A Quantum Monadological Solution to the Measurement, Consciousness and Qualia Problems

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ABSTRACT

The measurement, consciousness and qualia problematics are intertwined: all hinges on the failure to "deconstruct" world, consciousness and qualia. Physical reality is quantum at all scales, whereas world is dis-closed in parallel at unique addresses: thrown existence is monadological. Two categories of solution to the measurement problem are distinguished and analyzed: spontaneous decoherence theories and selection by match theories. A new interpretation of the Schrödinger wave function as representing the quantum brain's "self-tuning" is proposed. Quantum neurophilosophy and neuroquantology within the framework of thermofield brain dynamics support an integrated solution to measurement, consciousness and qualia problems.

Key Words: measurement problem, consciousness problem, qualia problem, thermofield brain dynamics, deconstruction, Schrödinger wave function, quantum neurophilosophy, neuroquantology, quantum brain theory

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> The very best quantum-foundational effort will be the one that can write a story — literally a story, all in plain words — so compelling and so masterful in its imagery that the mathematics of quantum mechanics in all its exact technical detail will fall out as a matter of course.
>
> *Christopher Fuchs, quoted in Ball, 2013.*

1. Introduction

The foundational "measurement problem" has long vexed physics. There is no consensus intuitive understanding of why quantum theory works so well (Aronson, 2013). Nor is there consensus on what the quantum state represents: physical reality or the observer's expectations regarding physical reality. Since the objective and subjective interpretations of the quantum formalism still cannot be decided, this raises the possibility that there is some deep erroneous metaphysical assumption common to both.

The measurement problem was given a vivid formulation in Schrödinger's (1935) famous *gedanken* experiment, which contrives to superpose a live *cat* with a dead one, which is, superposed until an observation is made and the superposition collapses to a dead cat *or* a live one. Remarkably, scholar.google delivers over seven thousand references to "Schrödinger cat" in the last five years!

Leggett (2002; R421) observes that unitary evolution of such a superposition is "a very fundamental and non-negotiable ingredient of the quantum mechanics (QM) formalism." Although we do not anticipate clear resolution of hoary philosophical issues, such as

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the consciousness and qualia problems, we do expect much more of physics with regard to a fundamental and non-negotiable issue.

Nonetheless the recent "Oxford Questions on the Foundations of Physics" (Briggs et al., 2013) considers the measurement problem to remain the "first cloud on the horizon of physics both present and future" (p. 6). This persistent problem is defined as

> "the difficulty in explaining completely, in terms of quantum theory, *the emergence of a classical world*, i.e. a world so accurately described by classical physics with its definite values—a world free of superposition and entanglement." (Briggs *et al.,* 2013; p.6, italics added)

The central aim here is to resolve the measurement problem by *deconstructing* this "emergence of a classical world," which these authors, like physicists in general, take for granted.

According to an early solution proposed for the measurement problem (von Neumann, 1932; Wigner, 1979), "consciousness" plays a decisive role. Yet consciousness, too, is very deeply problematic: the relationship of consciousness to the physical world has been with us and exhaustively argued since the 17th century when the term 'consciousness' first came into use (Globus, 2013a). The closely related problem of "qualia"—the "raw feels" of experience (Feigl, 1967) such as the smell of burning leaves or the sound of a champagne cork popping—also remains open. However there is no hint of any consensus resolution in sight for the consciousness and qualia problems. Some would even declare *Ignoramus et ignoramibus* (McGinn, 1991), that we are ignorant about consciousness and qualia, and shall remain so. Scholar.google delivers over 150,000 references to the "consciousness problem" and over 7000 for the "qualia problem" in the last five years!

Persistently unresolved while much discussed controversies attract the "deconstructive" attention, which is ever alert for the taint of traditional metaphysics. Might there be some *meta-physical presumption* common to measurement, consciousness and qualia problematics, literally "hiding in plain sight" (to borrow Mender's (2013) felicitous phrase)? Perhaps the seemingly separate measurement, consciousness and qualia problems have a latent link that could resolve them all, a proverbial "killing three birds with one stone."

The entry of consciousness into the measurement problem can be seen most clearly in the von Neumann formulation where there is unitary evolution of the wave function, including within the stages of processing inside the brain, until some nonphysical consciousness finally comes along and collapses it. Wigner (1979) was confident on this point.

> "When the province of physical theory was extended to encompass microscopic phenomena, through the creation of quantum mechanics, the concept of consciousness came to the fore again: it was not possible to formulate the laws of quantum mechanics in a fully consistent way without reference to consciousness." (Wigner, 1979; p. 172).

Consciousness is involved in a different way for Bohr, cognitively rather than perceptually. Now the wave function describes the experimenter's probabilized conscious *expectations*. Probabilistic wave function collapse in the case of measurement is the certain fulfillment of one or another expectation. "Quantum Bayeseanism" (Fuchs, 2010; Fuchs *et al.,* 2013) is related to Bohr's conceptions. Here the probabilities of the Born rule are individual degrees of updated conscious belief rather than probabilities of what will be found on observation of the world. The Born rule in quantum Bayeseanism is cognitive rather than ontological.

The intimate involvement of consciousness in the measurement problem, according to the formulations by the very founders of quantum mechanics, arouse the deconstructivist suspicion that in some way the unresolved measurement, consciousness and qualia problematics are deeply intertwined. The deconstructive eye is attracted to such overlapping controversies as strategic points of incision into discourse. The postmodern approach of deconstruction (which has so febrilely deconstructed itself that no definition is even possible!) is highly suspicious that metaphysical presumptions lie hidden beneath deep and persistent problematics. That suspicion is explored here. We should anticipate that a unified resolution of measurement, consciousness and qualia problems will be counter-intuitive to the extreme, yet hopefully "a story all in plain words." If these problems could be resolved at one stroke, that very parsimony would lend credence to the solution.

The central claim of the present proposal is that the entirety of physical reality is solely under quantum description at all scales, from sub-Planck scale through the quotidian scale of everyday life, to cosmological scale. This claim is of course contrary to the evidence of common sense observation (which includes the readings of physics laboratory equipment): *physical reality is not worldly at any scale*, with one kind of exception. At certain addresses in space-time there are highly evolved macroscopic quantum systems where the ordinary quotidian human world is *disclosed in parallel* in accordance with quantum brain mechanisms. Here worlds are multiple ... scattered, parallel, monadic bubbles of quotidian Being. All worlds are intra-monadic. There is no public world-in-common whose pointer states any qualified observer might read off, but as Leibniz proposed in his *Monadology* (Rescher, 1991), there are monadological worlds-in-parallel. Leibniz, however, did not deny world altogether. He believed a compassionate God *thinks* an actual world (indeed, "the best of all possible worlds"), so that humans might not be completely deluded in their trust in world. Yes, we each have our own world within our windowless monad, according to Leibniz, but still there actually *is* a world thought by God which our images reflect. There are for Leibniz

> "continual fulgurations of the divinity from moment to moment, limited by the receptivity of the created being, to which it is essential to be limited." (Rescher, 1991; 162).

(The etymology of "fulguration" refers to lightning flashes which imply powerful intervention from above). In contrast to Leibniz, I propose *there is in fact no transcendent world but only multiple parallel worlds disclosed within scattered monadic "bubbles*." In sum: Physical reality is quantum at all scales, alleviated by local monadic world disclosure in parallel at the quotidian scale.

Our monadic states, for this formulation, are not states in which there is immanent-consciousness-of-transcendent-world but *existential states*, in which we always find ourselves *already* amidst some world or other, amidst Being. The state of existence (Heidegger's *Existenz* (1962; 1982; 1999)) is *always* to find ourselves (whenever we take notice) *already* amidst some world or other, which may include a pointer on a meter in a physics laboratory. That we must find ourselves in this way is our "thrownness" (*Geworfenheit*). Con-sciousness—which is literally a *knowing*-together, etymologically from *con-scieri* (Globus, 2013a)—should not be understood as perceptual but as reflexive, a higher-order *reflection* on states of disclosed existence. The core case of monadic *Existenz* is to be unreflectively engaged with a practical world disclosed within the monadic bubble.

So physical reality as quantum is in no way worldly. World is a monadological constitution. Since quantum physical reality is closed to our perception and unworldly—an "abground" (Globus, 2013b; Heidegger, 1999)—phenomenal world is conceived as a "dis-closure." (The hyphen in 'dis-closure' is intended to remind that unknowable, indeed inconceivable closure is primary (Plotnitsky, 2010).) *Quantum brain mechanisms dis-close thrown monadological existences amidst worlds in parallel.*

Consciousness, so exhaustively discussed in recent decades, is just a pernicious metaphysical habit deeply embedded in our very language, thinking and theory. It is no easy matter to deconstruct consciousness and succeed it by thrown existence. The consciousness problem dissolves in the monadological formulation in that there is no "consciousness of world." Instead in waking life (and often in dreaming too) we are always already amidst world. The monadological state is just this: to be encountering world. It is only when we reflect—the meta-physical trap—that we are "conscious of" world. Otherwise we just procede on our ways amidst it. If we are monads, then the ontological divide between immanent consciousness and transcendent world does not hold. Whatever happens existentially across *Daseins* is intramonadic dis-closures in parallel.

In summary: the present thesis is that reality is thoroughly quantum at all scales, from subatomic to quotidian classical to cosmological. World thrownness at privileged addresses is monadological. Consciousness is reflexive. *Existenz* is dis-closure.

Such a monadological solution to the measurement problem is consistent with both collapse theories and Bohr/Bayesean theories, combining the advantages of each. This solution is extremely counterintuitive—which we are accustomed to expect in quantum theory. It dissolves the problematics of consciousness and qualia, which although not conventionally a part of physics, lurk in the vicinity of the measurement problem. The monadological solution provides the ultimate deconstruction of common sense and its quotidian safety, thereby extending the astonishing revolution of quantum physics.

The next two sections discuss various solutions to the measurement problem. It has gone generally unnoticed that these well-known solutions fall into two categories. The first category highlights the familiar and currently ascendent spontaneous collapse theories in which coherence is transitory, and blind or quasi-blind chance rules the collapse to world. Collapse by selective match theories, which includes Copenhagenism, the Transactional Interpretation and two versions of Thermofield Brain Dynamics, are taken up in the following section.

2. Spontaneous Decoherence Theories

There have been many factors proposed to account for spontaneous decoherence of the wave function superposition to a von Neumann "mixture." For example, Ghirardi, Rimini and Weber (1986) introduce (essentially arbitrarily) a small nonlinear and stochastic component into the usual dynamics, which forces a collapse to one of the probability weighted alternatives. Pearle (1989) adds to the usual Schrödinger equation a randomly fluctuating anti-Hermitian Hamiltonian which brings about collapse. Penrose (1994) proposes that when a significant amount of space-time curvature is introduced, on the order of just one graviton, the quantum linear superposition of the wave function fails and one of the probability weighted alternatives actually takes place. Everett's (1983) "many worlds theory" is still a version of spontaneous collapse theory, but in which *each* of the superposed possibilities collapses onto an observable world.

Perhaps the most highly elaborated decoherence theory is that of Zurek (1998; 2005; 2007), which he calls "quantum Darwinism." Decoherence is formulated as

> "a process of continuous measurement-like interaction between system and an (external or internal) environment [which] invalidates the superposition principle in the Hilbert space of an open system" (Zurek, 1998; p.1796).

Here the continuous measurement-like interaction between the superposition and its environment brings about collapse to some pointer state. This event is almost instantaneous in the case of a macroscopic superposition such as the Schrödinger cat. It is a survival of the fittest "which in effect bars most of the states and results in singling out of a preferred stable subset of the einselected pointer states" (Zurek, 1998; p.1796). So Zurek's "Darwinism" is selectionistic in only a negative sense, which is why this measurement problem solution is grouped here with spontaneous decoherence theories.

> "Interaction with the environment destroys the vast majority of the superpositions quickly, and, in the case of macroscopic objects, almost instantaneously. This leads to negative selection which in effect bars most of the states and results in singling out of a preferred stable subset of the einselected pointer states." Zurek, 1998; p.1796)

The "selected" is only what is "left standing" so-to-speak after spontaneous decoherence, the Darwinian "survival of the fittest" after the ravages of decoherence.

Two tacit but crucial moves should be noted in these collapse formulations. Collapse theorists do not question consciousness, which is taken commonsensically, and do not problematize the world as object of consciousness. But a subtle and insidious assumption is that ordinary world objects like cats are at finest scale "really" composed of quanta. This is in line with the long historical sequence of scientific discovery, in which cats as ordinary world objects were progressively understood to be composed of cells, made up of molecules, and atoms, and ultimately subatomic particles. This widespread assumption that world objects are actually composed of particles is well illustrated by what at first blush seems an innocuous passage on crystals by Vitiello (2001).

> "But the crystal, is it a classical system or a quantum system? It is both! It is a macroscopic quantum system. In a trivial sense, any physical system is a quantum system since it is made up of atoms which are quantum objects. … *the crystal property is a classically observable property* … The crystal is thus *at the same time* a classical system and a quantum system." (Vitiello, 2001; p.14, italics original).

The same conception of the quantum domain is found in Penrose (1994).

> "We must think of it as the level of physical things that are in some sense "small enough," like molecules, atoms, or fundamental particles." (p.254)

Here world objects qua physical things are uncritically thought to be classical or quantum depending on the scale at which they are observed. World systems are "at the same time" classical and quantum as a function of how *we* look at them. However, if the observable cat is a monadological phenomenon, then reduction from world to quanta is a gross category mistake. If physical reality is quantum at all scales, then physical reality is not worldly, except within certain types of monad as a specific product of their operations. It is the deconstructive attitude, with its deep suspicion of commonsensical metaphysical residues that opens a new solution to the measurement problem.

3. Selection By Match Theories

The solutions to the measurement problem just discussed do not actively select the result of wave function collapse but are random, or in the case of quantum Darwinism, a winnowing of the possibilities. (In "winnowing" the wheat, the chaff is indiscriminately blown off, leaving the grain). *Selective matching is a cognitive process*. Cognition is a fundamental biological principle, as Loewenstein (2013) shows in great detail. The brain is cognitive at all levels according to Loewenstein's analysis—selecting among choices in virtue of a matching process—even to the macromolecules of the retina.

> "In the case of three-dimensional molecular structures, this means that the partner molecules must fit like hand in glove. Thus the macromolecule, in effect, recognizes it partner—it selects it out of a myriad of other molecules." (Lowenstein, 2001; p. 26).

Four selective matching theories will be discussed here.

3a. Schrödinger, Bohr and Fuchs

The most venerable of selective process solutions to the measurement problem is due to Schrödinger (1935) and Bohr (1949). (See the detailed discussion by Plotnitsky, 2010). The psi-function is a "catalogue" of probabilistic expectations, according to Schrödinger (1935; p.158), expectations regarding the outcome of experiments in quantum physics. The experimental results fulfill one or another of the expectations. Similarly for Bohr,

> "[t]he appropriate physical interpretation of the symbolic quantum-mechanical formalism amounts only to predictions, of determinate or statistical character, pertaining to individual phenomena appearing under conditions defined by classical physical concepts." (Bohr, 1949; v.2, p.64)

More recently those probabilistic expectations have been interpreted as Bayesean in character (Fuchs, 2010). Here the world is taken in a completely commonsensical manner.

> "The world is filled with all the same things it was before quantum theory came along, like each of our experiences, that rock and that tree, and all the other things under the sun ..." (Fuchs, 2010; p. 7).

Our "experience" of the world furniture goes unquestioned. The quantum state is no longer about reality but about the observer.

> "[q]uantum states cannot be states of reality, but must be something *more like* states of information, knowledge, expectation, or belief (Fuchs, 2010; p.15)
>
> The quantum state is not something the system itself possesses. Rather it is solely a function of the observer (or, better, agent) who contemplates the predictions, gambles, decisions, or actions he might make with regard to those quantum measurements." (Fuchs and Schack, 2004).

When the undoubted quotidian world matches one or another of those expectations, the probabilistic wave of expectations collapses to a probability 1.0 certainty. Thus the wave function describes not the world but the observer's expectant mind, and wave function collapse describes the fulfillment of one of those expectations. The "selection" is cognitive, selection of expectations by matching with an undoubted world.

3b. The Transactional Interpretation

The Transactional Interpretation (TI) was formulated by Cramer (1980; 1983; 1986; 1988 and see also Kastner, 2013 for a comprehensive discussion of TI). TI is based in the Wheeler-Feynman formalism for radiation sources. It is explicitly nonlocal and relativistically invariant (Cramer, 2009). This is a time-symmetric formalism, in which radiation sources emit half their radiation in "retarded" time-forward form and half in "advanced" time-reversed form. Thus in the Cramer solution there are offer waves from emitters and confirmation waves from absorbers. The "transaction" ("handshake") of these physically efficacious possibilities is the match of adjoint operators, which corresponds to an actualized macroscopic event.

> "Transactions are irreducibly stochastic collapses triggered by absorption events. So in TI, measurements—and any other empirically observable events—are just the results of actualized transactions. ... an offer wave describes an unabsorbed possibility while macroscopic objects such as pointers and observers are conglomerates of actualized events based on completed transactions." (Kastner, 2013, p. 57).

The present discussion does not question TI as a solution limited to the measurement problem, but will point out its limitations with regard to explaining consciousness.

TI is essentially Kantian, according to Kastner, who extends TI to a subject/object dichotomy.

> "[s]ense data are the product of the object, as a source of offer waves—and the subject, as a set of absorbers. Together, the subject and object produce transactions that provide information about the object." (Kastner, 2013; p. 160).

So the classical subject/object dichotomy is understood in terms of a confirmation wave/offer wave quantum dichotomy. What is left hanging here is the relationship of a mental/physical dichotomy to a physical/physical dichotomy, which physicists do not feel obliged to resolve, leaving that hoary enigma to the philosophers.

Kastner generalizes TI's sense data formulation applied to transactions at the peripheral sensory receptors to include transactions deep within the brain.

> "Energy is transferred via these transactions from those emitters to absorbers on our bodies; that energy serves as input for additional emissions between our sense organs and absorbers in our nerves, and so on, culminating in transfers of energy to our brains. Brain changes make possible our perception that 'something happened'… " (Kastner, 2013; p. 156, italics added)

It is believed that the brain has roughly 100 billion neurons, 100 trillion synapses, and a firing rate across synapses averaging 200/second. Each of these myriad firings according to TI would typically result in a transaction at some locus of brain functioning. This leaves the problematic of consciousness highly nonspecific. Why are only certain transactions conscious? How do "brain changes" result in perception? The problematic of the relationship of the brain to consciousness and qualia is swept under the rug.

On the one hand TI is consistent with panpsychism. Each of the 10^{11}x10^{14}x200 handshakes per second might be thought minimally conscious. On the other hand TI is equally consistent with consciousness being an emergent property of colossal numbers of handshakes at some higher central location (variously called the "dynamic core" (Edelman and Tonini, 1998), the "global workspace" (Baars, 1988), the "centrencephalon" (Freeman, 2007)—or whatever plays the role of Descartes' pineal gland). That the handshake is real while consciousness is not real leaves philosophical perplexity unmitigated. Kastner's promissory "and so on" italicized in the quotation above, with regard to how the brain makes possible perception of world, does not inspire confidence that the longstanding philosophical issues can be moved toward resolution by PI. It is this type of deferral, I claim, that has left the measurement problem unsolved.

3c. Dissipative Thermofield Brain Dynamics

A third selection-by-match solution to the measurement problem is that of Vitiello (1995; 2001; 2003; 2004), which applies quantum field theory to thermal systems. Vitiello treats the brain as a far-from-equilibrium, open dissipative system exchanging energy with its environment. The system plus the environment to which it is coupled is a closed system whose dynamics are nonlinear and non-perturbative. Vitiello's formulation exploits the infinitely many non-unitary ground states of minimal energy, each of which may dynamically encode sensory order in virtue of symmetry-breaking. The order that conserves the vacuum state symmetry broken by input serves as the memory code. Each consecutive state of the unitarily inequivalent ground states is a total memory upgraded by current input.

Such a dissipative dynamics, Vitiello emphasizes, calls for doubling of the system's degrees of freedom and the entanglement of these dual modes. The environmental mode is labeled the "tilde (~) mode" and the system mode is called the "non-tilde (non~) mode." Sensory input from the environment triggers the spontaneous breakdown of electric dipole rotational symmetry of water molecules in the brain's vacuum state. The broken symmetry is conserved in the vacuum state as a condensate of Goldstone bosons which varies in density according to the input order. This boson condensate of variable density, dynamically constituted, is the actual memory code. This process breaks time-reversal symmetry, while under energy conservation law; the condensate preserves the symmetry broken by sensory input. The memory code consists in *couples* of entangled tilde and non-tilde modes representing environment and system respectively. The transitions which the system and environment undergo are serially expressed in the system's vacuum state under Bogoliubov transformation.

Then, the mathematical formalism for quantum dissipation (Celeghini *et al.,* 1992) "requires the doubling of the brain degrees of freedom. The doubled [tilde] degrees of freedom … are meant to represent the environment to which the brain is coupled" (Vitiello, 2004; p. 319). With repetition of the sensory input and loss of its energy, the tilde mode settles into the ground state and matches the non-tilde memory trace. The memory trace is the input's complex conjugate. This match between sensory input and memory trace is accordingly real, just as in the handshake transactions of PI discussed above.

Vitiello identifies consciousness with this ~/non~ match between sensory input and memory trace. Just as with the critique of PI above, this sensory-memory match is real but consciousness is anything but real, so the consciousness/brain problematic remains stuck. Consciousness for Vitiello is an emergent, "a manifestation of the dissipative dynamics of the brain" (2001; p. 141). The process of consciousness is grounded in the "trade" of the brain/subject with world, in the real match of complex conjugates representing brain/subject and external reality. According to this formulation consciousness is between dual modes.

As already noted, a significant problem for Vitiello's formulation, as for TI, is that the match between-two is real, whereas consciousness is precisely that which does not seem to be real … so consciousness/quantum brain remains just as problematic as consciousness/brain. But there is a further problem: a failure to distinguish sensory signals from signals that the brain itself generates, i.e. cognitive signals that do not re-present sensory input but are purely "self-tuning" signals (Globus, 2003). Such self-tuning signals play the role that philosopher's call "intentionality." Intentional self-tuning signals, like sensory signals, also fall into the ground and break its symmetry, with preservation of the broken symmetry as memory traces of intentions in the form of Goldstone condensates. Intentional traces promote a kind of self-tuned attunement. Although sensory (or "other-tuning") and self-tuning signals occurs in different brain regions, they are not distinguishable qua tilde signals.

Yet a deeper problem encumbers Vitiello's dissipative formulation, in which the relationship between system and environment is reciprocal. The system + environment is a closed system; the energy lost by either is gained by the other. As either increases in entropy the other correspondingly increases in negentropy, under thermodynamical law. But the relationship between the tilde representation of the environment and the non-tilde system is not dissipative. Rather than being reciprocal, the tilde representation and the non-tilde system are complementary in their matching. Non-dissipative thermofield brain dynamics avoids this difficulty, as well as handling the problematic of intentionality (self-tuning).

3d. Thermofield Brain Dynamics

This formulation of thermofield brain dynamics de-emphasizes the dissipative aspect that Vitiello features. For Vitiello the dual modes represent the non-tilde system and the tilde surrounding environment (in effect the heat bath). For the present formulation, pace Umezawa (1993; 7.2.2), the ground state per se has dual entangled modes whose relationship is governed by Umezawa's "tilde conjugation rules." One mode of the ground is in a thermodynamic sense the "environment" of the other. The system mode is labeled non-tilde as in Vitiello's notation but the tilde mode no longer represents the environment external to the system but represents the alter mode with which the system mode is coupled. The total number of quanta in the ground state remains constant since the creation of a particle in either mode of the ground requires under energy conservation law annihilation of a particle in the other mode. The coupled non-tilde/tilde or coupled tilde/non-tilde are the dual modes of the ground state.

So the non-tilde/tilde condensate memory trace is of the dual mode form particle/hole, since creation of broken symmetry-conserving Goldstone quanta in the non-tilde mode of the ground as a function of symmetry breaking by inputs, is accompanied by annihilation of quanta from the tilde mode. The memory trace consists in particle-hole couples. With repetition of a remembered sensory signal, however, the non-tilde Goldstone quanta comprising one mode of the memory trace are energized out of the vacuum leaving "holes." Again, since the total number of quanta must remain constant, it follows that "in the vacuum state the annihilation of the quantum A [by repetition of the signal] corresponds to the creation of the quantum ~A, and vice versa" (Vitello, 2001; p. 113). Thus the trace of recognition is of the tilde/non-tilde dual mode form holes-quanta, whereas the trace of memory is of the form quanta-holes. This crucial distinction between memory traces and recognition traces is not drawn by Vitiello.

So there is a sharp distinction between "memory traces" and "recognition traces" in this dual mode formulation, viz. memory traces are particles-holes, whereas traces of recognitions are holes-particles. Now when the signal is once again repeated there is a match between signal and recognition trace, a match which is real and accordingly dis-closed, that is, presences. (This recalls Plato's doctrine of reminiscences, in that memory—traces of recognitions—is prior to perception). The match is not consciousness but the being of world, i.e. world-thrownness. The match is real and world-thrownness is real. It is the very world we always find ourselves already thrown amidst. Instead of the metaphysical consciousness-of being we have the existential thrownness-amidst-being.

The world-thrownness of Heidegger's Existenz is dis-closure—that is, world's appearance—in virtue of three participants in the match. In addition to sensory input to the brain, which after processing dissipates its energy and falls into the ground, and in addition to the recognition memory traces just described, there are "self-tuning signals" the brain itself generates. Like sensory input, these self-generated signals are processed by the brain, dissipate their energy, and fall into the ground, where they participate in the matching process. In so far as ground is concerned, signals are signals whether generated from without or from within. Other brainy organisms, such as bears, birds, and beatles, differ most importantly from us in their self-tuning component. Such organisms are thrown amidst the-world-for-bears, the-world-for-birds, the world-for-beetles, and so on.

There is no transcendent world "out there" to be contrasted with immanent consciousness, as we commonsensically believe and as language forms constrain us to think. Physical reality is solely under quantum description at all scales.

Nor is there a "consciousness-of" world. What we call "out there" is the actuality of the between, in the rich complexity of the ground state of the living brain. Existenz is always already amidst a world because of the richness of the match in the between of the quantum thermofield ground state of the living brain.

4. *Some Deconstructions*

The deconstructive attention is attuned for mislabeling as a symptom of the repressed in texts. (Derrida (1982) emphasizes his debt to Freud's (1914) Psychopathology of everyday life, which focuses on the analysis of "slips of the tongue"). The noun 'observable' is something of a misnomer for a verb-like quantum operator, and this catches the deconstructive eye. The noun 'observable' is perfectly appropriate for classical physics but not for quantum physics, where the focus is on operators. According to Mender (2013) the laws of quantum physics "always entail active verbs" in that they "necessarily describe or predict what will happen when something is done to a system" (p.47). Citing Margenau (1977), Mender points out that "a quantum operator serves more as a 'verb' than as an object-noun within embedding mathematical 'sentences'" (p.47). He emphasizes that "active practical agency" implies neither a dualistic subject nor transcendental subjectivity. So Kantian active practical agency is necessarily implied by quantum physics, whereas in classical physics there is a subject who is a passive observer, reading off the pointers on meters.

The facticity of observables in the-world-out-there is not questioned in physics. Physics begins with observation of world and quickly looks away and more deeply, building its scientific edifice from observables but not really questioning them (or else leaving any issues for the cognitive and brain sciences and even philosophy to work out). We move skillfully and unreflectively through, and make practical use of, observable world; nor do we doubt world in our reliable quotidian lives.

The problemata of measurement, conscious observation and qualia turn out to be protuberances of the same underlying issue. The qualia problem is bogus simply on phenomenological grounds … there are no observable qualia, only qualities of world. The ocean blue is a quality of the perceived ocean out – there – in – the-world (bracketing deconstruction of world for the moment). There is no blue in the mind independent of the ocean world. The sufferer will insist that the pain of a toothache is in her tooth, not a quale of mind. Again,

> "When, for example, a ripe tomato looks red to me, I experience redness all over the facing surface of the tomato. Each perceptible part of the surface looks red to me. None of these parts, in looking red, look to me to have a receiver-relative property. I do not experience any part of the surface as producing a certain sort of response in me or anyone else. On the contrary, I surely experience redness as intrinsic to the surface, just as I experience the shape of the surface as intrinsic to it." (O'Regan and Noë, 2001; p. 145)

The commitment to qualia is philosophically an attachment to Kantian phenomena, distinguished from his noumenal things-in-themselves. These commitments are deeply embedded in language.

Consciousness is much trickier to deconstruct than qualia. It is so entrenched in our quotidian phenomenology and in our very language that consciousness eludes our grasp (Globus, 2013a). As I type these words which appear on my computer screen, just as you read them on your computer screen, there is no consciousness, only my typing, and words appearing on the screen, and our reading them. I am unreflectively focused in a particular world of text and you are encountering your particular textual world. It is only when we detach and reflect that we bring in consciousness. Involved existence is unreflective, pragmatically engaged with world (Merleau-Ponty, 1983). In reflection we are conscious of having been thus thrown amidst world … and overlook the immediate thrownness of reflection. To relegate consciousness to reflection does not deny the cognitive, which is identified with the brain's self-tuning, and which meets other-tuning (sensory input) and past-tuning (recognition traces) in the between of the brain's vacuum state, resulting in world disclosure.

I suggest three reasons to credit the uncomfortable and counterintuitive deconstructive conception that there is no transcendent world in common which we each access in our various ways, but that we are monads disclosing worlds in parallel intramonadically, while physical reality is solely under quantum description at all scales. First, there are dream lives which are so vivid, so original and authentic, that we cannot distinguish them from the worlds of waking life (Globus, 1987; 2010; 2013c). We may have to reason out on waking that "it must have been only a dream." Indiscernables demand the same explanation on grounds of parsimony. It is not plausible that such dreams can be seamlessly stitched together out of memory traces from different times, places and contexts, unless we grant the REM-sleepy ego miraculous creative powers (Globus, 1987; 2013c). That dream world can be original de novo productions (Globus, 1987) establishes the autonomy of world thrownness from sensory input and thematizes the power of the creative process. We know from dreaming that the brain can create authentic worlds from scraps rather than requiring the real thing to re-present. Dreaming shows that a world-out-there is not immediately required for Dasein to be world-thrown

A second reason in support of a quantum monadology is that the theory of thermofield brain dynamics can account for monadic worlds, in virtue of the realness of the between, in the match of complex conjugates: sensory and intentional signals on the one hand and memory traces of recognitions on the other. Thus a neuroquantological explanation is available for monadic world disclosure in the between. It follows that *neuroquantology* is not only a scientific discipline but has profound existential significance. Of course the validity of a dual mode quantum brain dynamics, as with any version of quantum brain theory, awaits empirical confirmation. Quantum neurophilosophy has an anaclitic relationship to quantum brain science.

A final reason that justifies the present proposal is that its resolution of the measurement problem finally dissipates that ominous "first cloud on the horizon of physics" (Briggs *et al.,* 2013). Physics has made spectacular advances since Schrodinger's cat first meowed in 1935, yet no resolution has been even in sight. It is time to recognize, given the history of controversy and failure to even advance, that the fundamental move finally to resolve the measurement problem is significantly philosophical in nature, rather than strictly a matter of physics. The crucial role of quantum brain theory in this resolution highlights the importance of the field.

The schema that emerges from the monadological solution to the measurement problem is this: Reality is quantum at all scales, from sub-Planck to cosmological. World is not just a middle scale which is deep down "really quantum." The seemingly common human world differently construed by different observers is really multiple worlds—monadic worlds in parallel—disclosed in the between of human brains. More or less the same inputs, more or less the same culturally acquired self-tuning, more or less the same memories, then the actually multiple worlds will converge onto seeming more or less the same world, fully serviceable as if it were a quotidian world-in-common on which science might build its edifice. Given the inputs to, self-tuning of and traces of recognitions in a dog's brain, a dog will be thrown amidst a doggie world. And *pari passu* for all brainy creatures. A crystal also has a real between, but unlike dog, bat or human, its phonon condensate is static and undifferentiated. A crystal does not exist—in the sense of Existenz. A crystal is not "thrown." Lacking other-tuning, self-tuning or recognition memory, and the crystal for-itself simply is. Its form of dis-closure is bare being.

This formulation does not lead to panpsychism (Globus, 2009). There is a lower limit for the number of quanta, on the order of Avogadro's number, below which symmetry breaking does not take place and the conditions for disclosure do not obtain. A quantum is not conscious as some (e.g. Vimal, 2010) would have it. This lower limit halts the descent into panpsychism.

At the same time this formulation accounts for the obvious differences between quales—the difference between touch and taste—and the differences within qualia (sweet and sour). Umezawa (1993; 6.1.10 and 6.4.5) points to the existence of "emergent symmetries." The quale associated with different types and subtypes of emergent symmetries will accordingly differ.

The present formulation offers a "third way" to understand the wave function. The long-standing dispute (all the way back to Einstein v. Bohr) has been whether the wave function is ontic, about reality, or epistemic, about our expectations for or probabilistic knowledge of reality, which undergo Bayesean updating on making observations. I propose instead that the wave function represents self-tuning modulated by sensory inputs, rather along Bayesean lines, but wave function collapse is not to certainty—the collapse is not a cognitive event but a perceptual event—collapse to world-thrownness, to the dis-closure of Being ... collapse to Existenz.

The incision to the present integrated solution for the measurement problem, the consciousness problem and the qualia problem has been the existential acts of deconstructing the world-as-transcendent, qualia as immanent and consciousness as observing. This maneuver is extremely difficult for physics to abide, given its profound commitment to objective observation of world and avoidance of phenomenological inquiry. The measurement problem is a symptom of this commitment and avoidance. On a personal level it is extremely disconcerting as well, with the loss of any world-in-common and its replacement by monadic worlds in parallel, which leaves us Daseins profoundly isolated and fundamentally deluded in our practical lives. My discussion has attempted to demonstrate the potential explanatory power of quantum neurophilosophy and neuroquantology for the deepest problems in physics and philosophy.

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