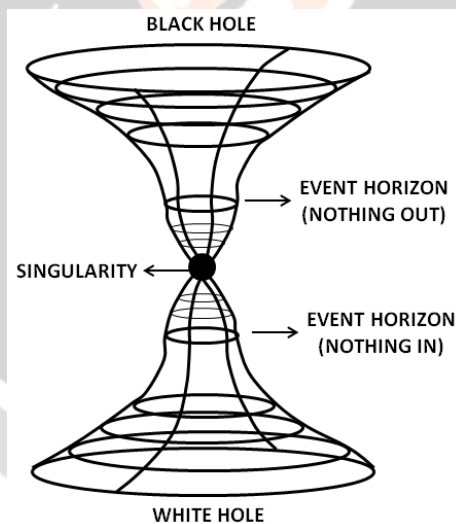


Fig -18 A diagram of Einstein-Rosen Bridge

3.2.4. The idea of Worm hole or Einstein-Rosen Bridge (ERB)

In 1935, Albert Einstein and Nathan Rosen used the general theory of relativity to elaborate the idea of worm hole, proposing the existence of bridges through space-time. Now, the question is, why is a wormhole called a 'wormhole'? or what is the significance of the term 'wormhole'? It is a very simple idea. This bridge is a shortcut through the fabric of space-time, just as a worm burrows through fruits. We can understand this concept with a piece of paper. Let, there are two points A and B on a piece of paper. Now tell me, what is the shortest distance between those points? What do you think? You may say the straight line connecting those two points should be the shortest distance. Yes, it is true. But, if we overlap those points by folding the paper then it will be the shorter distance than the previous answer. Technically the two points will be at the same point in space-time. Suppose the point A is your home and point B is your school. Now, if you can fold the space-time such that

point A and point B overlap to each other then the moment you step out of your home is the moment you step into your school. So, theoretically, the time taken for this is zero or negligibly small. It reminds me of the 'anywhere door' of Doremon cartoon (one of my favourite cartoon show). We can use ERB to enter the Junction level (shown in figure 5).

3.2.5. Problems of travelling through ERB

We can travel from one part of our universe to another part or a completely different universe through worm hole in just a few seconds or less than that time. Einstein's theory of general relativity mathematically predicts the existence of wormholes, but none have been discovered to date. We can see so many scenes of time travel through worm hole in Science fiction movies and novels.

But the reality of that process is more complicated. The concept of worm hole stills a hypothetical concept just because we cannot spot them due to mainly two reasons.

The first problem is its size. The worm holes are predicted to exist on the microscopic level. So, it is very hard to detect and almost impossible to travel within it for us. But, as the Universe is expanding, some of them may stretch to the larger size. The second problem is more important. It is about their stability. These worm holes would be useless for space-time travel because they collapse very quickly. This problem can be solved by using 'exotic matter'*. Worm holes containing exotic matter are more stabilized. They could stay open for a longer period of time. If a worm hole has enough exotic matter or we artificially add sufficient exotic matter to it then it can be used for travel through space. Some researchers say that it also can be used for time travel.

But, it will be challenging for a human. British cosmologist Stephen Hawking has argued that such use is not possible. There is one more problem. Even if we can stabilize the worm hole by adding exotic matter in it and travel through it, there is still a possibility that the addition of regular matter (here human beings) could destabilize the portal. We need the most advanced technology to detect and use worm holes as a time machine.

3.3. A new technique of travel through ERB as Wave

So from the previous discussions, it is clear that a safe journey through ERB is almost impossible for any human or material body and without that we cannot enter the Junction level. So to travel through it, we must have to consider another way (no matter how crazy it sounds!). Here comes the idea of Quantum physics.

For this we need the three most important concepts of Quantum mechanics:

(A) Concept of the Wave function

A wave function in quantum physics is a mathematical description of the quantum state of an isolated quantum system. The wave function is complex-valued probability amplitude, and the probabilities for the possible results of measurements made on the system can be derived from it.

(B) Concept of Wave-Particle Duality

Wave-Particle duality is the concept in quantum mechanics that every particle or quantum entity may be described as either a particle or a wave. It expresses the inability of the classical concepts "particle" or "wave" to fully describe the behaviour of quantum-scale objects.

(C) Concept of Quantum entanglement

Quantum entanglement occurs when two particles become inextricably linked, and whatever happens to one immediately affects the other, regardless of how far apart they are (violating our ideas about the concept of 'locality' and the fact that the speed of light is the maximum reachable speed).

So, if we cannot travel through ERB as a matter then maybe we can as Wave. According to Wave-Particle duality, every particle has its wave nature. Our body made of particles. So, our body also has a wave nature and also has a wave function. The different body has different wave functions.

* Exotic matter is not dark matter or antimatter. It has 'exotic' properties. It is non-baryonic. It has negative energy density and negative pressure. Most of the exotic matter remains hypothetical. Tachyons are examples of exotic matter. The Tachyons are very interesting because according to the theory of relativity these particles are able to travel faster than the speed of light. Exotic matter can violate known laws of physics. Interestingly, this type of particle may exist at the Junction level.

In Human Quantum mechanics, the Human Wave function (symbol Ψ) is the solution to a wave equation that describes the movement of a single human molecule (or human particle) in trajectory, when a human is viewed as a wave (or viewed as in possession of wave behaviour), according to the principle of wave-particle duality. In 2007, Libb Thims, in his Human Chemistry, in the context of human quantum chemistry, introduced a modern approach to the issue of wave-particle duality behaviour, in the concept of the human molecular orbital, as explained in human molecular orbital theory, wherein a person as a bound state point-like molecule (or human particle) moves daily in probabilistic activity orbitals. [4]

But the process of converting a human body into a Human Wave function is still unknown. We need more futuristic technology to do it.

In the concept of Parallel Universe, we've seen that human quantum decision and more specifically the human consciousness is the most important concept that we can use for these types of travels.

The relation between quantum physics and higher brain functions (consciousness) is a much-discussed subject by various points of view. One of the most famous proposals for quantum physics in the brain is the 'Orch-OR' model (Orchestrated OR activity ('OrchOR'), where 'OR' means 'objective reduction' of the Quantum state.) [5] performed by Roger Penrose and Stuart Hameroff. According to Penrose, consciousness is the product of quantum probabilities. According to this model, consciousness would be based on quantum vibrations in microtubules within brain neurons (figure 19); these vibrations have been confirmed by observations in the brain. It can be related to electroencephalographic rhythms. This topic is part of higher biological research.

The Orchestrated objective reduction is an organic philosophy of mind (or our thoughts) that claims that consciousness originates at the quantum level inside neurons, rather than the conventional view that it is a product of connections between neurons.

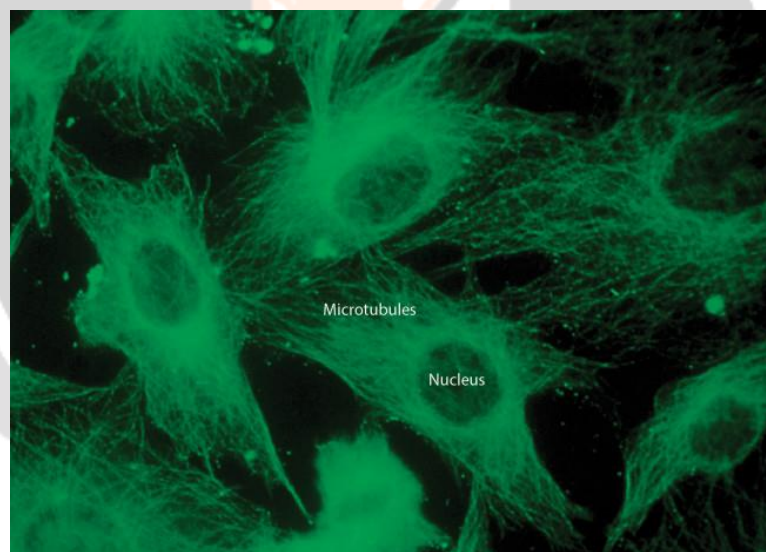


Fig -19 Microtubules within brain neurons (Image credit: Gopal Murti/Science Source)

We can tell these three things about Consciousness according to Roger Penrose:

- (A) Consciousness is not an independent quality but arose, in terms of conventional physical processes, as a natural evolutionary consequence of the biological adaptation of brains and nervous systems.
- (B) Consciousness is a separate quality, distinct from physical actions and not controlled by physical laws, that has always been in the universe.
- (C) Consciousness results from discrete physical events; such events have always existed in the universe as non-cognitive, proto-conscious events, these acting as part of precise physical laws not yet fully understood.

A hypothesis about the consciousness as a new state of matter has been presented in 2014 by Max Tegmark; he suggested that there is a new state of matter, just like solid, liquid, etc. in which atoms process information, give rise to subjectivity and, ultimately, to consciousness. He proposed the name ‘Perceptronium’ for this new state of matter.[6]

The consciousness could be interpreted as a result of a particular set of mathematical conditions. Various forms of consciousness might arise just as conditions for the creation of different states of matter (such as steam, water and ice).

3.3.1. A simple mathematical interpretation of Human wave function

In the paper “Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?” A. Einstein, B. Podolsky and N. Rosen concluded, “..... *Starting then with the assumption that the wave function does give a complete description of the physical reality, we arrived at the conclusion that two physical quantities, with noncommuting operators, can have simultaneous reality. Thus the negation of (1) leads to the negation of the only other alternative (2). We are thus forced to conclude that the quantum-mechanical description of physical reality given by wave functions is not complete.*” [7]

In 1932, a French scientist named Louis de Broglie suggested that the wave-particle duality applied to not only light but also to matter. That is to say, he proposed that all matter possessed wave-like characteristics.

The de Broglie wavelength equation is

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

Where h is the Plank’s constant (6.626×10^{-34} JS), m is the mass of the object in kilograms, and v is the velocity/speed of the object in meters per second.

So, for example, the De Broglie wavelength of a person with a mass of 50 kg running at 10 m/s will be about 1.33×10^{-36} m. (even smaller than the Plank length l_p).

A Worm hole in microscopic level can have the size about 10^{-35} m. A Human wavelength is less than that. So, we can use a Human Wave to travel though a microscopic Worm hole.

The configuration or state of a quantum object is completely specified by a wave function denoted as Ψ .

$P(x) = |\Psi(x)|^2$ determines the probability (density) that an object in the state $\Psi(x)$ will be found at position x .

Okay, so simply let’s assume a Human wave function (consciousness) as $\Psi(x, t)$. This wave function divided into an infinite number of parallel Universes with infinite numbers of different realities.

So we can say that for n number of Parallel Universes

$$\Psi = \Psi_1 + \Psi_2 + \Psi_3 + \dots + \Psi_n$$

$$\Psi = \sum_{i=1}^n \Psi_i$$

For infinite numbers of Parallel Universes

$$\Psi = \sum_{i=1}^{\infty} \Psi_i$$

Now the Expectation value of the position x of this wave function $\Psi(x, t)$ can be expressed as

$$\langle x \rangle = \int_{-\infty}^{\infty} \Psi^*(x, t) x \Psi(x, t) dx$$

It could be viewed as the average value of position (x) for a large number doppelganger of a person which are described by the same wave function.

If the given two possible states of a quantum system corresponding to two wave functions $\Psi_1(x)$ and $\Psi_2(x)$, the system could also be in a superposition $\Psi(x) = C_1\Psi_1(x) + C_2\Psi_2(x)$ with C_1 and C_2 as arbitrary complex coefficients satisfying normalization.

Now the probability density exhibits quantum interference aside from the usual addition of probability.

$$\begin{aligned} P(x) &= |C_1\Psi_1(x) + C_2\Psi_2(x)|^2 \\ &= |C_1\Psi(x)_1|^2 + |C_2\Psi(x)_2|^2 + C_1^*C_2C_1\Psi(x)_1^*\Psi_2(x) + C_2^*C_1C_2\Psi(x)_2^*\Psi_1(x) \end{aligned}$$

All the wave functions of a human body in infinite number of different Universes can be in superposition state like this,

$$\Psi(x) = \sum_{i=1}^{\infty} C_i\Psi_i(x)$$

Where, the total probability $P = \sum P_i = \sum |C_i|^2 = 1$ always.

So, basically, if your wave function in this reality (our Universe) is Ψ_1 (which is known), then you have other infinite numbers of unknown wave functions in the Multiverse represented by

$$\sum_{i=2}^{\infty} \Psi_i$$

3.3.2. How can we travel through time and dimensions? (Time travel, Inter-dimensional travel and travel to other Universes)

Have you ever noticed that why there is not any direct evidence of time travel? Why we didn't see any time traveller till now? Well, the simple answer to these questions is that we could not discover the real process of time travel yet in the future by which one can travel back to our time (The time when you read this article). Or maybe there is another process (this is not that kind of time travel happens in story and movies) where we can travel through time and dimensions not as a physical body (no one can notice this type of time travel). We can use our wave functions to travel like that. We can transport that wave function through an ERB without destroying it.

In my opinion, there are three types of travel:

- (A) Time travel
Travel to a different time (Past and Future)
- (B) Inter-dimensional travel
Travel to a different dimension in our Universe. (As the Universe can have Multi-dimensional nature)
- (C) Travel to other Universes.

Maybe we use the concept of Quantum Entanglement here. Quantum teleportation is a process in which quantum information can be transmitted from one location to another, with the help of classical communication and previously shared quantum entanglement between the sending and receiving location. It allows the transfer

of quantum states from one location to another without having to send the carrier of the quantum state. Because it depends on classical communication, which can proceed no faster than the speed of light, it cannot be used for faster-than-light transport or communication of classical bits. While it has proven possible to teleport one or more qubits of information between two (entangled) quanta, this has not yet been achieved between anything larger than molecules. Quantum teleportation is limited to the transfer of information rather than matter itself. Quantum teleportation is not a form of transportation, but of communication: it provides a way of immediately transferring a qubit from one location to another without having to move a physical particle along with it. [8]

The use of multipartite entangled states instead of a bipartite maximally entangled state allows for several new features: either the sender can teleport information to several receivers either sending the same state to all of them (which allows reducing the amount of entanglement needed for the process) or teleporting multipartite states or sending a single state in such a way that the receiving parties need to cooperate to extract the information. A different way of viewing the latter setting is that some of the parties can control whether others can teleport.

In this N copies of a qubit are teleported to N different locations. [9]

But teleportation is not the travel through time or dimensions. We need more research on this.

The main aim is to use the Junction level as a 'Common Platform' for all of these three types of travel. Junction level is a mixed state where all the wave functions of the Multiverse overlapped together. A basic diagram of this type of travel to another Universe is given below (figure 20).

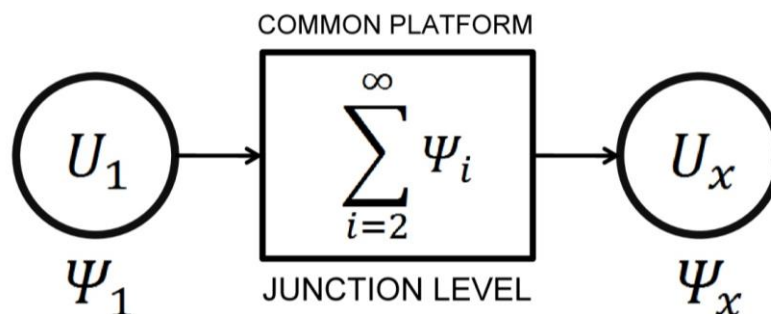


Fig -20 Basic diagram of travel through Junction level as a 'common platform'

In the above diagram, U_1 is our Universe where the wave function of a person is Ψ_1 (known). U_x is the universe where we want to travel where the wave function of that person is Ψ_x (unknown). The Junction level has all the infinite number of wave functions. At first, we send Ψ_1 to the Junction level via ERB (Einstein-Rosen Bridge) and then we choose the required timeline or dimension or another Universe where we want to travel. But, this way when there the contact is created between the two universes; there is a possibility of the person experiences déjà vu.

4. Conclusion

In this paper, I've represented a new theory about the structure of the universe and Multiverse (Junction Universe Model or JUM and Junction Multiverse Model or JMM) which does not violate recent discoveries and theories about the Universe but can help to predict its destiny and many other phenomena that we know but doesn't explain properly. Right now, it's only a model or hypothesis. It may sound awkward or inappropriate but when we know more and more about dark matter, dark energy and other mysteries of the Universe, I think my approach could help to extend the idea of Universe and Multiverse. I've added two extra levels to the known structure of the Universe: Vanishing point and Junction level. The Junction level concept is very important. It may possible to travel through it as a wave. All type of travels can possible through this level. But the process of converting a human body into a human wave function is still unknown. We need more futuristic technology to do it. For this, we have to merge ideas of Quantum physics with higher brain activities like consciousness. I need to do more research to do on this to find a valid and more perfect explanation of this process. This is just a prototype concept now. If it is possible then we need not travel physically at any distant places (no matter if it is in the past or future or beyond our Universe).

6. References

- [1] Norton, J, 2018. Einstein For Everyone. [online] Pitt.edu. Available at: <http://www.pitt.edu/~jdnorton/teaching/HPS_0410/chapters/> [Accessed 1 June 2020].
- [2] Tegmark, M., 2003. Parallel Universes. *Scientific American*, 288(5), pp.40-51.
- [3] Neat, A., 2019. An Intuitive Approach to Cosmic Horizons. *The Physics Teacher*, 57(2), pp.80- 85.
- [4] Thims, L., 2007. *Human Chemistry*. Morrisville, N.C.: Lulu, Inc.
- [5] Hameroff, S. and Penrose, R., 2014. Consciousness in the universe: a review of the “Orch OR” theory. *Physics of Life Reviews*, 11(1), pp.39-78.
- [6] Tegmark, M., 2015. Consciousness as a state of matter. *Chaos, Solitons & Fractals*, 76, pp.238-270.
- [7] Einstein, A., Podolsky, B. and Rosen, N., 1935. Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?. *Physical Review*, 47(10), pp.777-780.
- [8] Bennett, C., Brassard, G., Crépeau, C., Jozsa, R., Peres, A. and Wootters, W., 1993. Teleporting an unknown quantum state via dual classical and Einstein-Podolsky-Rosen channels. *Physical Review Letters*, 70(13), pp.1895-1899.
- [9] Dür, W. and Cirac, J., 2000. Multiparty teleportation. *Journal of Modern Optics*, 47(2-3), pp.247-255.
- [10] Ganguli, S., 2020. *The Invisible Creation: Looking Into The Deep*. 1st ed. Notionpress.
- [11] Wikipedia (Only used for definitions)
- [12] Figure 1, 2, 3, 5, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18 and 20 are designed by the author of this paper.

BIOGRAPHIES



Shuvadip Ganguli is an M.Sc. student of Physics, an NTSE scholar, member of Indian Physics Association (IPA) and author of science-related books. He lives at Bankura, West Bengal in India.

He also writes for science magazines in India. ‘PHYSICS My love: Story of Physics for Everyone’ is his debut book for which he was selected as Author of the year awardee at NE8x Online Literature Festival 2019. His second book is 'The Invisible Creation: Looking into the Deep'