
QUANTUM CONSCIOUSNESS

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QUANTUM PHYSICS: THE PROFOUNDLY PUZZLING PHYSICS

Till about a century ago, science believed that everything that exists in the universe is the result of matter energy interactions and nothing else.

However, as science explored deeper into the atomic and subatomic worlds, it came across several counterintuitive and paradoxical ideas like Wave Particle Duality, Collapse of Wave Function, Superposition, Decoherence, Entanglement, Tunneling and Time Reversal. These discoveries challenged the core assumptions of classical physics and gave birth to quantum physics.

From the conceptual point of view quantum physics is profoundly puzzling but its mathematical formulae are much more successful in predicting the behavior of the physical systems than any other theory.

An example can be the absorption/emission spectral lines generated by hydrogen atoms when electrons jump from one energy level to another. The mathematical formula explaining this phenomenon is

$$\Delta E = hf = E_i - E_f$$

Here, ΔE is the change in energy between the initial energy level (E_i) and final energy level (E_f)
 hf is the energy of the absorbed/emitted photon where h is Planck's constant and f is frequency of the photon.

There is a very strange feature associated with an electron's leap. The transition between the energy levels occurs like magic; it disappears in one level and instantly reappears in another, absorbing or releasing corresponding energy in the form of a single photon, in one go. Otherwise, as the electron would travel from one level to another, it would absorb or radiate energy continuously. *But, how does a photon decide what frequency it is going to have when the electron jumps from one energy level to the other? How does the electron (and photon) know beforehand where it is going to stop?* An electron in the $n=3$ energy level can jump down to either the $n=2$ or the $n=1$ level. *In order to make the jump, the electron appears to 'know' to which energy level it is heading so that it can emit photon of the correct frequency.*

So, while mathematically a very simple formula can describe this phenomenon, conceptually this is very perplexing.

The deeper the physicists went, the more they realized that quantum physics is not at all deterministic.

In 1916, when stimulated emission of radiation (a concept which was later developed for generating laser beams) was first studied, physicists found that *the atom seems to choose of its 'own will' not only the time but also the direction in which the radiation will be emitted.* There was no connection between the cause and effect. The concept of 'pure chance' was a 'weakness' which physicists hoped to remove with the further development of quantum physics. But that never happened.

Over the years, the physicists accepted that quantum physics is *the play and display of potentialities or possibilities*. The Schrödinger equation was a significant landmark in this realization.

BASIC BUILDING BLOCKS OF THE WORLD: WAVES OR PARTICLES?

Just as Newton's second law gives a mathematical formula to calculate the position of a particle at any point of time, Schrödinger equation (which is Newton's second law's quantum counterpart) makes predictions as to what path a given physical system will take over time. It gives the wave function which describes the wave characteristics of a particle and its value at a given point of space and time is related to the likelihood of the particle being there at that time.

The wave function collapse occurs when the wave function — initially in a superposition of all possible states — reduces to a single state due to interaction with the external world. This interaction is called observation.

According to the Copenhagen interpretation, light and matter only behave as particles in the presence of an observer. It is the essence of a measurement which connects the wave function with classical observables of particles like position and momentum.

And this is where things become confusing. There are two sets of laws that apply at subatomic levels (1) when observations are being made (2) when observations are not being made. The observer is very intricate in understanding the world of quantum particles and how they react because it is the observer who *somehow* collapses the wave function by observing it.

The Copenhagen interpretation, when extrapolated, requires an observer to observe the universe because without any observer the universe would never come into existence but remain forever in a superposition of many possibilities.

FUNDAMENTAL NATURE OF THE UNIVERSE

Quantum physics brought an entirely new perspective of looking at this world. When we try to understand the basic building blocks of this universe and life and go down to the sub atomic levels, we realize that we come up to the realm of abstraction.

The universe is believed to be made up of continuous fluctuating fields: matter fields, whose quanta are fermions (i.e., leptons and quarks) and force fields, whose quanta are bosons (e.g. photons and gluons). These fields give rise to particles. At that level, there is information that has been there since the big bang.

Quantum physics suggests that at the very fundamental level the universe is nothing but an ocean of pure potentiality or abstract potential existence which rises as waves to vibrate to give rise to particles, people and everything we see in the vast universe.

WHAT IS EMPTINESS MADE UP OF?

Most people think that the vacuum of outer space (the expanse that exists between celestial bodies) is empty. But when physicists explored deeper into the laws of quantum physics and relativity theory, they realised that for maintaining the self-consistency and balance in the mathematical equations describing the universe there should exist terms corresponding to more mass and energy than was known.

As per their estimates, the ordinary matter (which makes up all the stars, planets, galaxies and everything that we know) that this universe has is less than 5 percent of the mass/energy that the universe should have. The rest of the universe appears to be made of some mysterious, invisible substance/force that they called dark matter/energy.

Physicists Richard Feynman and John Wheeler calculated this latent energy of 'vacuum' to be approximately equal to 10^{94} grams of mass. To imagine this, consider a vacuum equivalent to the size of one ordinary light bulb. The latent energy this bulb contains is enough to boil all the world's oceans.

This is a huge amount of latent energy. The idea that empty space can have an intrinsic energy associated with it, and that there is no such thing as a true vacuum is seemingly unintuitive.

In fact, what quantum physics is pointing at is, that at the most fundamental level there is a realm of existence that is unfathomable, latent and unknowable. It is this latent energy which bubbles into existence giving rise to our understanding of the world.

THE EQUIVALENT CONCEPT IN ANCIENT INDIAN TEXTS

This field or ocean of *pure potentiality* is known by different names - Unified Potential Field or Quantum Field or Zero-Point Energy Field or Universal Consciousness.

While there is a debate going on for decades in the scientific world on Universal Consciousness, this concept has been recognized and accepted by ancient Indian sages thousands of years ago and forms the central theme of many ancient texts. It is surprising that quantum physics and ancient sages share similar sentiments about the Universe.

Take for example the shloka 9.4 from The Bhagavad Gita:

मया ततमिदं सर्वं जगदव्यक्तमूर्तिना।
मत्स्थानि सर्वभूतानि न चाहं तेष्ववस्थितः॥९.४॥

This entire world is pervaded by Me in My unmanifest aspect; all beings depend on Me, but I am not dependent on them.

The sages describe this all-pervading and all-encompassing field of Universal Consciousness that exists everywhere and in everything living and non-living as अपरिमेय (not measurable), अव्यक्त (latent or not describable) and अज्ञेय (unknowable).

IS IT PRUDENT TO EXPLORE SOMETHING THAT IS UNKNOWABLE?

Quantum physics indicates the presence of some mysterious energy field but it does not have much information about it.

However, the sages have been able to understand at least a bit of the ultimate truth through reflection, observation and self-analysis. The detailed description of their experiential knowledge, as revealed to them during deep meditation, exists in the ancient texts.

Maybe, these two ideas are two sides of the same coin....Maybe, they are two entirely different concepts....Maybe, if both experiential knowledge and experimental knowledge sat down across the table and talked, humanity may find more than it can envisage....Maybe...

We must remember that all the discoveries are not through laboratory reductionist work. Many of the most significant discoveries were first made inside the human mind and then their evidence was established.

For example, Einstein's concept of light-quanta (photons), which he conceptualized based on the clues offered by experiments on photoelectric effect, was published in 1905 but no one believed his theory that radiation was quantized. The maximum that fellow scientists were ready to accept was that radiation was absorbed or emitted by atoms in the form of quanta but radiation itself was considered to be a continuous wave.

When Einstein received the Nobel Prize for this discovery in 1922, it was for the mathematical physics and discovery of the law of photoelectric effect. By limiting the award for the 'law' the committee deftly sidestepped endorsing Einstein's controversial underlying physical explanation - the light-quanta.

Later, Compton made a discovery (for which he was awarded the Nobel prize in 1927), while studying the scattering of X-rays, which provided irrefutable evidence of the existence of light-quanta and it was finally established that radiation was indeed quantized.

GOD and UNIVERSAL CONSCIOUSNESS

The concept of Universal Consciousness is not equivalent to the God that people worship. God is the remote and inaccessible being worshipped as having power over nature or human fortunes and is the source of all moral authority. According to some religious beliefs, he is also the creator and ruler of the universe.

Universal Consciousness is something much more fundamental. As explained by the Nasadiya Sukta, it is 'One which existed enclosed in nothingness when darkness covered darkness and everything was hidden in cosmic water (Space Plasma) from which everything manifested'.

The Nasadiya Sukta is a set of seven Shlokas of the 129th Hymn from the 10th Mandala of the Rig Veda. It starts and ends with questions regarding creation. It does not say that God made the universe, the stars,

the sun, the moon, the earth, the plants, the animals and the humans but on the contrary, asks how anyone could know how and when creation happened, because everything and all beings including the Devas or Gods, could have appeared only after the universe came into existence.

नासंदासीन्नो सदासीत्तदानीम् नासीद्रजो नो व्योमा परो यत्।
किमावरीवः कुह कस्य शर्मन्नभः किमासीद्गहनं गभीरम् ॥१॥

There was neither existence nor non-existence, neither matter nor space
What covered it? Where was it? What was its purpose? What protected it? Who was the master of
the cosmic water (space plasma) that was dense and deep?

न मृत्युरासीदमृतं न तर्हि न रात्र्या अहं आसीत्प्रकेतः।
आनीदवातं स्वधया तदेकं तस्माद्भान्यन्न पुरः किञ्चनासं ॥२॥

There was neither death nor immortality and nothing to separate night and day,
That One existed enclosed in nothingness, there was only that One and no other.

तम आसीत्तमसा गूळ्हमग्रेऽप्रकेतं संलिलं सर्वमा इदं।
तुच्छेनाभ्वपिहितं यदासीत्तपस्तन्महिना जायतैकं ॥ ३ ॥

Darkness covered darkness, all this was hidden intelligence in cosmic water (Space Plasma)
And the One enclosed in nothing arose from the power of heat.

कामस्तदग्रे समवर्तताधि मनसो रेतः प्रथमं यदासीत्।
सतो बन्धुमसति निरविन्दन् हृदि प्रतीष्या क्वयों मनीषा ॥४॥

Desire entered and the primal seed appeared from the cosmic mind.
The wise who searched deep within their heart could discern between that which is and that
which is not

तिरश्चीनो विततो रश्मिरेषामधः स्विदासी दुपरि स्विदासी त्।
रेतोधा आसन्महिमानं आसन्स्वधा आवस्तात्प्रयतिः पुरस्तात् ॥५॥

From the primal seed sprang crisscross rays holding all the forces above and below.
The strong powers made fertile forces with strength below and impulse above.

को अद्भ्य वेद क इह प्र वोचत्कुत आजाता कुत इयं विसृष्टिः।
अर्वाग्देवा अस्य विसर्जनाथा को वेद यत आबभूव ॥६॥

Who can say and know where all this came from and how all this came to be?
The Devas (Gods) came after all this manifested so who knows where all this came from?

इयं विसृष्टिर्यत आबभूव यदि वा दधे यदि वा न।
यो अस्याध्यक्षः परमे व्योमन्सो अङ्ग वेद यदि वा न वेद ॥ ७ ॥

Where did creation have its origin? Who is One that created it or did the One not create it?
That One alone perceives all from above and knows the beginning or maybe doesn't?

CONSCIOUSNESS and UNIVERSAL CONSCIOUSNESS

Just as electricity is very different from an electric field or magnet is not the same as magnetic field, similarly we should not confuse Consciousness with Universal Consciousness. Consciousness or the state of being conscious means awareness of one's own existence, sensations, thoughts, surroundings, etc.

Whereas, Universal Consciousness is the omnipresent field which is *apart from the mind-body system but it pervades and illumines the mind-body system and is known in its functioning*. Without the mind-body system, the Universal Consciousness is still there, but it is not experienced. If you look at the structure of the human brain in detail you will see that it has been '*specifically designed or carefully engineered*' to *experience the Universal Consciousness*.

The nearest equivalent example of this concept can be modern mobile phone networks which exist around us but are experienced by the cellphones which have been specifically designed and configured to not only experience it but to also decipher the information contained within it.

INANIMATE OBJECTS and UNIVERSAL CONSCIOUSNESS

The ancient Indian texts state that from the Universal Consciousness evolved the whole universe. This implies that every animate and inanimate object around us *is the embodiment of the Universal Consciousness*. The closest term for this in philosophy is panpsychism.

The famous double slit experiment has been repeated many times by the physicists of many countries around the world with subatomic entities such as the electrons and photons. Well recorded and published experimental results clearly demonstrated that when no observer or any snooping device was present to observe the passage of the photon or electron through the slits, the screen displayed the multiple-fringe interference pattern, thereby implying that the wave behaviour prevailed. In contrast, when an observer or any snooping device was present, the wave collapsed and the definitive particle state prevailed, as evidenced by the presence of two dominant fringes on the screen.

If the photons and the electrons were devoid of Consciousness, then how did they become aware of the presence or the absence of an observer or a device?

WHAT NEXT THEN?

GI4QC is planning some state-of-the-art quantum experiments aimed at providing clues of the role of Universal Consciousness. How these results will help us...only time will tell.

When nothing is certain, anything is possible.