Scientific Research Publishing

Journal of Behavioral and Brain Science, 2021, 11, 171-178
https://www.scirp.org/journal/jbbs
ISSN Online: 2160-5874
ISSN Print: 2160-5866

A Model of How Matter Produces Qualitative Perception

Eric Bond

Whitman College, Walla Walla, WA, USA
Email: enrique5043@outlook.com

How to cite this paper: Bond, E. (2021) A Model of How Matter Produces Qualitative Perception. *Journal of Behavioral and Brain Science*, **11**, 171-178.
https://doi.org/10.4236/jbbs.2021.118013

Received: June 4, 2021
Accepted: August 14, 2021
Published: August 17, 2021

Abstract

A model of the way subjective experience arises in matter is proposed, beginning with a brief history of the mind/body problem and proceeding to describe how quantum physics has made modest in roads into an in-depth account. The promise quantum biology holds for developing neuroscientific theory is drawn to its logical conclusions, establishing the preliminaries of a comprehensive paradigm for explaining basic elements of perception and how they give rise to full-fledged consciousness.

Keywords

Consciousness, Neuroscience, Quantum Biology, Perception, Mind/Body Problem, Entanglement, Superposition, Electric Charge

1. In Search of a Paradigm for Theorizing Consciousness

The mind/body problem has deeply preoccupied many natural philosophers and then scientists since at least the 17th century when Rene Descartes brought it into sharp relief with his book Meditations. He described how it is possible to radically doubt the facts of existence, for we may be fooled by errors of our senses, fallacious hearsay, or even a malicious spirit bent on duping us behind the scenes. But there is one fact we can never deny: our thoughts exist, the condition for any first-person experience at all to be taking place. As a consequence of his reasoning, he wrote the Latin words cogito ergo sum, "I think, therefore I am", immortalized in the annals of intellectual tradition.

But then the question immediately presents itself: what is the substance of thought, its composition? Descartes' is certainly not the only possible approach, and a schema this paper intends to counter with a sort of panprotopsychism to be unveiled as we proceed, but he adopted dualism, the view that human thought

obtains in a spiritual substance distinctively capable of reason, set apart from our material bodies and the visceral instincts which arise from them. This perspective has intuitive appeal, for human thoughts certainly seem to occur independent of flesh and bone, with the capacity to pilot our bodies, impulses and decisions in profoundly executive functioning. At the same time, alterations to anatomy, most dramatically in the nervous system and brain, clearly modify the properties of human experience such as feelings, sensations, mental images, even personalities, reasoning patterns, all sorts of cognitive abilities. Mind affects physiological matter while the matter we are comprised of likewise influences mind; causality proceeds in both directions, from qualitative subjectivity to the objectively physical or vice versa, and academia has been interrogating this enigmatic interface for centuries.

The issue was not lost on Descartes, who proposed the brain's pineal gland as an intersection point of mind with matter. Not a bad initial hypothesis, for conjoinment obviously must consist in something definite, concrete, tangible about the body's structure, and the brain's key relationship to awareness makes its interior the logical choice. But as we learned more about biochemistry, it became apparent that organisms are made of fundamental units called cells, dazzlingly diverse aqueous solutions contained by membranes, and solution chemistry as investigated in a typical lab seems anything but amenable to bodily processes. Thousands of enzymes, each simultaneously catalyzing up to a hundred intricate reactions per second between complex molecules, neurons transmitting signals from head to foot and back again in mere milliseconds, this is nothing like the optically inspectable diffusion of acid in a beaker of basic solution infused with indicator chemical, the gradual melting or freezing of water, even the substantial delay in the diffusion of a noxious gas throughout a room. There must be something more, responsible for the impossibly rapid yet highly organized rates so characteristic of biology.

The answer for Earth's terrestrial nervous systems, organisms and ecosystems generally seems like it must reside in the quantum nature of matter as discovered since the beginning of the 20th century. Quantum processes have been proven extremely fast, often nearly instantaneous, and while first assumed operative upon only subatomic constituents, they are being implicated at larger and larger scales. Recently, the record for quantity of entangled atoms was set at a whopping fifteen million [1], and then shattered by entangling two aluminum drums a fifth the thickness of a human hair [2]. Entanglement has been demonstrated to occur at a minimum of three trillion meters per second [3], while light speed is a comparatively slow three hundred million meters per second. Thermodynamic chemistry and physics have historically aimed at encompassing, in theory, the nature of atoms as driven by heat (energy transfer between matter of different temperatures, more specifically different rates of internal motion) or work (energy transfer between matter as classical, Newtonian force is exerted between objects), and still hold as an apt model of immense ranges of material occurrence, but are

transitioning into the subsidiary of a quantum paradigm which more accurately and precisely synthesizes our knowledge of macroscopic phenomena with the inner features of atoms as exacted by electrons, nuclei, radiation, etc.

To get a handle on the quantum world, we may describe three of its facets. In quantum tunneling, the wavelike nature of matter can create a nonzero chance of particles transiting to the opposite side of a thin barrier [4], a phenomenon which explains how nucleic particles travel out of a radioactive atom, the penetration of electrons through oxide film in soldered metal wires, even the flux in enzyme active sites. Quantum superposition is a property by which waves combine to produce new hybrid waves [5], responsible for the shapes of electron orbitals and colors of the visible spectrum. Quantum entanglement refers to the way material systems correlate in "spooky action at a distance", jointly modified by near-instantaneous causality [6], which has found applications in cryptography, helped to explain the function of biological systems such as photosynthetic reaction centers, and continues to be further elucidated by crafty experiments.

So it seems that quantum processes are central to many material happenings, including organic ones. The brain along with much else in the natural world can only be accounted for if its components are moving and changing at quantum rates. But surely an explanation of nature and the body in terms of its quantum features must lie far in the future? It turns out that a quantum theory of organic matter is just around the corner, and already engenders hope for explaining one of the most elusive aspects of neuroscience in particular, the generation of qualitative experience.

2. Arrival at a Theory of Qualitative Experience

The first foray into a substantive quantum theory of consciousness was probably carried out by Roger Penrose and Stuart Hameroff in the 1990's. Orch-Or (Orchestrated Objective Reduction) theory proposed that microtubules, the basic components of a cell's cytoskeleton, have properties conducive to entanglement between their atoms, and in neuronal masses these ubiquitous entanglements may give rise to a sort of integrated quantum pulse or periodic coordination of superpositions sufficient to extend throughout the entire brain [7]. The philosophical significance of this theory is that since quantum processes have so far evinced nondeterministic features in the lab, a variegated cycling between quantum coherence and wave function collapse might be the material mechanism of free will, our intuitively experienced indeterminacy of human choice. Early versions of the theory have been debunked by researchers who recognized microtubule structure, brain temperature and additional factors as unsuitable to support this mechanism as thus far detailed, but the core idea of a global superposition is important, for some agent must bind disparate regions of the brain to yield unified stream of consciousness, even if this does not ultimately allow for the existence of free will as conventionally conceived.

Johnjoe McFadden and colleagues attempted to address this binding problem, the question of how a single field of awareness can emerge from trillions upon trillions of distinct biochemical ingredients, with CEMI (Conscious Electromagnetic Information) theory in the early 2000's. It claims the brain's electromagnetic field, arising from many billions of axon potentials, is a sort of supervenient layer of functionality, amplified by the synchronization of constructive wave interferences to play a predominant role in forming the more or less steady state, fluid holism of waking consciousness [8]. This readily explains why consciousness exemplifies a superordinate unity, which is quite obvious from the close correlation of states of awareness with brain waves as registered by an EEG, but does not by itself pinpoint a mechanism, what the electromagnetic field acts upon.

McFadden himself offered some big clues regarding the intersection of radiative fields with brain matter. He described how ion transport channels, which he hypothesizes as an ultraquick quantum tunneling of ion wavicles into and out of the axon, may be receptive enough to the brain's electromagnetic field (an interaction which would be mediated by electric charge) that a ferrying of single ions is affected by brain waves. He also elaborated how the fast triplet reaction, consisting in machinations of three entangled electrons, was discovered in a molecule called cryptochrome which is present in the eyes of European robins, the antennae of Monarch butterflies and elsewhere, revealed to be sensitive enough for responding to the Earth's magnetic field and seemingly one of the first links in biochemical pathways that enable many organisms to sense their way towards destinations during long-range migration [9].

Quantum biochemistry is quintessentially sensitive to quanta fields or their signatures, and making the conceptual leap to quantum neuromaterial that is uniquely adapted for cocausality with electromagnetic brain waves at the level of both species and individual organisms proves simple enough. The preeminent postulate regarding qualitative subjectivity must clearly start from the following: anelectrically charged quanta field/molecular complexing as the substance of stream of consciousness, engaged in a feedback loop with memories that are etched into the chemistry of brain matter by some related mechanism, altogether an orchestration ranging from the most unconsciously particulate phenomena to the most synthetically aware.

But the famous hard problem of consciousness remains: why do all these variously dispersed or holistic phenomena result in a "what it is like to be"? What is added on to mere hylic form that renders it a subjective mind? What is the palpable medium of experiencing? This has been a difficult issue, but it seems we should begin with the most parsimonious hypothesis, that it is due to something in the way quanta of various kinds entangle as they interact.

Understanding how electromagnetic radiation entangles is relatively straightforward, and it has been studied effectively since the 19th century. The most salient example is provided by visible light: primary colors can easily be blended to produce secondary colors, all colors blend to produce white light and can be

separated again by a prism, while the colors of course blend in different combinations to produce the entire spectrum of shades. Electromagnetic waves have additive properties, with their various wavelengths compounded into new, individualized hybrids when proximal enough. It is the nature of waves to form unions when they touch, composites which do not erase the original wavelengths, for they can be teased apart again, but nonetheless bringing forth something alternate upon formation, an admixture with emergent properties not possessed by any of its elements alone. Essentially, entangled waves superposition, and superpositions such as these are the root of color's objectively defined correlates in the environment.

Then what is the source of subjective color, consisting in our perceptions at the boundary between mind and matter? A logical hypothesis is that it relates to the way particles superposition. Just as wavelengths of light superposition while they entangle, subatomic wavicles and especially electrons doubtless superposition when they blend into hybrid orbital shapes, and these superpositions take effect on a macroatomic scale, as it has been shown that trillions of atoms can entangle at once. Light is able to blend into electron orbitals in an atom, changing their energy and also in some as of yet superficially comprehended way a complicated orientation in space, so the same principles of superposition seem to apply in the case of both light and electrons. Then if we envision electrons in atoms as something akin to hybridized standing waves, what might the mechanism of this arrangement look like?

We get an indication from the 100% efficiency of photosynthetic reaction center complexes in translating light to chemical energy [9]. If a single, central molecule can absorb energy from multiple chlorophyll pigments no matter the quantity or direction of ultraviolet light, the state of these atoms cannot be much like an orbiting particle model, for Newtonian physics predicts at least some loss of energy as light and heat when electrons fail to contact each other as they cycle within the spatial bounds of a transport chain. Total energy yield lends more validation to a picture of electron arrays as hybrid waves spanning numerous molecules, stabilized by electric charge, cytoskeletal fibers and membranes, transmitting even the slightest excitation as a rippling flow that never fails in making its way to reaction center complex hubs, resembling a minutely perturbable body of water.

Then how might this lead to the phenomenon of subjective color? Experiments entangling trillions of atoms have so far been carried out at significantly higher than body temperature, with amalgamations being a chaotic mess within which any superpositions probably dissipate as quickly as they materialize. But in the nervous system, brain and perhaps elsewhere in the body, entangled molecules and molecular complexes may exist that have been streamlined by evolution to sustain superpositioned states for longer durations, perhaps long enough to supply a mechanism of subjective color, amounting to quantum resonances amongst hybrid wavelengths. These trillions of resonant "color" centers could blend into the global electromagnetic field of brains as electrically charged standing waves course through this organ, the mechanism for binding resonances into

a cohesive stream of consciousness.

This seems a satisfactory initial hypothesis for how image perception occurs, but what about the shocks and contours of auditory, olfactory, gustatory, tactile and interoceptive sensations, not spatial, yet extremely localized, nor temporal, yet time-lagged, not objects or concepts of objects, yet intrinsic to reality's structure? The probable explanation is so economically simple that it almost escapes notice: it is an intrinsic feature of superpositions amongst entanglement—hybrid waves—to not only evince dimensionality but to feel in a diversity of ways. Most of these fragments of feeling in the environment discompose quickly enough as positions of molecules shift and fleeting chemical bonds break that qualitative experience is not in effect. But in organisms, molecular complexes are held in stable assemblages for prolonged periods, and even if these do not end up being as long-acting as consciousness itself, their synchronization as coordinated with, blended into, and exquisitely adapted to radiating electromagnetic fields from action potentials, all amalgamated by electric charge, perhaps in addition to further kinds of fields and associated forces, is adequate to bring about the nuances of subjective sensation.

An interesting implication of this theory is that qualitative experience seems as if it would not be limited to highly cognitive organisms but rather pervades biology, likely existing to some degree in all creatures with a nervous system. It may be the case that an organism's chemistry is essentially an extremely heterogeneous standing wave partially welded into a medium of percepts by specially adapted properties of electrical charge, with even bacteria possessing the rudiments of human subjectivity, though they of course must lack as involute a sense of self. Pushing this idea even further, the essence of qualitativity is probably not restricted to carbon-based structures, being instead a basic attribute of matter which saturates the environment, a collective soul. Heterogeneity of mind in matter means some parts of the brain may be more qualitatively active, possibly employed to project perceptual elements in an integrating way as a subjective substrate that might even exceed boundaries of the body, a foundation for memory sequences, thoughts and additional highly aware experiences as the locus of identity.

It turns out that matter seems to influence mind and mind seems to influence matter because mind is lodged in matter, active on the same plane as physical reality though greatly transcending current knowledge, existent in part as a host of quantum processes. The search for molecules, biochemical pathways, all the adjuncts of qualitative experience, an endeavor which might even be provisional of a table of the perceptual elements, promises a vast vista of future research opportunities for science and a new paradigm in the study of consciousness.

3. A Preliminary Model of Qualitative Experience

These insights about how the previously enigmatic subjectivity of consciousness arises from basic matter can be summarized as follows:

It is intrinsic of matter as it perpetually quantum entangles to also superposition, its wavelengths blending into hybrid structures of variable dimension. The nature of these superpositions is not only to occupy space but to feel in some primitive, fragmentary sense. Most of these entanglements discompose as rapidly as they form, but in conscious entities superposition persists long enough and achieves sufficing organization to supply the fundamentals of mind.

For human consciousness in particular, a gargantuan selection of specially adapted molecules, molecular complexes and biochemical pathways, clearly with highest concentration in the brain, coordinate as the basic particulars of qualitative experience. Molecules of subjectivity must be located in neurons, probably glia and elsewhere, the full perceptual functions of which have not yet been discerned. The huge range of cell types and tissue regions in the brain grants qualitative experience its diverseness: visual, auditory, gustatory, olfactory, tactile, interoceptive and introspective elements of subjectivity with all their emergent conglomerations.

The synchronized electric pulsing of thousands of neurons in billions of combinations throughout the brain creates a global electromagnetic field as well as electrical charge fluctuations tied to brain waves, at the highest levels of organization recordable with extant EEG technology. This permeating flux of standing waves generated by electrical potential, radiating throughout the entire brain's mass, binds the superpositions linked to electromagnetic fields and cellular chemistry into an integrated stream of consciousness which is more than the sum of its molecular parts, an emergent energy capable of driving biochemical pathways by way of top-down mechanisms. Various sections of the brain are delegated to different subjective tasks: basic quantum sensations, synchronization, body awareness, memory, thought patterns, imagination, reasoning, the concept of self, personality, etc. These innumerable processes include propagation, coordination and projection by a highly electrified, EM/molecular as the primary platform of human consciousness.

The theoretical perspective contrasts with Descartes' dualism in being a sort of multifarious monism explaining perception as conventional chemistry infused with distinctly quantum dynamics, most essentially the superpositions or blended wavelengths which bring about complex assortments of color and feeling within matter. Yet it sharply differs from the physicalism that has been so pervasive amongst science's monist accounts of material structure, instead regarding the hallmarks of perception as taking effect at a very basic level, something more akin to panpsychism. It is not, however, panpsychism strictly speaking, because even though superpositions which give rise to the substance of qualitative experience are very close to fundamental, they are still an emergent property, requiring relatively large-scale, finely tuned arrangements to produce anything resembling a sentient mind. The most precise term is probably panprotopsychism, in this incarnation distinguishing consciousness from the body and offering a conceptual conduit for describing body-transcending consciousness as a material occur-

rence, so that the collective unconscious, soul and the spiritual in general, all kinds of frontiers which psychology and neuroscience have barely breached, may become accessible and brought into harmony with the foundations of current knowledge.

Quantum physics has begun to reveal phenomena that previous scientific paradigms were unable to model, particularly near-instantaneous and retroactive causality. It seems apparent that electromagnetic matter is the veneer of a more essential reality of much larger and deeper scope, the principles of which may subvert contemporary knowledge in amazing ways. Neuroscience along with many more disciplines are sure to transform, and it will be a parlous adventure to harness all of this futurism for the sake of consciousness and for the purpose of apprehending consciousness itself.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Michael,I.(2020) 15 Trillion Quantum Entangled Atoms Make a Record-Breaking Hot Mess. https://newatlas.com/physics/15-trillion-atoms-quantum-entanglement/

[2] Brad, B. (2021) Quantum Entanglement Has Been Directly Observed on a Macroscopic Scale. https://interestingengineering.com/quantum-entanglement-directly-observed-on-macroscopic-scale

[3] Joshua,F.(2013) Chinese Physicists Measure Speed of Quantum Entanglement. https://lifeboat.com/blog/2021/05/chinese-physicists-measure-speed-of-quantum-entanglement

[4] The Physics of the Universe, Quantum Tunneling and the Uncertainty Principle. https://www.physicsoftheuniverse.com/topics_quantum_uncertainty.html

[5] Superposition. The Quantum Atlas. https://quantumatlas.umd.edu/entry/superposition

[6] Paul, S. (2021) What Is Quantum Entanglement? https://www.livescience.com/what-is-quantum-entanglement.html

[7] Orch Or.The University of Arizona Center for Consciousness Studies. https://consciousness.arizona.edu/orch-or

[8] Electromagnetic Theories of Consciousness. Psychology Wiki. https://psychology.wikia.org/wiki/Electromagnetic_theories_of_consciousness

[9] Johnjoe, M. (2014) Life on the Edge: The Coming of Age of Quantum Biology. Crown Publishers, New York.