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Embodying Consciousness in Brains and Machines II: Portals

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Abstract

This paper adopts the philosophical theory of mental monism and examines the constraints on models of embodiment within that framework. It proposes a biologically plausible model of embodiment in brains and suggests an extension to embodiment in machines. The conscious mind is characterized as a nonphysical and nonlocal system comprised only of volitions and phenomenal experiences, subject to scientifically discoverable natural laws, and capable of processing information independently of the linked brain tissue.

Keywords

Hard Problem, Consciousness, Mental Monism, Idealism, Artificial Consciousness, Conscious AI

1. Introduction

The problem of understanding how conscious minds are embodied in brains has a long and contentious history, which has in recent years expanded to include the possible embodiment of conscious minds in machines. That has been triggered by sudden enhancements in artificial intelligence (AI) through the use of large language models (LLMs). There has been an energetic debate over whether AI machines can be, or already are, conscious. For example, Chalmers (2023) has argued that LLMs are probably not (yet) conscious, but laments that there is no consensus on a fundamental model of conscious embodiment, so any conclusions are bound to be tentative, although he definitely rejects "biological chauvinism", the belief that machines cannot be conscious simply because they are not biological.

There are three broad philosophical claims that take consciousness seriously: "property dualism", that some physical things have (nonphysical) conscious properties; "substance dualism", that minds are nonphysical entities that interact with

physical brains; and "mental monism", that only minds are real. Property dualism is dominant within the philosophical community.

One of the most influential theories of that type is Chalmers's "naturalistic dualism". Although he is cautious about making definitive statements about how consciousness fits into the physical world, Chalmers has, since the 1990s, consistently favored a version of property dualism in which phenomenal consciousness is a property of computation, rather than of matter. Consciousness "naturally supervenes" on computation, meaning it is a brute fact that any change of consciousness must be driven by a change of physical computation. A machine that reproduces human neural computation would, *ipso facto*, have a similar conscious mind. This is subtly different from computational functionalism, which simply identifies consciousness with certain computations. Chalmers has always regarded consciousness as nonphysical, and therefore, it supervenes on computation but cannot be identified with computation.

Chalmers (1996) admitted that this theory is counter-intuitively "epiphenomenal", meaning that the conscious mind cannot affect the brain. That leads to what he called the "Paradox of Phenomenal Judgment": when a philosopher uses the word "consciousness", she cannot actually refer to consciousness, as her state of consciousness plays no causal role in her brain, hence any statement of a theory of consciousness, including property dualism itself, is vacuous. In fact, most versions of property dualism are epiphenomenal, and that makes theories of this class untenable for anyone wishing to recognize the everyday reality of conscious minds active in the world. It seems that philosophers are driven to this position by a belief in the causal closure of the physical world. Nonetheless, a few philosophers have speculated that the collapse of the quantum wave function creates a gap in the causal mesh of the physical world, through which a nonphysical consciousness could affect the brain. Chalmers and McQueen (2022) unusually examine this in the context of property dualism. Interaction between mind and brain is most often associated with substance dualism and mental monism, not property dualism.

The accompanying paper (Lloyd, 2026) defends mental monism against both property dualism and substance dualism (and, *a fortiori*, against physical monism), and that theory will be adopted here. It is a minority position, but mental monism (aka idealism) has growing support, for example (Chalmers, 2018a): "even though idealism is implausible, there is a non-negligible probability that it is true". I will summarize it as follows. Concrete reality comprises only conscious minds, including personal minds (such as humans), and an extensive background mind, the "metamind", which is responsible for all natural phenomena not under volitional control of personal minds. Following Berkeley's terminology, the metamind comprises "archetypes" that are rendered as physical objects. The physical world is understood to be a virtual construct that is grounded in consciousness. Personal minds are agentic archetypes and operate in the physical construct through avatars (such as human bodies), which are special objects capable of mental-physical interaction.

Historically, mind-body interaction has been most commonly considered in the context of substance dualism, where mind and brain are coequal realities. In mental monism, interaction is also required between the mind and a *virtual* physical world. This paper sketches how such interaction might work.

The "embodiment" of a conscious mind in a physical object is a condition where the conscious states affect, and are affected by, the physical states of the object. That definition excludes epiphenomenal consciousness. So, we should not say that an object "is conscious" or "has consciousness", which would imply that consciousness is a property of a physical object. Rather, we should say only that it "embodies" consciousness, which leaves open the manner of that embodiment and whether the consciousness is literally "in" the object.

If the theory presented here is correct, then not only can conscious minds be embodied in machines through a quantum mechanism, but a new discipline of engineering artificial conscious minds could open up. The term "conscious artificial intelligence" is often used interchangeably with "artificial consciousness", but this rests upon a contentious assumption that having conscious experiences requires intelligence. Everyday experience points to the contrary. Having any conscious experience, such as seeing phenomenal red, is a given datum, and not the outcome of intelligently solving a problem. Correspondingly, the road to machine consciousness does not lie in writing intelligent, conscious code, but rather in reproducing the physical substrate that allows a human mind to be embodied in a brain.

This paper's main premise is mental monism, as defined above. A common criticism is that it does not explain the interaction between the conscious domain and the (virtual) physical domain. This paper puts forward conjectures intended to fill that gap. The central conjecture is the existence of "portals", mechanisms that convey information between a personal mind and its avatar. One part of the portal is purely mental; the other part is rendered as a structure in the avatar's brain. I argue that the latter part enters a quantum superposition, which the former part collapses by performing an observation. In volition, the mental part also selects the state into which the physical part collapses. The physical part is conjectured to be the DNA molecule.

2. Interface Theory

In the common notion of neural correlates of consciousness (NCC), all mental events have a mapping into physical events in the brain. Mental monism is not obliged to do this. Obviously *some* experiences map to brain events (e.g., my mind sees phenomenal red when my brain detects red light), and *some* acts of volition map to brain events (e.g., my fingers hit the laptop keys that I choose), but in general there is an interface function in which certain brain events map into input "ports" in the mind (a subset of the mind as a whole), and volitional acts in an output "port" in the mind map onto certain brain events. I will use the term "portal" for a structure that allows the conveyance of apparent causation between a con-

scious mind and its embodying object (brain or computer). I say "apparent" causation because, in mental monism, actual causation occurs only between mental events; a shadow causation flows from mental to physical events, or between physical events. The (virtual) physical part of the portal is what is commonly referred to as the neural correlate of consciousness.

I am conjecturing that only a proper subset of the mental world maps onto physical events. The metamind has no physical counterpart; there must be some events in the mental universe that do not map to physical events. Whether there are any such "disembodied" mental events inside the personal mind is an empirical question, but the macro scale of personal minds makes this likely.

2.1. The Quantum Measurement Problem

The problem of quantum measurement, which is at the core of the portal theory of conscious embodiment, can be stated simply: the Schrödinger wave equation describes the dynamics of a quantum system in a precise, deterministic way, while a measurement of the system involves an abrupt change triggered by an observer, but neither the observer nor her act of measurement is understood in physical terms.

In the classical understanding of the physical world, reality is made of particles—atoms and suchlike—flying around in space, bumping into one another and subject to force fields, plus waves of energy. In the quarter of a century from 1900 to 1926, that worldview was uprooted and replaced by a wholly new conception. Werner Heisenberg (1902-1976) wove the nascent strands of thought into the new worldview in a paper in 1925. Building on this revolutionary framework, Max Born (1882-1970) published the last major component of the foundation of quantum mechanics: the Born Rule for computing the probabilities of different outcomes of measuring any quantum system. He was eventually awarded the Nobel Prize for it in 1954. It irreversibly brought consciousness into the heart of modern physics, but also thereby created an acrimonious dispute among physicists and philosophers.

Some of the founders of quantum physics—Max Planck (1858-1947), John von Neumann (1903-1957), Erwin Schrödinger (1887-1961), and later Eugene Wigner (1902-1995)—recognized the central role that consciousness has to play in quantum physics. They did not, however, provide a cogent theory of what consciousness is, nor of how consciousness does this. Von Neumann, in particular, was vague about where the intervention of consciousness occurred in the combined system of measuring instrument plus human brain. This led physicists to adopt a policy of "Shut up and calculate" (sometimes attributed to Richard Feynman). That is, just use the equations of quantum physics and disregard the conceptual foundations. As physicist Sean Carroll (2019) has recounted, research into quantum foundations was for many years a taboo and, even now, is not well favored in mainstream physics.

Some physicists were dissatisfied with this policy of "Shut up and calculate",

but dared not bring consciousness into science. Some proposed that physical systems just spontaneously executed the Born Rule; others concocted a tale of infinitely many parallel universes that split off every time we make a quantum measurement. Henry Stapp (1928-) was one of the few major physicists who maintained that there was a causal role of consciousness (Stapp, 1999, 2001, 2017).

In quantum mechanics, the constituents of the physical world are wave functions. Protons and electrons are no longer particles existing independently of observers, but wave functions. When a measurement is made of one of the observables of that wave function, we do not observe the wave function itself; we find only a specific value of that observable. The wave function defines the distribution of probabilities of those individual values, but not which specific value will be found in any given measurement.

Already, we see something paradoxical. The wave function evolves smoothly and deterministically in time. But when a measurement is made, it "collapses" to one value in whichever observable was observed. Now, if this is a proper scientific theory, there should be an account of precisely when and where the collapse occurs, and how. Measuring, say, the position of an electron involves a macroscopic instrument plus the brain of the experimenter. Where, in that complex system of apparatus plus brain, is the collapse? Quantum mechanics was silent on this. Likewise, it said nothing about how the collapse occurs. This so-called Copenhagen Interpretation of the formalism of quantum mechanics was good enough to carry out calculations, but inadequate as a conceptual picture of reality.

2.2. Candidate Theories of Quantum Measurement

The candidate interpretations look broadly like this:

- *Simple Copenhagen Interpretation*: what counts as a measurement is ill-defined, and the outcome of a measurement is random, except for the probability distribution as defined by the Born Rule.
- *Observerless Collapse*: the collapse just happens by itself, not because of a measurement. In this group, we have the Ghirardi-Rimini-Weber (GRW) theory of spontaneous collapse (Ghirardi et al., 1986) and the Penrose theory of gravitational collapse (Penrose, 1989: pp. 367-371). These theories leave no opportunity for consciousness to operate causally upon the world. Yet, we know from everyday life that the conscious mind can report its experiences and exercise free will. It could not do that if the collapse were under objective control.
- *Consciousness-Driven Collapse*: Karl Popper and John Eccles proposed that a nonphysical consciousness exercises free will by means of quantum tunneling in the synapses between nerve cells (Popper & Eccles, 1977). They address only free will, and not the quantum measurement problem, nor the problem of consciousness perception, nor is there any attempt to model the architecture of the conscious mind and how it might actually interact with the physical world.
- *Many-Worlds Interpretation* (*MWI*): This was developed by Hugh Everett (1930-1982) in his doctoral thesis as the "Relative State Interpretation" of quan-

tum mechanics (later tagged "Many Worlds Interpretation") (Everett, 1956, 1957). According to this theory, there is no actual collapse of the wave function. Whenever a measurement is made, the universe branches and stays that way forever. As the branches are decohered, there is no scope for interaction between them, so it is as if they are separate, classical worlds. Hence, the "many worlds" tag. But they are not really different worlds in any normal sense of the term: there is just one universe, and these are different superposed branches of the universal wave function. As the other branches ("worlds") cannot, in principle, be observed, and as they can have no effect on our branch, the existence of these branches can never be tested, which violates Popper's principle of falsifiability (Popper, 1959). They are indistinguishable from fiction. The defense made by Many Worlds advocates is that the existence of these branches is implied by the mathematical equations of quantum physics. This is a *non sequitur*: the fact that one part of a mathematical structure matches reality simply does not imply that other parts do as well. Recall Pythagoras' theorem from your school days. For a right-angled triangle with hypotenuse a, Pythagoras tells us that $a^2 = b^2 + c^2$. So, if b = 3 and c = 4, then a = ±5, but the negative solution −5 is discarded as nonphysical. Likewise, we should jettison the other branches of the wave function other than our own. The empirical fact that is observed is that the wave function collapses non-deterministically. To suppose that it doesn't really collapse but instead yields an infinity of unobservable branches is unscientific. Moreover, if MWI were true, then the physical universe would be wholly deterministic, and there would be no way for consciousness to act upon the world: we could not report our conscious experiences or exercise free will. Without consciousness, the universe is characterized by Tegmark's Mathematical Universe Theory(Tegmark, 2014), just mathematical structures devoid of any distinction between reality and unreality, and in that case MWI makes sense. That line of thinking, however, is clearly inapplicable to the real world.

In some quarters of the physics community, you will find quite an aggressive dismissal of the proposition that consciousness is involved in quantum physics. Here, for example, is the highly regarded physicist, author, and podcaster Sean Carroll:

> "Almost no modern physicist thinks that consciousness has anything whatsoever to do with quantum mechanics. There are an iconoclastic few who do, but it's a tiny minority, unrepresentative of the mainstream." (Carroll, 2016: Chapter 21)

It should be borne in mind that Carroll is committed to the Many Worlds Interpretation of quantum physics, which inherently excludes both consciousness and the collapse of the wave function. He is also committed to the notion that consciousness has no fundamental existence but is only a high-level emergent property of the brain. Both of those positions are philosophically untenable. Only

about one in five physicists believe in the Many Worlds Interpretation (Gibney, 2025), and the rest of them don't hold positions that have any firm view on the involvement of consciousness.

2.3. Decoherence

Many people (even some physicists) say that decoherence explains away the measurement problem. This is incorrect. Decoherence occurs when a target quantum system (such as an electron) that is in a coherent superposition of states interacts with a larger system (such as a measuring apparatus), with the result that the phases of the component wave functions of the target system (the electron) are scrambled. The target system (electron, say) remains in its superposition of states, and in fact drags the interacting system (measuring device) into superposition too. What has changed is that measuring the target can no longer yield an intermediate state but only one of the base states. For example, if you are measuring the position of an electron, then, without decoherence, you might (*per impossible*) observe the electron smeared over a volume of space. As the measuring device is large, however, you will always decohere the target system and never see it smeared over space. De-smearing it does not collapse the measured observable into one outcome. There is something else going on in the act of measurement, besides decoherence, that selects one specific outcome out of all the possible outcomes that were represented by the target system's initial wave function. That is the hard part of the measurement problem, and it is the part that needs the involvement of consciousness.

Physicists who say that decoherence clears up the Measurement Problem are mostly followers of Everett's Many Worlds Interpretation. But MWI itself already abandons the measurement problem by denying the existence of conscious observers. Without conscious observers, there is no actual observation, no actual collapse of the wave function, and no actual reality. On this view, the physical universe is just an abstract mathematical structure: it has no Measurement Problem because there is nobody in it to make measurements.

2.4. The Physical Part of a Portal Is Nondeterministic

If the physical universe were wholly deterministic, then it would be impossible for a conscious mind to affect it. At each time t, the state of the universe would be determined by the combination of its state at an earlier time t' and the dynamical laws. There would be no gap in that causal chain for the mind to change the course of events. We would face causal closure.

It is clear from everyday experience that the human mind regularly affects overt behavior and therefore must affect the brain. Therefore, the physical part of the output portal must be a nondeterministic process. There appear to be only two candidates. One is the initial condition of the universe (i.e., the Big Bang), the other is the measurement of a quantum superposition. The initial conditions model is feasible, but not plausible. We will therefore consider only the quantum model.

Quantum mechanics is clothed in many misunderstandings, one of which is that at the microphysical level, the physical world is seething with randomness and uncertainty, with particles being in more than one place at the same time, all that sort of thing. This is wrong. Any physical system, including the universe as a whole, evolves with determinism and certainty, in accordance with Schrödinger's wave function—until an observer measures it, at which point any observed superposition collapses to a single state. For example, an electron passes through a two-slit apparatus as a deterministic wave until measurement, at which point it will render a particle at one definite, but unpredictable, location. The Born Rule defines how to compute the probabilities of different possible outcomes, but there is no physical law that tells us precisely which outcome will be measured on any occasion. It is a common belief that the selection of one outcome out of the two or more superposed states is purely random, modulo the Born probability distribution. Physics says no such thing. (In fact, it is not clear how one could even give a satisfactory definition of pure randomness.) Physics gives us the probability distribution, but the individual outcome is simply not determined: it is not "random". Since the conscious mind clearly affects what the brain does, and the only gap in the deterministic evolution of the Schrödinger wave function is the act of measurement, we are led to hypothesize that a volitional act by the conscious mind is embodied by choosing the outcome of the collapse of some quantum superposition in the brain.

Recall that the physical part of the portal is virtual. Its archetype signals to the personal mind that its physical rendering is in superposition, and the personal mind responds by selecting which outcome is to be rendered in what is, in effect, an act of quantum measurement by the mind.

Ockham's razor suggests that there is only one kind of portal: the brain creates some quantum superposition, the mind detects this, then collapses it. There is no obvious need for a separate kind of portal for efferent and afferent signals, although that is an empirical question. A single kind of portal would make sense in the context of evolution, as perceptions arose to allow advantageous action rather than for idle contemplation. One difference would be that the efferent collapses would be situated in the motor cortex and be under voluntary control, while the afferent collapses would be in the sensory cortex and not normally be under voluntary control.

Only agentic archetypes (personal minds) can collapse superpositions. Although the metamind has an awareness of all objects (as it renders them), it does not "observe" them.

2.5. Mental Monism and the Portal Theory

The human body is an avatar that allows the mind to operate in the (virtual) physical world, and its (virtual) channel of communication with the mind is a nondeterministic quantum process in the brain, which I shall call a "portal", for which the best candidate appears to be a macromolecule specific to the individual (see

below). This theory addresses the three key issues:

- The Measurement Problem: where, when, and how does an observer collapse the wave function? The wave function is collapsed collectively in the instances of the designated macromolecule, and it does so when the sensory input from the observation reaches the relevant part of the brain. It is achieved by an operation in the formal automaton of the conscious mind, as outlined by Lloyd (2020). That action manifests in the physical world through the portals that have been described above.
- The Perception Problem: How can a nonphysical conscious mind receive sensory input? The brain places the macromolecules in superposition that the conscious mind detects.
- The Volition Problem: How can a conscious mind exercise free will in the physical world? The brain creates an opportunity for conscious intervention by placing the designated macromolecule in a quantum superposition, and the conscious mind collapses the wave function and selects an outcome, which then affects neural firing and hence behavior.

Of course, it would be more elegant for all three issues to be resolved by the same interface model.

In principle, this is a falsifiable theory. For the Measurement Problem, the test would be a version of Wigner's Friend thought-experiment (Wigner, 1961), such as Frauchiger and Renner's (Frauchiger & Renner, 2018). For Perception and Volition, chemically blocking the pathways to or from the portal should, respectively, obliterate the relevant part of the perceptual field or disable voluntary action. Much more detail needs to be worked out before specific tests can be formulated, such as which genes are used in the portal.

I would reiterate that mental monism is not being proposed to solve the Measurement Problem. Rather, it is proposed on the back of a philosophical argument. It is then found to offer a solution to the Measurement Problem as a bonus.

How mental monism offers a solution to the Measurement Problem will become clearer as I expand on the internal mechanisms of the portal. Essentially, because the physical brain is (according to mental monism) a virtual system and is underpinned by conscious structures of the same type as the personal mind, we do not need to invoke magic or brute psychophysical laws (as David Chalmers has recommended). Instead, we have a single ontological playing field governed by a single set of mental laws. Mental monism can achieve an economy and theoretical elegance in the mind-brain interface that is unattainable in dualism.

2.6. The Portal Navigation Problem

The two theories, substance dualism and mental monism, have a peculiar problem that simply does not arise with property dualist theories such as panpsychism: namely, the "portal navigation problem". A portal is the mechanism that allows the exchange of information between the mind and brain. Theories of property dualism, such as panpsychism, have no need for portals, so *a fortiori* they have no

portal navigation problem. An early example of a proposed portal is the pineal gland (Descartes, 1975). For the past century, essentially all theories of substance dualism and mental monism have proposed some kind of quantum mechanical process as the portal. So, we have quantum tunneling across synapses (Popper & Eccles, 1977), and quantum collapse in microtubules (Hameroff & Penrose, 2014), and my quantum collapse in DNA (see below). Gordon's mental monist account proposes quantum mechanical portals, but fails to address the navigation problem (Gordon, 2022). Whatever the choice of portal, the navigation between the mental and physical sides of the portal is a crucial but largely ignored problem.

Whether you regard the brain as ontologically real (substance dualism) or just a virtual object in a construct (mental monism), you are still faced with the fact that your conscious mind possesses no spatial location. Your mind is not literally in your head, or any other place. As it's not in your head, how does it know which head to use for sensory input and motor output? Your mind receives sensory perceptions from the brain and sends motor commands to the brain. But, which brain? Why does my mind exchange information with my brain, not yours, given that my mind is not actually inside my brain?

Approaching this from the physicalist perspective, you might want to say that there is no navigation problem. You might claim that brain connectivity is a pointer to a particular mind. That is, if there is a neural connection between portal 1 and portal 2, then they will map to the same mind. That, however, will not work because any such connection will occur after the portals have done their communicating with the mind. Suppose a portal needs to tell its mind that light of wavelength 625 nm has impinged on a particular part of the eye. How will it know which mind to send this data to? *Post hoc* connectivity is too late. The identification of the target mind must be something inhering in the portal at the time of transmission.

So, we need a brain structure that is (a) small enough to be put into quantum superposition in the midst of a thermally noisy brain, and (b) common to all neurons in one brain, but (c) not shared by any other individuals.

Hameroff & Penrose (2014) proposed microtubules, which apparently meet criteria (a) and (b) but not (c). The microtubule is a structure built of tubulin proteins, and these proteins are the same in all individuals. There is no personal biomarker in the microtubule. So, if a conscious mind were linked to microtubules as portals, then the mind would map equally to microtubules in everyone's brain. A microtubule is a microtubule is a microtubule: a mind would have no way to tell which microtubules constitute its personal doorway into the correct brain.

The physical side of the portal needs to have some unique biomarker, so that the conscious mind can connect to just the proper portal, and hence it can latch onto one particular physical person.

Lloyd (1999) suggested that the portal is the DNA molecule, not the microtubule. The DNA ticks all the boxes: it is unique to each individual, and present in every neuron; there are biologically plausible molecular pathways from the den-

drites to the nuclear DNA, and from the DNA to the axon; the DNA molecule is about 40,000 times longer (about 2 m) than the longest microtubule (0.00005 m) and therefore has vaster computational power; and there is circumstantial evidence in its favor from twins and split-brain patients. Figure 1 shows this schematically.

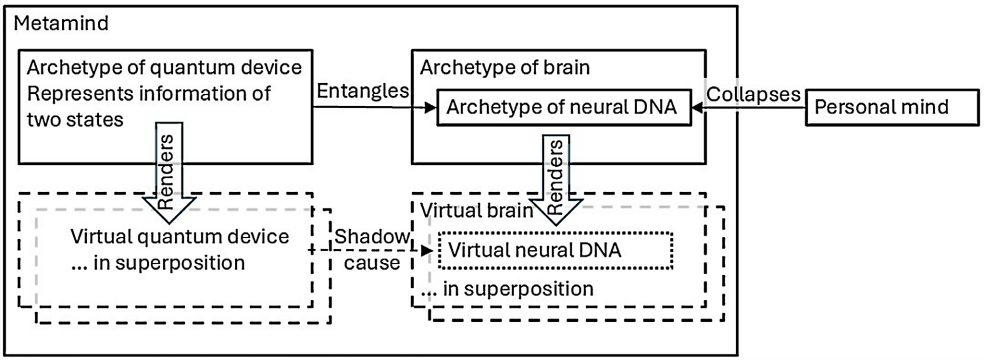

Figure 1. Schematic of a personal mind collapsing a superposition.

2.7. An Analogy from VR (Virtual Reality)

Consider a VR (Virtual Reality) game. Suppose you put on your VR headset, but you find that instead of a continuous stream of imagery from the point of view of your avatar, the screen keeps glitching between the points of view of other people's avatars. When you try to move, you see that your actions are expressed in jerky movements of other people's avatars. Your connection to the VR world randomly switches every few seconds between arbitrary avatars.

Frustrated, you take off the headset and telephone the support guy. "The system's broken: I'm getting data feeds from random avatars, not just my own avatar." The engineer runs some diagnostics and says, "No, the system is running correctly. What portal mapping are you using? Each avatar has a unique ID number. When you first open an account, you choose an avatar, and you copy that avatar's ID into your headset. Whenever you log in after that, your headset connects with the virtual POV (point-of-view) of your own personal avatar that has the relevant ID." You protest that that is precisely the setup process that you went through. The engineer replies, "Wait, what part of the avatar's body did you upload the ID from?" And you reply, "I specified 'brain microtubule', I got the ID number from the avatar's simulated microtubule and copied it into my headset registry." The engineer's face lights up: "That's your problem. Everyone's microtubule has the same code. Microtubules in meatspace are just strings of identical tubulin proteins. So, the simulated microtubules in the avatar likewise use identical object modules. By using a code from the microtubule, you're connecting to any random person's avatar, as all the avatars share identical microtubules."

"So what's the solution?" You ask. "Just go back into the setup process and copy the ID number from your chosen avatar's simulated DNA. Thereafter, your headset will always connect to the data stream from the same avatar."

2.8. Consciogenesis and Zygotic DNA

One snag in a simple DNA portal theory is that the genome is not actually identical in all brain cells. Small random mutations in the genome occur during the growth of the fetal brain, leading to a "mosaic" of slightly different genomes throughout the brain (Sran et al., 2024). A solution is to suppose that the link is defined by the DNA at the time of fertilization, which creates the zygote.

This makes sense if we think of what happens at "consciogenesis", the creation of a new conscious mind. At fertilization, when the DNA becomes fixed in the zygote, we must suppose that this triggers some operation in the domain of consciousness, which causes a new mind to bud off from the universal stream of consciousness. That would be a natural point of time at which to forge the link between the conscious mind and the DNA, which is inherited by all descendant cells of the zygote.

This is speculative, but falsifiable: in experiments such as those of Pizzi et al. (2004) and Pizzi (2018), the theory predicts that the nonlocal correlations that Pizzi observed will occur between monozygotic DNA (even if it has suffered mutations) but not heterozygotic DNA.

2.9. Biological Interface with Portals

I have suggested above that the portal between the conscious mind and the (virtual) brain is the DNA molecule, which is placed into superposition and then collapsed by the mind. How could that operation interact with neural firing?

Nerve signals generally travel as depolarizations on the surface of a neuron, bypassing the nucleus, and typically take milliseconds. Furthermore, the nuclear synthesis of neuropeptides (precursors of neurotransmitters) typically takes minutes to hours. Normally, therefore, quantum collapses in DNA would have no role in real-time neural activity. Nevertheless, certain neurotransmitters arriving at dendrites can trigger metabotropic (rather than ionotropic) receptors, which trigger a cascade of secondary signaling molecules that can pass through the nuclear membrane and reach the DNA. For example, glutamatergic signaling (Reiner & Levitz, 2018). Downstream from the portal, the slow process of protein transcription could be avoided if a conformational change in the DNA could release sequestered proteins, which could trigger a rapid, localized signaling cascade that modulates ion channel activity in the cell membrane. The whole process could take up to a few hundred milliseconds, but that is in the right order of magnitude for conscious deliberation. These intracellular pathways are purely illustrative, but they show that it is at least biologically plausible that quantum collapses in DNA could be a means by which the conscious mind could affect neural activity.

There are two potential counterexamples, which I will discuss below:

- In split-brain patients, the hemispheres of the brain have the same zygotic DNA, yet experiments reveal that the sensory data and motor control are separated. Nevertheless, research led by Yaïr Pinto indicates a single consciousness with partitioned sensorimotor data (Chalmers, 2018b; De Haan et al., 2020;

Pinto et al., 2017, 2023).

- Identical twins have the same zygotic DNA but do not share a mind. So, we would have to suppose that some mechanism blocks co-mentality. Nevertheless, there is anecdotal evidence of apparent anomalous communication (so-called "telepathy") between monozygotic twins (Brusewitz & Parker, 2024; Parker & Jensen, 2013).

These potential counterexamples certainly require further attention, and I examine them below, but they do not block this DNA portal hypothesis.

As the conscious mind is nonlocal, if the DNA molecule serves as a portal, then the location in space of two molecules of the same DNA should not affect their ability to latch onto the same conscious mind. Therefore, we would expect to find nonlocal correlations in stimulated DNA, and there is tentative experimental evidence for this (Pizzi et al., 2004; Pizzi, 2018) (Note: This nonlocal communication is not related to the quantum nonlocality observed in entangled coherent particles. These DNA molecules are not coherent).

2.9.1. Split Brains and Nonlocal Consciousness

Introduction

The *corpus callosum* is a structure that connects the cerebral cortices of the two hemispheres of the brain. In the 1940s, the surgical operation of callosotomy (cutting the corpus callosum) was introduced by William P. van Wagenen as a treatment of last resort for patients with severe epilepsy. Twenty years later, Roger Sperry conducted a series of experiments on these "split-brain patients", which revealed peculiar behavioral features indicating that the two hemispheres were working independently (Sperry, 1961, 1968). This gave rise to the popular view that the conscious mind of the patient had been split into two minds, only one of which (in the left hemisphere) possessed language skills.

The notion of two minds in a split-brain patient is what we would expect from the philosophical theory that the conscious mind is literally situated inside the brain tissue. It does not sit well with the rival theory that the conscious mind is nonlocal.

The two-minds notion remained the standard understanding of split-brain patients until 2017, when Yaïr Pinto published new studies. In fact, as Pinto pointed out, there had been inconsistencies in Sperry's original papers from the beginning, but these had been overlooked, and the standard view was "cast in stone" in textbooks and review papers.

New Exploratory Experiments

In short, Pinto showed that there was actually a single conscious mind spanning the two separated hemispheres. Pinto et al. (2017) first of all observe that split-brain patients don't notice anything odd, either in their day-to-day lives or in the experimental setup. They do not report any big holes in their perceptual fields, nor any weird involuntary movements of their hands. But the crucial finding is that the left brain can report (verbally or using the right hand) conscious experiences arising in the right hemisphere, and vice versa. The patients shouldn't be

able to do this if conscious experiences are situated in isolated hemispheres. Moreover, the patients report high subjective confidence in the (correct) judgements about the presence and position of things seen in the other hemisphere. What the split-brain patients can't do is make direct comparisons between visual experiences in the visual fields that are associated with the two hemispheres. That is, the left hemisphere can verbally report the presence and position of a shape in the right visual hemi-field, but cannot say whether it resembles a shape in the other hemi-field.

Further experiments (Pinto et al., 2023) showed that the cross-hemisphere comparisons became doable when the subject was asked to perform some task that involved paying conscious attention to the images. In summary, what the research seems to be showing is that low-level, pre-conscious brain activity is split by the callosotomy, but conscious experiences and actions that are based on separated stimuli to the two hemispheres are co-conscious in one unified mind.

The authors note that this undermines two popular theories of consciousness—the global workspace theory and integrated information theory. They briefly mention the possibility of a quantum mechanical explanation, but say this is not tenable as the brain is a large, warm body that would quickly decohere any quantum superpositions over relevant distances across hemispheres. That, however, is a problem for the Hameroff & Penrose theory, but not for the portal theory.

de Haan et al. (2020) provide a useful review of this evolving experimental field. See also Accardo's introductory video (Accardo, 2023) and Chalmers' debate with Yaïr Pinto, Elizabeth Schechter, and Joseph LeDoux (Chalmers, 2018b).

Interpretation of Experimental Results

There is not, as yet, any plausible theory of how this could happen if the mind is supervenient on brain tissue. But it is what one would expect if the conscious mind were a nonlocal entity that functions independently of the brain and communicates with the brain via local neuronal portals.

In the split-brain experiments, there is *prima facie* evidence that physical transmission of information between cerebral hemispheres has been blocked. Nevertheless, the DNA in both hemispheres is obviously the same, so the molecular tagging of portals is the same. So, according to the theory proposed here, the mind-brain portals in both hemispheres are expected to map to the same mind. In summary, we have:

- Tentative experimental evidence for single consciousness in split-brain patients, which seems to lack a plausible physical explanation.
- A theory of nonlocal consciousness that, if true, might provide an explanation for single consciousness in split-brain patients.

The renewed experimental investigation of mind localization in split-brain patients is still nascent, and the results do not yet prove any model. Nonetheless, the theory of nonlocal consciousness is a contender and therefore worth developing further.

2.9.2. Monozygotic Twins and Nonlocal Consciousness

Monozygotic twins ("identical" twins) share the same DNA, but they have separate minds. Does that defeat the hypothesis that DNA serves to identify the portals that belong to one mind rather than another? Not necessarily: there are tentative experimental results and many anecdotal reports that suggest a degree of communication between twins' minds beyond what one would expect from normal, physical communication. If the DNA portal theory is correct, then it must account for why the phenomenal content of the minds of monozygotic twins is mostly, but apparently not entirely, disjoint. As yet, the reported "twin telepathy" is too weak to count as significant evidence for the DNA portal theory, but it should prompt research into how it might be strengthened.

Within academic science and philosophy, any mention of telepathy (or other paranormal phenomena) triggers an immediate dismissal on physicalist grounds. This, I would speculate, is due to an interiorized conservatism that is essential for the maintenance of scientific rigor. The arguments against physicalism in Part I (Lloyd, 2026), however, undermine that dismissal. Moreover, the nonlocality of conscious minds opens up a possible route to modeling telepathy. Those two considerations warrant making an effort to think through how the theory of consciousness might offer a naturalistic explanation of telepathy.

Despite the popularity of the concept, telepathy is not a well-defined phenomenon. It is commonly thought of as the direct transmission of mental images or thoughts between minds. This will not do. The term "transmission" etymologically and logically indicates that the images and thoughts pass through the intervening space between one brain and another. As I argued in Part I, however, consciousness cannot be ascribed a spatial location; therefore, it cannot be said to be transmitted through space. Conversely, if conscious images "transfer" instantaneously from brain to brain, then they would run foul of non-simultaneity in Special Relativity. Besides that fundamental objection to the standard notion of telepathy, there is also the "navigation problem": if the sender's brain is beaming out waves of "psychic energy", how is it going to locate the intended recipient, and how will the recipient pick out the sender's intended messages from those of the billions of other human brains on Earth? These objections undermine the standard concept of telepathy as an energetic phenomenon. An alternative conception is that telepathy involves the direct sharing of phenomenal content between two nonphysical, nonlocal minds without anything passing through the physical space between the corresponding avatars.

The evidence for telepathy in controlled experiments does not reveal a very large effect size, but it is statistically significant. Radin (2003) reports telepathy success rates of 10 percentage points above chance. Skeptics say that it can be ignored because the effect size is small, but that is a *non sequitur*. If the effect is real, there is no obvious reason it couldn't be engineered to a higher reliability. For comparison: Becquerel's first photovoltaic cells were 1% efficient; by the 1950s, 6% was achieved; now they are 40% efficient and industrially significant.

In this connection, two interlocked problems face the portal theory: to explain why monozygotic twins don't simply have a single sensorium, as the basic theory would predict, and to explain telepathy between people in general. The mechanisms are not necessarily the same.

The evidence for the relative strength of the telepathic effect in monozygotic twins compared to other subjects is doubly uncertain, as we are comparing two statistical effects, neither of which is particularly large. Furthermore, the smaller population of monozygotic twins limits the options for large, statistically useful trials. For example, Parker & Jensen (2013) studied telepathy in four pairs of twins, but this does not tell us the effect size. Most of the evidence is anecdotal, and this certainly indicates stronger telepathy in twins, but we must await the development of more powerful experimental protocols to get more robust evidence.

Meanwhile, we can address the conceptual problem. In the DNA portal theory, all conscious sensory impressions in both brains must pass into a single mind. How is each twin aware only of the sensory impressions of one brain?

This is similar to the split-brain case. In the analysis that has been formulated by Pinto for split brains, the sensorium is split, preventing direct comparisons across visual hemifields, but the impressions feed into a single conscious mind with a single conscious agency. Before the split, the mind would have one body-image, or schema, for a whole body, and the conscious rendering of sense-impressions from each hemisphere will naturally fit into the correct place in the body image. After the split, we can assume that the whole body image persists. Assuming that the access consciousness (using Block's concept (Block, 1995)) is governed by the body image, we would expect sense impressions of both hemispheres to be accessible by the single mind. In other words, each hemisphere of the split brain would continue to map its sense-data into its own half of the body image. On the other hand, each twin would have its own whole-body image. A single conscious mind would therefore not be able to comprehend sense impressions from both hemispheres at the same time. We can compare this "body image rivalry" to binocular rivalry. Hold your finger up near your eyes and focus on the distant background. The image of the finger is not solid, but patches of it show up against the background. The visual field cannot show two different things at the same position and at the same time (Sterzer & Rees, 2009). Likewise, the joint conscious mind of the twins cannot place both streams of registrations in a single body image. So the sense-impressions form two exclusive sets. Each twin's brain would interact with just its own body-image, in what might be termed "bicorporal rivalry". Sudden, emotionally charged experiences might breach this barrier. Experimental work on twin telepathy has focused on this kind of impression. This model applies only to telepathy in monozygotic twins. A more general model of telepathy could be developed, but it is outside the present scope.

2.10. Artificial Portals to Artificial Consciousness

There is nothing supernatural about human brains or human DNA. According to

the theory outlined above, every quantum superposition shows up in the domain of consciousness, but almost none of them show up inside minds. First, in order to latch on to a particular mind, the "portal" that is in superposition would have to be complex enough to be unique. We can certainly imagine artificial macromolecules that could serve this purpose. Second, the portal would have to be embedded in an information processing system whose inputs and outputs can systematically be mapped onto the possible states of such portals. A sensorimotor interface of that kind is needed for embodying an artificial conscious mind in a machine.

Using artificial portals to program an artificial mind requires understanding the motive force of the mental domain, for without that, we cannot predict state changes within an artificial mind. This is discussed below (§5.1).

A potential side-benefit of engineering artificial consciousness is that we could transmit data between portals without passing through the intervening space. As a communication device, a "telepathy machine" would have considerable advantages. It would achieve light-speed communication without hindrance from intervening masses such as buildings or water bodies, or the diminishing effect of the inverse square law.

How, in principle, could we evaluate artificial consciousness in an information processing system?

- If the system is deterministic, then we know that it embodies no consciousness. This is irrespective of how much intelligence it has, or what score it has in a metric such as IIT (Integrated Information Theory).
- If the system's output depends on quantum wave function collapses, then we can infer that it is showing up in the consciousness domain, at least as isolated experientiae. But if the objects whose states are collapsing are standard circuits that exist in other devices, such as a standard quantum computer, or used in a time-share, then those conscious experientiae will be drowned out in the noise from all other instances.
- If the system's output depends on quantum collapse in macromolecules that are unique to that system, and have been produced from a common ancestor macromolecule, then the associated experientiae might form a mind. At present, the only way to tell would be to see whether the system exhibits purposive behavior that is governed by those collapses. If it does, then we can infer that the system has embodied an artificial conscious mind that is endeavoring to achieve something.

This is valid as an in-principle account of evaluating artificial consciousness, but is insufficient to develop an experimental protocol. We will need to build tools for consciousness engineering, but this requires determining the structure and dynamics of the domain of consciousness, which is some way off.

3. Free Will

We seem to have free will, but how could it fit into our understanding of the na-

ture of reality? Within mental monism, a solution to the conundrum falls out as a natural consequence of some straightforward premises, even though Berkeley, the key advocate of mental monism in Western philosophy, did not develop it.

The two main positions in the debate over free will face formidable difficulty: on the one hand, simple denial contradicts everyday experience, while on the other hand, acceptance has to explain how it is reconciled with causal closure and, more fundamentally, how free will differs from determinism and randomness. A third position, "compatibilism", says that free will is real and not real.

Compatibilism generally rests on redefinition: the folk psychological notion of "free will" is redefined to be something unproblematic, which is then declared to have a real existence. For example, if a chain of deterministic cause and effect runs through an internal mechanism of some agent X, then it is "as if" it has free will. For example, consider these two cases: 1) You kick a robodog across the room. 2) The robodog decides to cross the room according to its onboard AI software that is searching for something, such as a power socket to plug into. The latter is supposed to be free will because the behavior resulted from something inside. But the robodog's program was implanted by an external agent, namely the computer programmer. More generally, the distinction between external forces and internal causes is arbitrary, as the sum of its internally generated behavior can be traced to a combination of external forces from the entity's creation plus all of the inputs it has received over its lifetime. If those constituent causal chains are deterministic, then the entity's behavior as a whole must likewise be determined. List (2019) has advanced a form of compatibilism based on emergent levels of description. At a high level of description, the state of an entity might not be determined by its prior states *at that level* of description, even though the same system at a microphysical level of description is determined. He claims that free will is real at that higher level of description. That, however, is simply not what "free will" means in normal usage. If a deterministic entity seems free from the outside because we cannot discern its determining forces, it is nonetheless still deterministic.

3.1. Benjamin Libet's Experiments

In the early 1980s, Professor Benjamin Libet at the University of California in San Francisco conducted a series of experiments that supposedly tested whether we have free will (Libet, 1985; Libet et al., 1983). His results are widely quoted as proof that free will is an illusion, and yet the experiments actually say nothing about free will.

In the most cited experiment, a subject has to press a button whenever s/he felt like it. Libet attempted to cross-reference the time of volition with the time at which the neural process of pressing the button started. For the former, he asked the subject to watch a dot moving around an electronic "clock" display, and make a note of when "he/she was first aware of the wish or urge to act". Let's call that the "Noticed Time". At the same time, Libet would monitor the subject's brain activity with an electroencephalogram (EEG) and note the start time of the elec-

trical activity in the motor cortex that would lead to the finger press. He found that the electrical activity started about 300 ms before the Noticed Time. Libet, and his many followers, interpreted the result thus: the brain makes a decision to act, and a third of a second later, the mind picks up on this and mistakenly believes that it was responsible for the decision.

The flaw in Libet's experimental protocol is that he is not measuring the time of volition itself. He is recording when the subject becomes aware of the volition, but obviously, the volition must precede the awareness of the volition. The timeline is like this:

T = 0

- The conscious mind exercises volition to decide to press the button.
- This flips a quantum superposition in a portal in the brain.
- It triggers an electrical activity in the motor cortex lasting 500 ms.

T = approx. 250 ms

- The clock reaches the Notice Time.
- The visual signal proceeds from the retina to the visual cortex.

T = approx. 300 ms

- The visual perception of the clock showing the Noticed Time enters the conscious mind.
- An awareness of the forthcoming voluntary action enters the conscious mind.

T = approx. 500 ms

- The finger presses the button.

An act of volition is not an item in the sensorium. It is an action of the subject, not an object of the subject's awareness. There is no quale of volition. Just as the mind gains an awareness of sensory impressions entering the brain, so it also gains an awareness of incipient motor events. The mind does not perceive the volition itself; it perceives the result of the volition.

There is no way that Libet's experimental protocol can yield any information about the exercise of free will. To get a handle on this phenomenon, we have to go back to first principles. As I have argued earlier, the conscious mind embodies itself in physical objects such as brains by, in effect, measuring and hence collapsing quantum wave functions in what I have called "portals" in the brain. These nondeterministic events reveal the trace of a conscious mind.

This is the only test within the physical realm: Monitor a system (be it a brain or a computer) and see whether it exhibits meaningful, purposive behavior that is steered by nondeterministic collapses of quantum wave functions.

3.2. Free Will versus "Random" Events

What is the difference between events that are produced by free will and merely random noise? In the physicists' worldview, everything that happens is either determined from antecedent states and rigid laws of physics or it happens by random chance. There is no third category. The same dichotomy, we are told, arises in the mental world. A mental event is either deterministic, driven by some laws of con-

sciousness, or it is random chance. What is free will supposed to be, if it is neither deterministic nor random?

Let us consider more closely: what does "random" mean in the framework of mental monism? In this framework, all that exists are conscious minds, and everything that happens is a mental action. So, any so-called random event is actually a volitional act by some mind, but it is a disconnected mind, not a mind that is engaged in pursuing some purpose. The difference between a mental event that we would describe as "random" and a mental event that we would describe as "free will" is not absolute but a matter of degree. We tend to say that a pattern of events reveals free will at work if it is meaningful or purposive. But those events are of precisely the same nature as events that we tend to call "random" just because they are haphazard. Deterministic events are also mental actions, which were originally free in their inception but have been carried forward in time.

There is ultimately only one kind of mental event: whether we classify it as random or volitional depends entirely on context.

This understanding of all events in the universe being driven by a mental force was found in the Advaita Vedanta (8th Century CE). "Thou Art Brahman" and "Thou art that" are two of the Mahavakyas or "great sayings", and they mean that everything that happens—be it seemingly random, or willed by a person, or determined by laws of nature—is an act of the universal consciousness, or Brahman. We do have personal free will, and, as we are numerically identical to Brahman, our actions are also the free will of Brahman. It all boils down to the same thing.

4. Micro-Telekinesis

Micro-telekinesis is the reported phenomenon in which a conscious mind apparently affects microphysical processes. Rather than offering an assessment of the controversial laboratory experiments of micro-telekinesis, I will merely address this conjectural question: If micro-telekinesis is real, *then c*ould the theory of portals offer a framework for a naturalistic theory of the phenomenon?

4.1. Anomalous Effects of Conscious Minds

There is a general class of phenomena loosely termed "anomalous" or "paranormal", in which conscious minds apparently bring about observable results that should not be possible by any standard physical account. Three principal phenomena are telepathy, telecognition, and telekinesis. The conventional, pre-scientific definitions are as follows: telepathy is the transfer of thoughts between minds; telecognition (aka remote viewing) is the transfer of perceptual information from a remote target to a conscious mind; and telekinesis is the remote causing of physical changes by a mind. None of these definitions is satisfactory because they already presuppose a mechanism, which is not part of what is actually observed and, I shall argue, is not likely to be the actual mechanism.

Here, I will consider only telekinesis, and specifically micro-telekinesis, which is evidenced in random-number generators ("Macro-telekinesis" is moving visible

objects such as cups, or bending spoons. "Micro-telekinesis" is affecting electrical circuits, normally random number generators (RNGs)).

The usual protocol is that the subject sits with a machine that outputs 1s and 0s on a genuinely random basis produced by a quantum process. The subject tries to change the ratio of 1s and 0s away from the physically predicted ratio of 50/50. Results have been reported in which there is a statistically significant deviation from the null hypothesis of purely random 0s and 1s. Meta-analyses of sets of such studies provide *prima facie* evidence that there are statistical anomalies being observed in these RNG trials (Radin, 1997), but unfortunately, this field attracts commentators who seem to be concerned more with defending preconceived opinions than with open-mindedly investigating the reported phenomena.

The naïve conception of telekinesis is that the conscious mind reaches out of the cranium and acts upon the world "out there". In the case of micro-telekinesis, it is supposed that the mind reaches into the circuitry of the RNG (Random Number Generator), figures out the logic gates, and tweaks the flow of electrons so as to yield the required imbalance of 0s and 1s. Rupert Sheldrake (2003) would have us picture an "extended mind" as a field, like a kind of squidgy ectoplasm, spreading out from the brain tissue and navigating through other physical structures.

None of these conceptions are tenable. Any such "mental field" would have to interact with matter to be effective, in which case it would be detectable by physical instruments in the intervening space between the brain and the target, yet no such detection has been made. If the influence is transmitted by some novel kind of energy radiating out from nervous tissue, then it would be subject to the inverse square law, yet one of the few consistent results of parapsychology is that the success rate is invariant with distance. A radiating energy would also be blocked by a Faraday cage or large blocks of matter. For if the putative energy can interact with the substance of the RNG device, then it would also interact with and be blocked by barriers of similar substance. There is no evidence of directionality: the subject does not have to orient her head toward the target, nor even know where the target is. Finally, and crucially, the supposed mind field would have to be smart enough to understand the electronic circuitry and tweak the operation just so as to change the output. In a pivotal series of experiments, researcher Helmut Schmidt developed what he called the "Equivalence Hypothesis": the success rate of micro-telekinesis is not affected by complicating the RNG circuitry (Schmidt 1987). All these factors make the notion of the mind affecting the machine highly implausible.

In one particularly intriguing set of experiments that Schmidt carried out, and others have replicated, "retro-telekinesis" is reported. Instead of the 1s and 0s being observed in real-time as they are generated and the subject is concentrating on them, the binary digits are recorded on a tape, which is stored overnight, and the subject concentrates the next day before the tape is read. This protocol makes no difference to the success rate. Obviously, no influence can go back in time, even though it appears to do so. Instead, this is an extreme application of Schmidt's Equivalence Hypothesis, and it points toward the locus of action being in the mind

of the observer, not somewhere "out in the world".

Regarding "mind fields" proposed by Sheldrake, there are strong philosophical arguments (Lloyd, 2026) that the conscious mind is nonlocal, that is, not situated in space at all, and hence certainly not smeared out over physical space in a field.

Dean Radin, a prominent figure in parapsychology, also dismisses the naive idea that the mind sends forth beams of "psychic energy". Instead, he argues that it is more like a correlative relation than a causal one (Radin, 1997, 2006).

Radin has proposed that there is a quantum mechanical basis to micro-telekinesis, but has not offered any specific pointers to what such a theory would look like. In interviews, he has sometimes made comparisons with the quantum entanglement of coherent particles, as in the famous EPR (Einstein-Podolsky-Rosen) thought experiment (Einstein et al., 1935). This is a non-starter, as the subject's brain and the RNG machine are not in a conjoined quantum state to begin with, and even if they were, the circumjacent air would decohere them extremely quickly. Decoherence scrambles the phases of wave functions, so that the waves become independent. We can therefore rule out coherent entanglement as having anything to do with micro-telekinesis.

Radin also says that quantum entanglement, *per se*, is the answer. We are all entangled with one another, and with the whole universe. So what? Whichever interpretation of quantum mechanics is favored, the universe as a whole has a wave function, and our brains are parts of it. But to go from that basic fact to any account of paranormal phenomena is going to require some theoretical work. Sadly, the required theoretical work seems to be lacking from Radin's many published works.

Radin acknowledges that the conscious mind must play an active role in collapsing quantum superpositions, and contrasts this with Hameroff and Penrose's epiphenomenal theory of consciousness generated by wave function collapse (Radin & Kauffman, 2021: p. 16), but he provides no model beyond, "Mind […] is the means by which quantum potentials are actualized" (ibid.: p. 17). Radin leaves the matter in the same vagueness that von Neumann left it: consciousness collapses quantum superpositions, but the questions of where, when, and how it does so are not addressed. He admits that he has no answer to the Hard Problem, mentions panpsychism as a possible ontology, but elsewhere insists that consciousness is nonlocal, which is the opposite of panpsychism.

What is clear is that there is no plausible physical mechanism, classical or quantum, for the conscious mind to act upon the RNG machine. If the phenomenon is real, it is weirder than that.

4.2. Quantum Entanglement and Volitional State Reduction

If we provisionally accept the experimental results of micro-telekinesis experiments, then we need to think outside the box to find a logically possible mechanism.

The more interesting micro-telekinesis experiments use quantum tunneling

and radioactive decay as the source of randomness in inherently nondeterministic quantum events (See experiments by Schmidt (1987) and PEAR (2007)). The source system will go into a superposition (of, say, emitting a radioactive particle or not). When it is measured, the measuring apparatus will be entangled in the same superposition. Likewise, when a human looks at the read-out from the device, the human brain will also go into superposition. Everything that interacts with the apparatus will also go into superposition, which basically means the whole universe. (Ignore people who say that decoherence explains the apparent collapse. It doesn't. Decoherence limits the wave function to a superposition of "pointer states", that is, states that are macroscopically sensible. But it is still a superposition. A further ingredient is needed to trigger the collapse).

It may seem outrageously weird that the universe goes into superposition because of one quantum event. But that's what mainstream physics has been telling us for many decades. What happens next, however, is a matter of acrimonious debate. According to the standard Copenhagen Interpretation of the quantum mechanics formalism, the superposition will suddenly collapse into just one branch when an "observer" measures it. The details of this were never clear in the Copenhagen Interpretation: Precisely what counts as an "observer"? Precisely where, when, and how does the superposition collapse? The general view among the founders of quantum mechanics was that the consciousness of the observer did the collapsing, but as there was no specific theory of consciousness or how it did this trick, the problem was put into abeyance by those who proclaimed "Shut up and calculate!"

As I mentioned above, the Many-Worlds Interpretation can be dismissed as it precludes the operation of free will, and we are left with the Copenhagen Interpretation. So, each time one of the random digits, 0 or 1, is produced, the universe forms two branches, and the conscious mind somehow reduces this superposition back to a simple state. The Born Rule defines the probabilities of the different outcomes from a quantum measurement, but it does not say that the outcome must otherwise be random. The conscious mind could temporarily adjust the Born rule for a limited time and then correct the imbalance. Or, alternatively, it could adjust the Born rule and just not bother to reset the balance. In which case, a statistical imbalance would be observable, which is precisely what is reported in telekinesis experiments on RNGs (random number generators).

Cucu (2020) has suggested that it is not just the Born rule, but energy conservation that could be violated if consciousness were to intervene in the collapse of a superposition. Computing the expectation of energy involves averaging the energy of each superposed branch, and that expectation will be impacted by the collapse of the superposition. To say that that is a violation of the conservation of energy would be misleading, since there is no actual value of energy before the measurement: in whichever branch is selected, the portal has the same energy before and after measurement, it's just that all the other branches that contributed to the expectation have vanished.

4.3. Micro-Telekinesis and Portal Theory

According to the theory I have been developing here, the conscious mind triggers the collapse of the DNA macromolecule. This would happen at the point in the brain's perceptual process where the subject consciously perceives 0 or 1.

In Lloyd's model, acts of conscious perception and acts of volition are ontologically the same. It is just that they play a different role in the activities of the mind (Lloyd, 2020). Every perception involves a decision on which branch of a superposition to adopt. So, in the case of an RNG experiment, the brain (including the DNA portals therein) is placed in a superposition of the two outcomes, seeing "0" and seeing "1". The metamind chooses which branch to keep. If this low-level decision-making can be steered by the personal mind instead, then the subject can choose whether there was a 0 or a 1.

Notice that this does not involve the mind acting upon the RNG device. Quantum mechanics puts the universe into a superposition of two states (according to standard quantum mechanics); and the conscious mind collapses that to one state (according to von Neumann's theory); but with suitable training, that action might be made volitional and can be deliberatively steered (according to the present theory). Of course, it seems outrageous to suppose that the subject's mental intention collapses the wave function of the whole universe, but that's just the weirdness of quantum mechanics.

One elegant aspect of this theory is that it does not posit any new mechanism to explain micro-telekinesis. The model that I have proposed for accounting for the embodiment of a conscious mind in a brain also serves as a model of micro-telekinesis.

When it is viewed this way, the existence of micro-telekinesis is established every waking moment of the day. Whenever you make any voluntary movement, your conscious mind causes a change in the micro-electrical activity in your brain, which causes the intended movement. What is that but micro-telekinesis in your own head? Our minds have developed a skill in the specific micro-telekinesis that is involved in controlling bodily muscles, but there is no fundamental reason why it can't be trained to extend to collapse the wave functions of external observation, such as RNG data. Whether that is psychologically practicable is another matter, but I do not see any fundamental limitation.

Telekinesis must take place in the sensory cortex, not the motor cortex, where voluntary actions are embodied. Recall that in voluntary acts, the brain will place the portal into superposition of two states, which would lead to two different actions; and the conscious mind collapses that superposition, thereby triggering one or other of those two actions. In the perception of the result of a quantum event (which could have outcomes X and Y), the environment will cause the brain to go into a superposition, with one state causing perception of state X and the other causing perception of state Y. The conscious mind collapses the superposition, leading to one perceived result or the other. Normally, this is not under voluntary control. It would require effort and training to be able to collapse the wave func-

tion in the sensory cortex.

5. Architecture of the Mental World

Lloyd (2020) has proposed a low-level automata-theoretic model of the domain of consciousness, which takes the experientia as a basic unit that is both volition and experience. Here, I want to take that model as a starting point and discuss the higher-level architecture of the mental world.

5.1. The Motive Force of the Mental World

In the mental monist framework, where minds alone exist, with no substrate, what mental force drives mental operations? I will propose a tentative answer, which fortuitously aligns with ideas from Nagel (2012) and others.

In the physical domain, energy and entropy are the engines that drive the world forward. In the domain of consciousness, we have neither physical energy nor thermodynamic entropy. What conservation law fuels the engines of conscious minds? What principle can yield an arrow of mental time?

In Newtonian physics, the notion of billiard balls traveling through space because they have kinetic energy sounds like a very natural way to express what is happening, but in fact, it is anthropomorphic. The ball's moving through space is *the same thing as* having kinetic energy. The energy does not "power" the movement, nor does it "make" the ball move. In the physical construct, objects have relative positions, and those positions change, and the so-called "energy" is an abstract way of quantifying the motion that happens to be conserved, as is momentum. In a collision between two billiard balls of mass M_1 and M_2, the velocities V_1 and V_2 are not conserved, but momentum $M_1V_1 + M_2V_2$ and energy $M_1V_1^2 + M_2V_2^2$ are conserved. This leads us to reify momentum and energy: we think of them as things, almost like fluids, even though nobody has ever seen any momentum or energy. They are just abstract ways of describing motion, which lend themselves to reification because they are conserved.

So, when we think about the domain of consciousness, we should stop looking for "mental energy" and think instead of conserved or persistent features that could provide structure among phenomenal experiences, so that they don't disintegrate into chaos.

My conjecture is that what is conserved is the whole set of experiences, like a mental blockchain. In conventional blockchains (Nakamoto, 2008), each transaction is retained perpetually, and new transactions are added like a palimpsest. My hypothesis is that the conscious mind retains all previous experiences, even though they are not readily accessible, and those experiences constrain what is possible going forward. In the metamind, the laws of nature are earlier decisions that persist as constraints on actions, which persist in perpetuity. In technical terms, the mind is maximally non-Markovian.

In a Newtonian world, let us replace billiard balls with glass balls that shatter on impact. It is easy to see how the Second Law of Thermodynamics emerges. A

macroscopic structure, such as a glass ball, comprises very many atoms. If the forces keeping them in place are broken, all the individual atoms will jiggle around according to their kinetic energy in random directions, still preserving energy and momentum in each interaction. This is seen on the macroscopic scale as an inexorable increase of entropy, and in fact, this is the great propellant of our world. This is what drives life forms: low-entropy energy from the sun is converted into the higher entropy of waste products and eventual corpses of plants and animals.

In the proposed model of the mental domain, the basic constituents are not free to wander in space as they do not live in space, but are constrained within the mental blockchain. The disintegration of large structures into flocks of small structures, which is a characteristic feature of the physical world, does not occur at a fundamental level in the mental world. As new experiences occur and constrain future additions to the great mental blockchain, in each interaction, the ordered structure grows. If "mental entropy" is a measure of structural disorder, then it is monotonically decreasing in the metamind, which in this respect resembles a crystal.

Consciousness's trend toward lower mental entropy *might* play a role in evolution. The fact that we can imagine that life evolved through random mutation and natural selection does not imply that that is the sole mechanism. Following Nagel's speculations (Nagel, 2012), we could imagine that the monotonic decrease in mental entropy could transfer into the physical domain as local reductions of thermodynamic entropy, and accelerate evolution by guiding mutations, not through teleology as Nagel suggests, but just by selecting for persistent structure.

5.2. Macro versus Micro Levels of the Metamind

Does the metamind simulate the physical construct at a micro level (say, vibrations in quantum fields) or at a macro level (tables, people, planets)? At least sometimes, it must operate at a micro-level; it would not be able to work out macroscopic properties that depend on microphysical processes. For example, why would the metamind render the sky as blue unless it had already worked out that Rayleigh scattering in the atmosphere differentially refracts different colors (Rayleigh, 1899)?

On the other hand, the existence of personal minds as macroscale primitives shows that the metamind can also contain macroscopic entities. Further tentative support for this comes from the apparent existence of "dream characters". Pioneering research by Tholey (1989) indicates that the characters in lucid dreams may have their own conscious minds. See also Holzinger (1990) and McNamara (2016) for further discussion. This has not yet been replicated by other researchers, but if correct, it would indicate that nature has the means to generate new minds with relative ease. Even without dream characters, the existence of personal minds shows that the metamind is capable of accommodating both micro- and macro-level entities. How and when does it develop aggregate macro entities? As an analogy, artificial image rendering software adopts a hybrid approach of carrying out deep learning on ray-traced images (Feng et al., 2026), but that seems too con-

trived to serve as a model of the metamind. What I want to suggest is that macro structures in the metamind emerge as a natural result of its informatic architecture.

5.3. An Object-Oriented Architecture

Human software engineers and the Metamind face the same problem: how to run an immersive, multisensory, three-dimensional virtual world? In seeking to reverse engineer the metamind, a plausible starting point would be to suppose it might have an architecture similar to that used by human engineers. So, I want to explore the hypothesis that the metamind is an object-oriented information processing system that generates the physical construct and renders it in a sensorimotor manifold in our personal minds. There are four main pillars of this kind of architecture, as follows.

- Abstraction: The software comprises "objects" that encode the properties of virtual objects. For example, the virtual objects around you—desks, chairs, laptops—have some properties in common: they occupy fixed volumes of space, they are opaque and tangible, they resist motion, you cannot put your hand through them, they require a push to move, they fall to the ground with gravity, and so on. These general features are encoded in a "parent" object, which is instantiated in "child" objects. Each child object adds specific attributes to the generic parent. A "root" object is featureless, while its successive descendants are increasingly enfeatured.
- Encapsulation: The software "objects" are self-contained and include data and methods, which are functions specific to that object. An object's data and methods may be private or public. "Private" means only that object, or instantiations of it, can access them, whereas "public" means that other objects can access them.
- Inheritance: The world is made up of objects that have many instantiations, with properties of parent objects being inherited by the descendants.
- Polymorphism: This refers to a feature of Object-Oriented Programming (OOP) languages, in which an operator can have multiple forms depending on the object it is acting on.

To avoid the confusion between "informatic objects" and "physical objects", I shall use Berkeley's term "archetype" to refer to the posited objects in the mental domain. The human mind is encapsulated, insofar as it is a self-contained system with private contents, and it has public "methods", i.e., functions for sensorimotor input/output. When you dream, the characters and inanimate bodies that you encounter in your dream appear to be encapsulated sub-systems, as their inner workings are opaque to you as a dreamer, even though they exist within your mind. And they evidently have built-in public methods, as you can perform actions upon them in accordance with their affordances: you can talk with people, open doors, climb steps, jump into water. The physical construct contains vast numbers of small things, down to atomic and sub-atomic scales. It would be a simplifying assumption to suppose that the common attributes of these things are defined just once, in an

abstract parent archetype, and each physical specimen (of, say, a proton) is an instantiation of that parent archetype, containing a representation of its particulars (position and momentum), and inheriting the common features from the parent. My suggestion is therefore that the metamind is built up from archetypes analogously to an object-oriented VR system.

In mental monism, there is no ontologically real space: the mental entities cannot move around and bump into one another. The only way that they can communicate is by possessing some inbuilt linkage. If all archetypes in the domain of consciousness inherit from common ancestors, this provides the necessary inbuilt linkage, a means of connection without invoking the notion of proximity in space.

Inheritance is also a crucial feature for persistent structure in a mental monist architecture. There does not appear to be any obvious analog of physical energy in the domain of consciousness. Instead, I suggest that the persistence of structure is achieved by inheritance from parent archetypes to child archetypes. As I suggested in an earlier paper (Lloyd, 2020), the base layer of the domain of consciousness operates like a minimal substrate-free cellular automaton, with a creation operator but no deletion operator. So, the universal cellular automaton grows perpetually, always inheriting features from parent objects, tracing back to an initial root object, which is analogous to Brahman in the Advaita Vedanta.

If the metamind were a detailed simulation of the physical construct, then there would be no need for polymorphism in our model of consciousness. As discussed above, however, there is reason to believe that at least some archetypes are macroscopic. If that is correct, polymorphism would be required in the inter-mental messaging.

How could macro-archetypes emerge? By applying the conjecture of reducing mental entropy, we would expect complex assemblies of micro-archetypes to be supplanted by simpler macro-archetypes. When you throw a ball in a parabolic arc through the air, the metamind does not compute the trajectory of every rendered atom in the ball, but replaces the flock of micro-archetypes with a single macro-archetype of the ball and computes the trajectory of its center of gravity. I suggest there is an incessant interplay: macro-archetypes emerging as dictated by entropy reduction, and resolving back into micro-archetypes when it is broken apart by an agentic archetype, that is, a person.

Finally, this model provides a route to understanding nonlocal entanglement, as in the famous EPR (Einstein-Podolsky-Rosen) thought-experiment (Einstein et al., 1935). In this experiment, two particles, A and B, are put into entangled states (that is, their wave functions are coherent) with, say, opposite spins. They are sent to remote locations, where Alice and Bob measure the spin of A and B, respectively: the individual spins are nondeterministic, but they must be opposites. In the popular account, if Alice measures A first and finds it spin up, then this nonlocally "causes" B to be found to be spin down when Bob measures it. And *vice versa* if Bob measures first. This account is wrong because under Special Relativ-

ity, there is no objective, physical sequence of Alice and Bob doing their measurements: in some inertial frame of reference, Alice measures first, and in others Bob measures first. In the mental monist framework, however, we can suppose that the two particles are local renderings of two archetypes that are instantiations of a single parent archetype, and that the allocation of spin to A and B is contained in the parent, along with a method for arbitrarily making the allocation. As I have argued in Part I (Lloyd, 2026: §2.24), the time dimension of a mental structure maps to the proper time of its physical embodiment, and all mental systems align with universal mental time. So, whichever particle is measured first in proper time, it triggers the parent archetype to allocate spins arbitrarily, and the other particle will render its half of that allocation. Thus, an object-oriented mental monist framework could model remote entanglement without recourse to superluminal communication or "spooky" action at a distance.

6. Conclusion

This paper starts from the premise of mental monism, namely that reality comprises only conscious minds, and the physical world is a "construct" grounded in the regularities of conscious experience, these regularities being driven by a background conscious mind, referred to as the "metamind". I have sketched how a conscious mind could interact with its "avatar" in which it is "embodied" in the physical construct.

As the physical world in general, and the avatars in particular, obey the laws of physics, a conscious mind is able to interact with its avatar only through gaps in the causal closure that are nondeterministic physical processes. The structures that execute this interaction I refer to as "portals". It is proposed that, *in vivo*, the physical component of the portal is a macromolecule that is unique to the individual, and that communication is achieved by the brain's placing the macromolecule in a quantum superposition, and the conscious mind collapses the superposition. In the case of voluntary action, the portal is situated in the motor cortex, and the outcome is under volitional control; in the case of perception, the portal is situated in the sensory cortex, and its outcome is not normally under volitional control. It is speculated that, *in vivo*, the macromolecule is DNA and that biochemical pathways exist for the DNA's state change to affect neural firing.

As a side benefit, the proposed mechanism would also resolve the measurement problem of quantum mechanics by identifying a mechanism for collapsing the quantum superposition.

It is speculated that machine consciousness can be achieved by building into a computer portals of the same type that are proposed in the brain, using artificial macromolecules instead of DNA.

What I have presented here is not a complete theory that we could test tomorrow. Rather, it comprises pointers to how the basic theory of mental monism, which I articulated and defended in Part I, could be developed into a complete theory of mind-body interaction.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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