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Research Article

The Physical Basis of Mental Life: A Perspective on the Nature of Consciousness

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Abstract

Scientists have grappled with "the hard problem of consciousness" [4] for as long as there has been science. Certain realms and disciplines elude a definitive and conclusory nexus to what would, in the modern era, be called "hard Science", meaning Physics, Chemistry and to a lesser degree, Biology. Consciousness is among these realms. By use of the term "hard science", my intent is in no way to denigrate disciplines that might be considered outside of this definition, or to even make such a distinction at all, it is in fact quite the opposite, to simply underscore that these categorizations reflect the limitations of our knowledge, nothing else; thus the "hard problem of consciousness". The purpose of this article is to proffer a quantum understanding of consciousness that might point the way toward such a nexus and provide an enduring basis for testable conclusions in the future.

1. The Mind/Matter Duality

I am of the mind that a nexus between the mental and physical does exist. Indeed, if Philosophy of the mind is correct that everything in existence must first have existed as a thought or concept (a blueprint if you will) in a mind or consciousness somewhere [1], then such a link must exist. Of course, on its deductive face, the missing link is action-one puts the thoughts he has into action, and viola, he now has the chair or table that was conceived in his mind. But this doesn't answer the question of what is a thought or what is consciousness in the first instance–and applying inductive reasoning to the problem still gets us stuck. The reason is that in thinking about thinking [1], we

are trying to explain something (thought) by way of a modality(thinking) that is not independent of the thing itself; the answer therefore, no matter how good will always leave us wanting. By way of illustration, here's a paraphrased quote from Justice Potter Stewart of the United States Supreme Court that quite elegantly lays out the dilemma: "I cannot intelligibly define the kinds of material embraced within that shorthand description (hardcore pornography) but I know it when I see it" [2]. Concise and to the point but necessarily vague and wanting from an epistemological point of view. Yet it cuts to the heart of the matter doesn't it? It's about experiences, emotional and sensory that are not fully captured by words or even pictures. Imagine trying to explain to someone what an orange is when all you have is a basket of apples. 'You just had to have been there (in the orange grove)' is likely how you'd put it at some point. Much as in quantum mechanics, some aspects of consciousness language has no words for [3]. Asking the wrong questions doesn't help either though. Asking what is a thought or what is consciousness is the same asking what is it like to experience red [4]? Instead, if we ask how do thoughts arise, where do thoughts come from or do they have physical constituents, correlates- then my hope is that we can derive a more accurate understanding of the physical basis of mental life that avoids straying into the unanswerable.

2. Ask the Right Question

Properly understanding consciousness and behavior consequent to it requires a grounding not just in behavioral science, medicine and pharmacology but quantum physics, physics and chemistry. Psychiatrist Carl Jung [5, 6] (1875-1961) spoke of the collective unconscious [6] of living systems such as a society, civilization or national entity in which each person enacts his individual roles informed by the mores, rules, customs, etc. of the society at large, the collective. This psychology is clear enough, but Jung also described observed phenomena he called "synchronicities" [6], co-occurrences in human and animal behavior for which there was no psychological or scientific basis of understanding, yet whose occurrence was thought not by chance alone. For example, Jung spoke of a synchronicity involving a beetle appearing on the office windowsill at the exact moment his patient began speaking about a dream involving a golden scarab [5, 6]. Other examples of this might include synchronization patterns seen in pulsatile glows of fireflies congregating in large numbers, formation of flocks of geese, and even such human phenomena as synchronization of biorhythms and menstrual cycles amongst female students known to occur in college dormitories. Far from being coincidental or even 'unconscious' in the strict psychological or suggestive sense of the term, my assertion is these events might be modulated by quantum & particle physics phenomena.

In order to completely understand this, we need to digress into physics history and the year 1887. In that year an experiment known as the Michelson Morley [7-10] experiment was conducted. According to the prevailing thought of the time, an ether permeates the entire universe and the earth and everything else in the universe was thought to be moving through this so-called ether. In setting up their experiment, they reasoned that the speed of light should vary depending on whether it was traveling with or against the ether. If a directional difference in the speed of

light was detected this was taken as evidence they had discovered the ether. They found no directional change in the speed of light and thus concluded that the ether did not exist. Enter Albert Einstein who theorized that the speed of light is the same for all observers [7]. The constancy of the speed of light is a central and proven feature of Einstein's theory of special relativity [7] and killed off the idea of the ether once and for all, or did it? If Michelson Morley found no directional difference in the speed of light, it only follows from this that the speed of light is constant, nothing more. The importance of not asking the right questions becomes painfully obvious at this juncture for if Michelson Morley had considered every angle and perspective, they would not have misunderstood the data. It appears Einstein for his part, missed this part of the data too. Can you blame him?

3. Tangled Up in Blue

So then, does the ether exist? Wolgang Pauli [8] of the Pauli exclusion principle postulated the existence of subatomic particles called neutrinos [8] in 1930. Neutrinos are the products of nuclear reactions and are produced copiously by the sun. Trillions and trillions of neutrinos from the sun bombard us continuously. Neutrinos are not massless yet pass through everything including planets. Of the literally trillions of neutrinos passing through a detector only 2-3 interact with the detector device. In addition, neutrinos oscillate, depending on time of travel and what they travel through. These oscillations combined with the phenomenon of quantum entanglement [3, 7, 11] where a particle decays into two particles each determining a characteristic of the other at any point of observation regardless of the distance between them, can convey packets of information that could potentially be harvested by living systems just as photosynthesis harvests energy from photons to yield energy required for life on planet earth. It has been recently proven that quantum mechanics plays a huge role in maximizing the efficiency of energy production in plant photosynthesis [12]. Furthermore, robins use quantum entanglement [12] and the earth's magnetic field to navigate during migratory periods. And neutrinos are not the only particles present in this soup putatively called the ether. At this point you might be wondering if I have strayed into astrology or found a wigi board but rest assured quantum physics is no pseudoscience, it has stood the test of time and its arrival to help explain the mysteries of the brain and mind could not be more timely.

4. All along the Watchtower

Neither do I believe it farfetched to postulate that the generation of thought in the collective unconscious is modulated at least in part, by quantum entanglement, quantum physics and particle physics- particle and wave constituents of a postulated ether whose full texture and richness we have yet to uncover. Here's how it might play out on a simplified level: Many trillions of neutrinos are continuously emitted, passing through matter, living and nonliving, brains and nervous systems the overwhelming majority of which pass through without consequence. A fair number are caused to oscillate under these conditions however and vastly fewer still are 'detected' as quantum vibrations in the next brain encountered via quantum entanglement with the brains before it generating a recollection, emotion or personally meaningful thought depending on what stimuli in the environment is accessible to the unconscious or the conscious five

senses holding the person's immediate attention. As this paradigm is expanded to include increasing numbers of brains (minds) the phenomena repeats and spreads itself like waves over many buoys in a lake or ocean, generating Jung's collective unconscious. It is important to note that the tightness or strength of quantum vibrations (minus background 'noise'), correlates with the quantity and quality (I am loath to say uniformity here because even identical twins each experience their environments uniquely and differently) of entanglements amongst buoys and if the quantum vibrations are strong enough spontaneous firing of axons may occur.

There is no such thing as a random thought. What determines individual consciousness and thought generation, aside from genetics and the capacity given it by its neuroanatomy, is a complex interaction between environmental cues and stimuli, brain physiology as modulated by neurotransmitters and neurotransmitter receptors, memory, AND quantum vibrations (perturbed electrons) in the brain generated by resonant neutrinos whose resonance is by virtue of quantum entanglement.

If you are to call this process and the resultant mind it generates random then you must answer why one thought and not another, which ultimately puts you on a circular path that ends up at 'what is consciousness?'- the metaphysical question that started it all. Don't get me wrong, some events are truly random, randomness exists in the universe but so does free will [13]. If we are to put the force of our will towards a credible scientific explanation of mental life, the explanation must penetrate new scientific ground not return us to where we have been before [1, 4, 9, 10].

5. Beam Me Up Scotty

Another phenomenon in quantum physics that I believe is crucial to understanding consciousness is that of virtual particles, quantum foam and quantum tunneling [8] which I understand to assume greater importance when at least two nervous systems with conscious brains are in proximity. It is possible however, that the ubiquitous neutrino plays a prominent role here also. Physicist Louis De Broglie (1892-1987) demonstrated that particles such as electrons have wave properties [7]. Indeed, each of us humans has a wave function which for all intents and purposes is negligible at the macroscopic levels, not so however, at the level where quantum mechanics takes over. This has important implications for the mind, specifically the unconscious.

You might recall the Heisenberg uncertainty principle from college physics. It can be expressed by the equation $\Delta E \times \Delta t = h/2$ where h is Plank's constant and ΔE and Δt are changes in energy, E and change in time, t. It says the energy of a system need not be conserved if the time interval is small. Thus, virtual particles can appear and disappear in and around quantum systems like your brain through quantum tunneling, producing quantum 'foam', a cloud of virtual particles surrounding you that can for an instance penetrate matter then disappear. Ordinarily this is without consequence but at the quantum level, where the mind lives the implications are astonishing and virtually endless, no pun intended. An energy transfer, however brief, can have sizeable downstream repercussions which can manifest as a spreading wave

or wave function bound by the calvarium yet being everywhere in it at once like a hologram in the brain. We see these quantum processes in plant photosynthesis and in nonliving things in the form of Feynman's equations (Physicist Richard Feynman 1918-1988) [8], it should be no surprise to find them in human brains. Could this be the ever-elusive conscious mind? What happens if you shift a person's probability cloud so that it predominates where the quantum foam was? An out of body experience? Teletransportation? More down to earth, have you ever had an interaction in close proximity with someone, say a customer, a boss, a stranger at a bus stop, an uber driver, etc., and instantly felt you had to get away from that person? Was the bad vibe your intuition or something else? Were you perceiving that person's wave function? I use the bad vibe example because evolution has hard wired us to be risk-averse beings, for centuries our survival depended on it and does still today. It could have been a good vibe, though less common, I suppose. The point is, thoughts such as these do not occur randomly, the fact they are not always accurate is irrelevant. They still warrant an investigation into the quantum forces, if any, involved in generating them.

6. Conclusion

The importance of quantum entanglement in the realm of cogitation cannot be overemphasized. It is however a fragile ecosystem, one that can be dismissed, ignored, glossed over or overridden by environmental exigencies, be they physiological, emotional, sexual, hunger, thirst, in short, anything in Maslow's hierarchy. The challenge then, is quite clear- cut through the noise and decipher what quantum physics is telling us about mental life. The Universe beckons.

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