An (un)satisfying resolution to the hard problem of consciousness?

WH Gilbert 2024

The "hard problem of consciousness" is a term that has garnered significant attention in the realms of philosophy and cognitive science. It was first articulated by philosopher David Chalmers in the mid-1990s and poses a fundamental question: Why and how do physical processes in the brain give rise to subjective experiences, the rich inner life that each of us calls consciousness? This contrasts with the "easy problems" of consciousness, which concern the mechanisms and processes that enable us to perceive, react, and think—challenges that, while complex, are conceptually tractable within the current scientific framework.

The hard problem, however, delves into the realm of subjective, individual experiences that accompany our perceptions, such as the blueness of the sky or the pain of a headache. These experiences cannot be directly measured, quantified, or compared between individuals. The challenge lies in explaining how physical structures and processes, like neural circuitry and brain chemistry, can not only produce functional cognitive processes but also these subjective, qualitative experiences.

In attempting to bridge this gap, theoretical physics and mathematics have been applied in pretty speculative ways. One significant approach has been through the field of neurophysics, which aims to understand the physical underpinnings of neural processes. This field applies principles from physics to study the brain's structure and function, offering insights into the neural correlates of consciousness. By mapping and modeling how neurons and their networks process information, scientists hope to elucidate how these physical processes might correlate with subjective experiences. Some recent experiments include optogenetics, a technique that allows the control of neurons using light developed by Karl Deisseroth and others. By genetically modifying neurons to express light-sensitive ion channels, researchers can selectively activate or inhibit these neurons. This technique has provided unprecedented insights into neural circuits and their roles in behavior and disease. Developed more recently by Karl Deisseroth's lab, Clarity is a technique for making brain tissue transparent. It allows for high-resolution, three-dimensional imaging of neural circuits without dissecting the brain, providing a more comprehensive understanding of neural connections. But even with these new imaging techniques (along with older technologies like MRI and other brain scanning techniques) we don’t see thoughts. We don’t even know where to look.

Another intriguing intersection of physics with consciousness studies is the application of quantum mechanics. Theories like Orchestrated Objective Reduction (Orch-OR), proposed by Roger Penrose and Stuart Hameroff, speculate that quantum processes within brain cells might be integral to consciousness. This theory suggests that microtubules within neurons could sustain quantum states, and that these states are somehow linked to the emergence of conscious experience. The set of ideas, however, largely lacks any hypothesized mechanism besides the ‘magic’ of quantum physics; they are far from being accepted mainstream scientific theories.

Mathematics, too, plays a pivotal role, particularly through information theory and complex systems theory. Information theory in the context of consciousness attempts to understand how information processing in the brain could give rise to subjective experiences. Complexity theory, on the other hand, offers a framework for understanding how high-level properties (like consciousness) can emerge from the interaction of simpler components (like neurons). Much like quantum mechanics, however, the mathematic models for consciousness are mostly in the form of grand theories rather than specific algorithms of function.

Evolutionary biology has been the well-reasoned source of recent amendments to concepts of consciousness (consciousness being defined as sentience experienced with access to a set of sentience -processing mechanisms). Understanding the basics of how sentience emerged in evolutionary terms profoundly helps circumscribe its parameters. Stan Klein points out that motility, being able to move, makes for a selective environment conducive to the emergence of a central nervous system. It is prerequisite for the motor control of physical muscle movement and also for the sensory input and information processing required to do something reproductive with this movement.

Yet the hard problem of consciousness seems to remain unresolved. Physics and mathematics must be involved with the brain's intricate workings. Yet, the leap from these physical processes to the ever-subjective realm of conscious experience continues to elude any comprehensive scientific explanation, to the point where many say the quest is quixotic. This gap underscores not only the profound mystery of consciousness but also the limitations of our current scientific paradigms in fully grappling with this sublime and enigmatic aspect of human existence.

Of course we may simply lack the ability to comprehend the hard problem of consciousness from the limited vantage point of our own consciousness?! If this is true, maybe there is a way to conceive of it, albeit an unsatisfying one, if we set the problem up properly with respect to math and physics of our experience. The next few paragraphs set up a metaphor that seems to help, an allegory of a brain much, much slower that our own.

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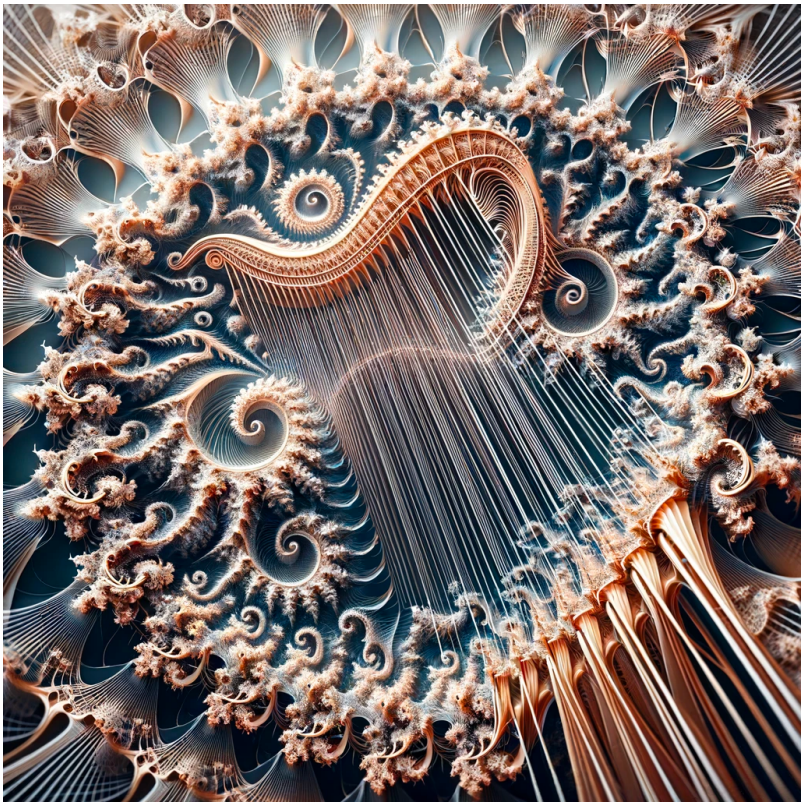
Imagine a giant sentient organism with a mind strung like a musical instrument, mechanically storing information as sound/vibration in clusters of harp-like coils, each with octaves of biochemically-vibrated neural strings that could be toggled-on or -off to hold information. Imagine acoustic axons wiring clustered ganglionic fractals of these coils, transmitting pulses between ganglia in an organic version of a can-and-string phone.



Imagine that this organism perceives the world through echolocation. Further imagine that there is constant sound in the world that emerges from unremitting thunder in a permanent layer of stratospheric clouds. Our echolocating being is able to use this constant sound-from-the-sky to resolve the form of objects around and doesn't need to send out a pinging sound like a bat does.

And that is just the sensory part… this organism's cognitive world is a VERY slow world, indeed (from our perspective). The refresh rate of its echolocation mechanism (interpolating down a human's 1,000 frame-per-second visual refresh to the speed of sound divided by the speed of light) would be about 1 refresh per 25 minutes.

Now imagine this organism perceiving a supersonic object, an object that circles the organism's world under the clouds, NEVER going slower than Mach 4 (an ~8 minute orbit). The objects's speed eliminates any evidence of its velocity or spatial position from direct perception from the reference frame of our acoustic-minded organism.

There would be about 3 object orbits per refresh; in the aural-organism's world of perception the object could only ever appear as energy traveling at the speed of sound with a vibration that resonated according to the object's number of orbits per, and location at, refresh. Echolocation information bounced off the object (and the sound generated as the object plows through the air) could only hope to be delivered as a weird doppler… some kind of sound moiré, 'lighting' up the echolocater's universe, but revealing nothing of the phenomenon's agency, the actual object. In

fact, the ‘object’ in the echolocater's world would be a ring-like entity around the planet (assuming the orbit was perfect). The object is perceptible to the acoustic being in a way very different than it would be for an electromagnetic being; the ‘object’ is different based on speed of

perception. For our being it has properties of both wave and object. Different acoustic observers from different positions would perceive slightly different aspects of the object, but they would not conceive of it differently. They would agree on the existence of a solid ring around the planet. It might pulsate and seem to ‘illuminate’ things; it would cast aural “light” that was different from the thundering clouds. Even though there is directional movement underlying the ring shape from an electromagnetic perspective, there is no such movement for our aural being. The object would ‘exist’ in the organism’s audioverse as a ‘shape’ very different from it’s ‘shape' in the world of an electromagnetic organism.

The acoustic foundation of the organisms’s geospatial modeling mechanisms would stifle this mind from ever forming a ‘real’ 3D model of the ever-flying object or attaining consciousness of its ‘true’ form. Our organism would perceive a phenomenon, but the electromagnetic signature of the entity would only be vaguely hinted-at. The object would have different shapes in electromagnetic vs. vibrational reference frames; the object would be a very real ring of ‘existing' matter in the aural world of our organism.

Perception is just the beginning; the underpinning limit of all things conceived by our hypothetical organism is their vibration-based cognition system, not the echolocation perception system. The organism's vibrational circuitry would impose a mechanical speed-ceiling on everything that existed, warping its cognition relative to the reality of an electromagnetic being. Consider the time it takes to flip a cognitive transistor (not a brain cell, but the actual smallest information-retaining circuit) and then travel between transistors. While not really straightforward, speed in this circuit is still distance/time. In electrical engineering, terms like "signal propagation speed" or "switching speed" refer to how fast a circuit can change states, and this factor is related to properties of the material that is changing state.

A single bit of information is indeed directly related to time and distance; it has a velocity. In our aural organism's case, it would be something like the time to achieve a vibrating state and then transmit that state. There is a spatial dimension and a time dimension to the state change, and if we agree that the spacial dimension can be called d c then we can identify the velocity of a circuit as d c/ t c . Wouldn't d c/ t c be a universal constant to this organism? Would it not be directly related to the velocity at which perceived entities transformed from 'Newtonian objects' to 'wavelike effects' from the reference frame of the sentient observer? Doesn't space literally warp in conformation to cognition, and don't space and time twist together oddly at the base of everything we experience? Our hypothetical object wouldn't just be imperceivable from a vibration-sensory perspective. It would literally go beyond the 'Vibrationally Newtonian' rules that build the aural brain's reality, and it would exist as an object with very different properties versus those perceived from an electromagnetic reference frame.

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Imagining an aural brain can provide slight objectivity on these kinds of problems we have with addressing our own consciousness. How can a hypercomplex, fully mechanical brain develop models of its own universe? It forces us to imagine not only some kind of vibrational representation of 3 dimensional reality, but also some way of playing these models out across time, like music, over and over, so as to be able to behave according to the predictions derived from the modeling. The acoustic brain has to hold multiple 4 dimensional models that can be recalled in the actual moment.

If the cursor of consciousness is only ever at a single slice of time, only ever existing at any one moment, how is it possible to have thoughts with temporal dimensionality? We have the ability to recall and mentally reconstruct-in the moment-experiences that play out across time, even though our conscious awareness seems to exist in a continuous "now," a single slice of time. It emerges that we can consider consciousness to be '5D,' where last dimension wouldn't be a physical dimension like those in spacetime. Instead, it would be an additional conceptual layer or aspect that allows consciousness to integrate, process, and retain information over time, effectively providing

a 'dimension' of internal representation or understanding that transcends the mere perception of four-dimensional spacetime. It might not be wrong to say that consciousness exists as a ‘5D’ construct, albeit one integrated from 4D reality.

When we think about or imagine scenarios, our minds conjure models that have both spatial and temporal dimensions. These mental simulations allow us to envision how different scenarios might play out over time, which is essential for planning, decision-making, and problem-solving. In a sense, these mental models can be thought of as microcosms of spacetime, or maybe

‘reality-mirroring homunculi.’ These are not just static three-dimensional snapshots of space, but actually dynamic sequences that unfold over time, reflecting our understanding of how the universe operates. The human mind is capable of considering multiple scenarios simultaneously. This capacity for parallel processing allows us to weigh alternatives, consider different outcomes, and make informed decisions.

A ‘5D neural multiverse’ is a fascinating metaphor. Within our minds, there exist mechanisms to hold a multitude of ‘conceptual spacetimes,’ each representing different outcomes of circumstances. These are not physical universes, rather they are conceptual and perceptual in nature. As previously suggested, if we conceive of consciousness as being the cursor accessing innumerable tandem 4D modeling algorithms, it's abstract but mathematically correct to think about consciousness as having a higher-dimensional aspect. In this view, consciousness isn't just

navigating an immersive real-time model of spacetime; it's also drawing from a subconscious (maybe better say a consciousness-supporting) landscape of 4D notions. From this perspective, consciousness might be seen as a manifestation of a higher-dimensional ‘reality,’ where the outer 'dimension' is not just physical but one of possibility, imagination, and thought.

The mind seems to evoke such hyperdimensionality by integrating ‘conceptual spacetimes’ over time. In other words, a perceived ‘instant’ would actually ‘exist’ as the derivative of a set of conceived spacetime models. By only being ‘conscious’ of a connected string of such derivatives, the mind integrates a ‘stack’ of conceptual 4d models into a consciousness with boundaries way beyond the instant it seems to occur in. It doesn’t ‘feel’ like consciousness takes ‘stepping stones’ across time, but it actually does; while consciousness is perceived as linear and unbroken, it is actually HEAVILY stitched by conception. Our 3d cursor of consciousness makes for an illusion of a temporally linear 4d experience that is underwritten by a dynamic ‘5D’ model that took serious unconscious time to put together!

Why is this seemingly hyper-subjective conception of consciousness potentially important? First of all, it makes the conceptual problems of quantum mechanics slightly easier to come to terms with (Wave-Particle Duality, Observer Effect, Superposition). Quantum phenomena are testable, and very real, if seemingly impossible to conceive from our mind’s conscious version of spacetime. This way of thinking helps a little with that, and the testable existence of quantum phenomena is a priori evidence that the stream of consciousness is disconnected from the ‘true’ arrow of time.

Additionally, for anyone trying to model psychological mechanisms it provides the physical “dimensionality” they must exist in (albeit a frightfully vague one). For example, when contemplating a psychological mechanism associated with enjoying fruit, we can imagine multiple 4D ‘reality’ models integrated by a more abstract 4D ‘integrator’ algorithm. We can imagine this ‘integrator’ as a physically real adaptation, a 4D neurological function that coordinates ‘instinct-like’ visceral models of hunger outcomes with learning-modulated models of ripeness outcomes with still more learning-modulated models of fruit type outcomes. What we have called mechanisms are actually 4D models, not simple ‘if-then’ toggle-switch brain circuits, that are integrated by other 4D mechanisms! And so the notion presented here gives a shape, albeit a conceptual one, to psychological mechanisms, one that at least lays out the basic ‘structure’ mechanisms will have. We should expect vast, integrated sets of stacked 4D ‘reality-mirroring homunculi’ that can model complex outcomes. We should expect that some of these ‘reality-mirroring homunculi’ are stitched into the ‘5D’ world of possibility by other cognitive adaptations, also with temporal dimensions, that don’t mirror reality in the same way the ‘homunculi’ do, but rather integrate the ‘homunculi’ by playing a game with time. With a tempo of cognition/sensory impression that mathematically approaches dead slowness with respect to true arrow of time, the subconscious ‘tandem 4D’ processing of sensory impressions is effectively timeless across the life of an organism. Such artificial collapsing of time integrates our subjective

experience into a contrived, self-reflective ‘5D’ experience, a consciousness.

Going back to our aural being for perspective, a ‘second’ of sensory cognition in its audioverse (1,000 audiobrain refreshes) would equate to 17 days from the perspective of an electromagnetic being like us. We would be able to watch the aural brain do its processing between its 25 minute refreshes of sensory cognition, and we would see that there was much, much more time passing than the aural brain could ever know, aurally imperceptible orders of magnitude more time, between each instant of consciousness. Is it not axiomatic that for any time-sentient entity it will take exponentially more time to process the perception of time than what is consciously perceived?

As touched before, the speed with which the being process everything, including the perception of time, is has a mechanical limitation. It is a constant, and nothing in the being’s world of perception can exceed that speed or it just stops being real. Echolocation and aural processing of objects approaching the speed of sound have eerie connections to Lorenz transformations from our hypothetical being’s reference frame. A speeding motorcycle is “smaller” (front to back) after it passes.

Further, the point of sound from an SR-71 passing never moves faster than sound itself! From the perspective of the aural organism, as the jet approaches mach 1 it becomes audibly shorter (in the direction of movement) until it cross the event horizon into invisibility, but the sound it is making still exists. It just doesn’t retain the 3D shape information about what made it, rather the sound coalesces into waves that manifest as a sonic boom.

Trying to jam a definition of consciousness into our 4D world of meaning and reference is wrong-headed from the get-go, and we end up trying to define consciousness from a position of ‘5D’ blindness that is imposed by evolutionary constraints (like the high cost, rarity, and lack of genic control over of natural information processing substrates) to imperatives (like individualism in demes of multicellular organisms). Metaphorically, we are blind creatures trying to understand the nature of 3D space by feeling the walls of the labyrinth with out hands. If this way of thinking is correct, conceiving a satisfying solution to the hard problem of consciousness from our 4D cursor of experience is as impossible as trying to draw Earth’s spherical shape on a piece of paper! If a being has already experienced 3D reality, they can understand the meaning of map projections and such, but without 3D experience they never would. Perhaps our consciousness is just a slice of ‘5D’ possibility given a shape by that canalizing process of evolution. Perhaps consciousness just is , like time just is , but the adaptations that manifest as functional evolutionary features in the ‘dimension of consciousness’ give it a host of illusory qualities! Perhaps nonsensical self-reflection is nothing more than a useless byproduct of runaway natural selection!

Finally, it is this elusive higher-dimensional aspect of consciousness that gives us not an illusion of choice, but the godlike potential to actually choose and affect the physical universe. We can change reality, and this is sublime. Evolution produced a phenomenon that projects models of the

future, then changes reality to fulfill the desired projection. The possible outcomes of this seemingly teleological situation are pretty open-ended; the actual choice is happening sideways of the spacetime metronome of consciousness, at least the spacetime we consciously perceive, and this seems important. While consciousness is obviously just the tip of the evolved neural iceberg, we do have dramatic capacity for free will, and it is exactly this aspect of us that is sublimely important to notions of individualism and enlightenment.