

Bohr, Heidegger, the Unspeakable and Dis-Closure: An Exercise in Quantum Neurophilosophy

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ABSTRACT

The problematic of world is considered within the horizon of Bohr and Heidegger's surprisingly overlapping formulations of the "unspeakable." The process of world dis-closure—thrown *Existenz*—is discussed in terms of dual mode quantum thermofield brain dynamics. Existence, which is sharply distinguished from consciousness, is "between-two."

Key Words: Bohr, Heidegger, quantum neurophilosophy

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Introduction

It seems *prima facie* silly to think the celebrated, infamous and murky twentieth century philosopher Martin Heidegger (1889-1976) together with quantum brain science. Did not Heidegger scornfully advise to "leave science to its mania for its own usefulness" (Heidegger, 1999; p.198)? Heidegger did not even distinguish an essential difference between quantum physics and classical physics, dismissing both of them as having "the same *Ge-stell*, the same preconception of nature" (Glazebrook, 2000; p.249), a naturalistic metaphysical framework which Heidegger sought to deconstruct.

A central concern of Heidegger was with the *Seinsfrage*, the question of Being, which is an *ontological* investigation into the *meaning* of Being. Physics, in contrast, is

"ontic," already operating within a commitment to *Being* in the guise of "observables." However, in plumbing Heideggerian thought, a surprising rapprochement with Neils Bohr comes into view and a specific connection to quantum brain theory can be established. These considerations turn out to be crucial to the generally unthematized but profound problematic of the ordinary world about us.

A warning about the great difficulty in thinking Heidegger together with Bohr is perhaps necessary. Plotnitsky (2010; p.316) comments that "*Bohr's style of expression is ponderous and tedious, and almost deliberately dry in aiming to avoid any poetic appeal.*" Heidegger's writing is absolutely opposite: grandiose, metaphoric, obscure, undisciplined, idiosyncratic, inconsistent, and downright untranslatable! So when I use locutions below such as "for Heidegger," I am really appropriating him within the context and purposes of the present discussion, while nonetheless remaining, I believe, consistent with Heidegger's overall vision. To my mind engaging the surprising "hermeneutic circle"

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between Heidegger and quantum brain theory will illuminate both. The reward (if there be one) is to see deeply into ontology from a quantum and neurophilosophical perspective, and through this to deconstruct physics' observables and the very world surround we blithely move through in the ordinary living of our quotidian lives.

One aspect that feels troublesome in such an endeavor is not so much the physics but the conduct of existential phenomenology, in the face of the facile commitment on the part of neuroquantologists—indeed, the commitment by brain scientists in general—to *consciousness*. It is widely accepted that there is a “consciousness problem” which is avidly discussed. But the experts cannot come close to agreement, not even on something so basic as a definition of consciousness (Nunn, 2009; Vimal, 2009). The following discussion will shift the focus from consciousness to existence. In ordinary *unreflective* lived existence we are not “conscious of” world but find ourselves always already amidst it, “thrown” as Heidegger (1967) vividly puts it. This is an existential fact: in ordinary existence we are purposively amidst some world or other. The term ‘consciousness’ in this framework implies something second-order: reflection. This is how we find ourselves whenever we reflectively take notice: always *already* in some world or other.

I begin with Bohr's understanding of the quantum domain as *unknowable*, which has been lucidly interpreted by Plotnitsky (2010), and then connect the quantum unknowable to Heidegger's account of the “abgrund” (*der Abgrund*), especially as found in his *Contributions to Philosophy. From Enowning* (Heidegger, 1999, hereafter CP). But there is a Heideggerian supplement to the abgrund not found in Bohr: the event of lighting-up or dis-closure, an appearance of the everyday *world*. Heidegger problematizes “world,” rather than taking it for granted. For Bohr world is taken commonsensically; “world” implies a scale change from the quantum level, a change which is tied to our biological constitution. Classical physics emerges “in our interaction with the world on scales that are very different from those of quantum theory ... and may be determined evolutionarily by the biological constitution of our bodies” (Plotnitsky, 2010; p.33). We shall see that for Heidegger the being of world is not

a mere shift in the scale of *our* consideration but a “gift” (*ein Geben*) of the abgrund's operation.

Bohr's Unspeakable Anti-Ontology

Quantum reality is literally “unspeakable” (Bell, 1987). According to Bohr, quantum reality defaults all distinction, all objectuality. We might only endlessly intone, as in the Upanishads, *Neti. Neti.*, “Not this. Not that.” Such an unknowable is “beyond the limit of any analysis, knowledge, or conception” (Plotnitsky, 2002, xiii). This is a much more radical conception than the Kantian *ding an sich*, the noumenal thing-in-itself, which is unknowable to direct acquaintance but yet is knowable, since *noumena remain thinkable*. Indeed, this is just what scientific realism is about: thinking the noumenal reality on the basis of its phenomenal representatives under disciplined experimental conditions. Kantian noumena are nicely knowable by scientific inference whereas the abgrund is unknowable in principle.

The unspeakable quantum reality is “inaccessible, unknowable, unrepresentable, inconceivable, untheorizable, undefinable” (Plotnitsky, 2002; p.2). “It” is in “itself” neither wave nor particle, which are a function of classical experimental conditions in which measurement takes place (Plotnitsky 2010). Wave and particle come into being only through measurement.

It bears emphasis that Bohr's theory is *anti-ontology*. What is unknowable is what quantum reality *is*, but its “efficacy” (Plotnitsky, 2002) is quite a different matter. The effects of the unspeakable on measuring instruments are understandable in terms of classical physics.

[i]n speaking in terms of space-time behavior and classical-like physical variables or concepts we can only refer to the objects of the (quantum) interactions between (indescribable) quantum objects and (classically described) parts of measuring instruments. (Plotnitsky, 2002; p.81)

[w]hile we can measure either the position or the momentum of certain parts of measuring instruments there is no such underlying configuration comprised by the elements of reality from which such complementary measurements arise. (Plotnitsky, 2002; p.83)



In the next section the unspeakable will be identified with the Heideggerian Ab-ground.

The Abground

Heidegger's discussions of the Abground in CP are as obscure as anything in his *oeuvre*. I feel free to depart from the published English translation, which is by no means canonical. The present strategy is to "listen for" Bohr's anti-ontology in Heidegger, which will require some concentration. Such an interplay serves to bootstrap the understanding.

In a Heideggerian context the consciousness/quantum brain problematic can be replaced by an existence/quantum brain problem. The brain is now conceived as "Dasein's brain" (Globus, 2003). Consciousness not only has no consensus definition, as already noted, but is also encumbered by the unresolved problem of "qualia" and further, is integral to the most long-standing unresolved problem in quantum physics, viz., the measurement problem. Heidegger's *Existenz* deconstructs consciousness and offers a fresh incision into such vexed issues (Globus, 2009a; 2013).

The Abground is pre-space-time, "that unifying onefold that above all lets them [space and time] go apart into their separateness" (CP 264). The abground sustains the projection of space-time whilst "staying-away" (*das Weg-bleiben*). This staying-away is de facto unknowable in Bohr's sense. Whilst staying-away the Abground exercises an "originary essential sway" (*das ursprüngliche Wesen des Grundes*), a controlling influence which is its efficacy. *Wesen* is a crucial and slippery term in Heidegger. Rather than translate it as "sway," with its connotation of soft influence, I take *Wesen* as a controlling constraint, really an operator. *We cannot say what Abground "is" but only what it does.*

Such an Abground is not a groundlessness, not "the no to every ground but rather the yes to the ground in its hidden expanse (*Weite*) and remoteness" (CP 271). ("Expanse" here is not spatial but has the sense of, say, an "expansive intellect.") The Abground is not the eternal which lasts forever "but rather that which can withdraw in the moment, in order to return once again" (CP 259). This return is not a return of the same but is each time unique.

Abground "is" a withdrawing emptiness that at the same time brings into the open, clears, lights up. This is not the usual sense of "emptiness," as when the cupboard is bare. Instead "emptiness" is the fullness of what is still-undecided" (CP 266), a potential. The Abground is thus not a plenum, which distinguishes it from the richness of Bohm's (1980) implicate order that enfolds all possible orders. Nor should we properly speak of creation *ex nihilo*, creation from no-thing, since the unspeakable admits no "thing" to even negate.

The "lighting up" process is a crucial emphasis not found in Bohr, for whom the world is straightforwardly right *there* before us, consisting in observables. For Heidegger, as will be emphasized below, the *there* (*Da*) is existential. We are each a *Dasein*, a being (entity, *the Dasein*) whose being is to be *Da*, "there," there disclosively.² The Abground is a closure that operates to dis-close. It is an "attuning emptiness" (CP 266). Heidegger's contorted expressions are a function of the difficulty in speaking about a not-even-nothing that yet has *the latent richness of the unspeakable*.

The prefix 'en-' (*er-*) repeatedly comes up in CP (including the title, *Er-eignis*). The translators devote a section to it in their introduction (xxxvii-xxxix) and nicely bring out its meaning as a process of welling up, an enabling of, a coming into view, bringing something into a thoroughly fulfilled condition, a spontaneous creativity not in the sense of assembling available components but a creation *de novo* welling up from the unknowable, a continual welling that continually dis-closes. I usually hyphenate 'dis-closure' to remind that the unspeakable is ontologically primary and an operation (dis-) is required for any Being to appear.

One of the most difficult yet central terms related to the abground in Heidegger's obscure lexicon is *das Ereignis*. The 'eignis' component of this dynamic is often translated as the "event," but *Ereignis* implies more than the welling up of an event in the operation of the abground. There is also the sense of an

² Sometimes I shall write "Dasein" and sometimes "the Dasein." The latter is used when I want to remind that Dasein is an entity and the former when I emphasize that Dasein is a special entity whose being is to be "there" (*Da*). I also frequently (perhaps annoyingly) use the dash mark (-) to break up words so as to highlight their literal connotation.



“owning”—the event is my own—but without implication of any subjectivity, of any “I” that does or has the “owning.” The *Ereignis* event “happens to me,” but again the “me” implies subjectivity which is far from Heidegger’s meaning. What happens to us—the event—is “there” (*Da*), an opening, a lighting (*die Lichtung*), a clearing, awareness as such ... to which metaphysics wrongly adds a subject who perceives what is there, opened, lit up, cleared. The *Da* does not require a subject who is there; the lighting process is sufficient. We are always and already thrown-aware in the clearing process.

Dis-closure

The theories of Bohr and Heidegger are quite compatible with respect to the unspeakable at the quantum level. What the quantum level as abground is must be unknowable but what the quantum level *does* is indeed knowable by inference from its results. When it comes to the observable world, however, Bohr and Heidegger differ radically. For Bohr the difference between quantum and classical levels is essentially a scale change. There is an interaction between quantum objects and the *quantum level of the measuring apparatus*. What results is an “irreversibly amplified classical trace once the experiment is performed” (Plotnitsky, 2010; p.331).

The quantum interactions between quantum objects and measuring instruments are, however, capable of producing classically describable effects upon these instruments. More accurately, these interactions are capable of initiating the process that ultimately leads to these changes, whereby these interactions are “amplified” to the classical level ... (Plotnitsky, 2010; p.331)

The (classically) measured quantity only establishes a correlation between the object and a certain classical stratum of the measuring instrument involved, since the measuring process unavoidably and irreversibly amplifies the interaction in question into a classical-level effect. (Plotnitsky, 2010; p.332)

The observer’s brain is, after all, just an exceedingly rich classical measuring apparatus.

As already noted, Bohr’s account should be distinguished from Kant’s distinction between noumena and phenomena. Kant’s phenomena are appearances—

observable world—whereas his noumena *are objects*, which we can only think about and model mathematically (as in the traditional structural realism of Schlick (1979), Russell (1948) and Feigl (1967)). In contrast Bohr’s ground is not even objective and so strictly speaking not a Kantian noumenal. At this point Heidegger differs profoundly from Bohr. The appearance of the phenomenal is not a scale change caused by measurement, but dis-closure in the between-two (*das Zwischen*). To appreciate Heidegger’s conception will require some heavy slogging. The reward is opening a path to *neuroquantology*, at least in the form of thermofield brain dynamics.

Heidegger problematizes that any *being* (entity) is. Ordinarily we do not remark that we always find ourselves already amidst some world or other. Finding ourselves such is not apparently our doing ... we are “thrown” amidst a quotidian world at hand. Heidegger instead wants to found world-thrownness in the pre-space-time Abground and the process of dis-closure. He identifies dis-closure with *truth*, lighting, clearing, sheer awareness, our being “there.” When we shake the sleepy-head in the morning and ask, “Are you there (*da*)?” we do not mean to ask if the person is space-time located in the bed, but if she is disclosing the same bedroom world as us, if she shares our truth, if bedroom Being appears. The *Da* is “the clearing for every possible ‘where’, ‘here’ and ‘there’, but also for ‘then’ and ‘when’” (Heidegger, 2006; p.285).

The ‘t/here’ [*Da*] lights itself up in *Da-sein*. (Heidegger, 2006; p.285)

The Dasein is the entity whose truth is the clearing of space-time world-thrownness, which alleviates the beyond no-thing-ness of the unspeakable Abground.

Temporality

Es gibt Sein. Es gibt Zeit. It gives Being. It gives Time. (*Time and Being*, hereafter TB, 19) Being and “time” are the gift of the abground. It is with regard to time that Heidegger parts company with Bohr in a radical way. Since Heidegger’s sense of “time” is so idiosyncratically misleading, I shall keep eyebrow-raising quotation marks around the term.

The first part of the quotation, *Es gibt Sein. Es gibt Zeit.*, seems clear: The abground gives the phenomenal world, the manifest



quotidian world in which we find ourselves thrown, whether in daily practice or in scientific endeavors where “world” amounts to readings on measuring instruments. So there really is a world, thanks to the operation of the abgrund. Thus “man always remains approached by the presencing of something actually present” (TB 13). The difference from dry Bohr is merely Heidegger’s poetic expression. Both find world grounded in the operation of a fundamental process ... the ontologically unspeakable and epistemically unknowable abgrund.

The “time” that the abgrund gives, however, is in Heidegger’s sense not what we usually think of as temporal. “For time itself is nothing temporal, no more than it is something that is ... we no longer mean the succession of a sequence of nows” (1972; p.14). “Temporality” for Heidegger is *pre*-spatial, *pre*-time, the operation of stretching space-time, “an extending, opening up the four-dimensional realm” (1972; p.17).³ Temporality “preserves the realm in which presence is extended” (1972; p.17). The event of the abgrund’s operation “is not simply an occurrence, but that which makes any occurrence possible” (1972; p.19).

But pre-space-time does not exhaust the meaning of “time” for Heidegger. Temporality is “the realm of the open” (TB 19), but open in a certain way: there is a fundamental attunement (*Grundstimmung*) which “constantly, essentially, and thoroughly attunes human beings” (Heidegger, 1995; 7 FCM). Again, “being attuned is to be grasped as *the fundamental nature of our Dasein*” (FCM 89). Temporality predelineates world, projects the possibilities for world, stretches space-time dimensionality, situates the Dasein for what could be disclosed. Temporality is accordingly ecstatic (*ekstasis*)—gets outside itself, reaches beyond itself, transcends the Dasein’s immanence, in virtue of its expectations being confirmed. (Heideggerian *Ekstasis* might be updated by saying that it is Baysean, its expectations probabilistic and continually updated.)

In the idea of “temporality” Heidegger is separated from Bohr, who remains Cartesian. Bohr’s observer is not given a

quantum explanation but coming at the terminus of the von Neumann chain, the observer’s consciousness (not her brain!) collapses the wave function. The Born rule is for Copenhagenism purely cognitive: the Schrödinger coefficients squared give the weighted *expectations* of the conscious observer. Cognition *per se* is left unexamined by Copenhagenism which is tacitly dualistic. The Schrödinger wave function would sail merrily on uncollapsed were it not for an unquestioned von Neumann consciousness that is distinct from the abgrund of physics. For Heidegger in contrast the observer’s expectations are given by the abgrund’s *ekstasis*. It gives Being, gives the phenomenal world, in virtue of ekstastic temporality. The ekstases provide the Dasein’s situatedness and are grounded in the abgrund. Heidegger is even further removed from Bohr with the former’s concept of the “between.”

Dis-Closure (*Unverborgenheit*) and The Between (*das Zwischen*)

To review, both Bohr and Heidegger subscribe to a physical reality that is an unspeakable unknowable abgrund. The operation of this abgrund is thought to generate world at the macro level, and worlds of course include the embodied brains of Daseins, entities who are peculiarly “there” (*Da*) disclosively. However Heidegger, unlike the metaphysical Bohr, brings out that the abgrund also attunes the Dasein’s brain (which includes the attuning that dimensionalizes space-time), thereby situating the Dasein. So the *Da* ends up confusingly with two very different meanings: (1) “there” in the ordinary sense that the computer screen is there in front of your nose, and (2) “there” as being aware. These meanings can be easily distinguished as “there-in-space” and “there-as-aware.”

Now observation is taken as primitive by Bohr and physicists in general. Physics, whether classical or quantum, cannot get off the ground without observables. Copenhagenism assumes consciousness of world ... let the brain scientists figure out how it is done and let the philosophers of mind wrangle over what consciousness really is. It makes no difference to the physicist whether consciousness really is physical, or is itself an irreducible substance, or some kind of emergent system property, or an aspect of some neutral substance, or a mere bystander

³ It is interesting from a quantum standpoint that Heidegger describes this event as a vibratory welling up (*der Erzitterung*), which has been rather clumsily translated as “enquivering.”



without causal efficacy, or an illusion, whatever Heidegger, however, offers a novel alternative to physicalisms, Cartesianisms, emergentisms, neutral monisms, and epiphenomenalisms. Instead of “consciousness” he wants to explain the lighting up (*die Lichtung*), or the clearing, or dis-closure, as *the state of a between*, which is between-two, *das Zwischen*.

On the one mode there is the abgrund’s gift of Being, of world. On the other mode, there is the abgrund’s gift of Dasein’s attunedness which includes the moment-to-moment stretching of experienced space-time. (“Here” at my computer or “here” in California. “Now” this moment or “now” this semester). Dis-closure (*Unverborgenheit*) occurs between these two gifts of the abgrund. The lighting, the clearing, being there-as-aware—what is misleadingly called “consciousness” (which derives after all from *con sciere*, to know together)—is a function of the between. The abgrund gifts Being and gifts “time.” The belonging-together of Being and temporality dis-closes the world in which we find ourselves thrown. We are “there” (*Da*) in the ongoing match of the abgrund’s gifts: Being and “time” qua situatedness. Thus our *Existenz* is continually renewed between two. The fabulist writer Jorge Luis Borges well expresses the spirit of Heidegger’s conception.

Every instant is autonomous. ... Each moment we live exists, not the imaginary sum of those moments (Borges 1998).

The abgrund gifts both world and Dasein’s space-time situatedness: *Existenz* for each Borgesian moment is their belonging-together in the between-two. There is only a flickerless (Zeno-effect) dis-closure (which is “truth” on Heidegger’s sense), in waking and dreaming alike, and unspeakable abgrund.

The process of dis-closure, then, is nothing like what is thought of as consciousness. Dis-closure is *between*, between-two, *das Zwischen*, the encounter of world and situated Dasein, which serves to clear, to light-up a bubble of perception. Bohr is not so different from Heidegger after all. For each the abgrund gives a world, which includes embodied human brains. Bohr simply accepts that this brain is somehow or other conscious. Heidegger has zero interest in Dasein’s brain and what its relevance might be to *das Zwischen*. But his approach implies a very significant difference from brain science.

For brain science the wet brain machine processes information of the world whereas Dasein’s attuned brain meets the world’s order. Heidegger (1977) rails against the machination of technology and science, and Dasein’s brain (though he never discusses it) must not generate consciousness but dis-close existence. *Das Zwischen* will provide below the segue to Dasein’s quantum brain.

Quantum Brain Theory and the “Between-Two”

A concept of duality has populated philosophical thought since antiquity, which the physicalistic monism of science has never succeeded in completely stamping out. The currently most maligned form of duality, known as “dualism,” features the ontological duality of mind and matter, which Descartes had interact at the pineal gland. Leibniz proposed a duality that is a psycho-physical parallelism (Rescher, 1996), like two independent clocks set to run in harmony by God (“pre-existing harmony”). There is the duality of Spinozan neutral monism, in which mind and matter are dual “aspects” of a reality that is neither, a view still put forward today (Velman, 2000). Emergentism (Sperry, 1969) is a form of duality where emergent properties arising in complex systems are not only more than and different from physical reality but act causally back on that complex reality from which they have emerged. Epiphenomenalism (Huxley, 1898) has the duality of mind and matter, where mind emerges from matter but without the causal action back onto matter that emergentism features. Epiphenomenalism’s causality is one way whereas emergentism’s causality is two way.

A new conception of a *duality*—which is to be sharply distinguished from *dualism*—is proposed by quantum thermofield brain dynamics. Here the duality is of modes of the ground or vacuum state. The ground is “between-two.” This version of duality comes in two varieties, both arising out of quantum brain dynamics (Jibu and Yasue, 1995), which is not dual mode per se. The between (*das Zwischen*) is an innovation in the long history of duality.

The central insight of quantum brain dynamics (Jibu and Yasue, 1995) was that the symmetry of the water electric dipole field of the brain’s ground state is broken when neural representations of sensory input dissipate



their energy and fall into the ground. Under energy conservation law such broken symmetry must be conserved. The preservation is in the form of a dynamically created boson condensate (Nambu-Goldstone (N-G) bosons) which may extend over macroscopic regions. This macroscopic N-G condensate is the memory trace. Vitiello (2001, 2003; 2004; Vitiello and Freeman, 2006) showed that since there are infinitely many unitarily inequivalent ground states, sequential recording of inputs does not overlap but accumulates, so that the brain achieves a huge memory capacity.

Now according to the original model of Umezawa and coworkers (Ricciardi and Umezawa, 1967; Stuart, Takahashi and Umezawa, 1978; Umezawa, 1995), and refined by Jibu and Yasue (1995), when the sensory signal recorded by the macroscopic N-G condensate is repeated, the memory trace is activated *and this activation of ground state memory traces is equated with consciousness*. There is no duality, no between-two, in this early formulation. Consciousness is tantamount to activation of memory traces.

Vitiello in contrast proposes that consciousness—the conscious Now—is a phenomenon of a between-two. The duality is that of the dissipative system and the environment to which the system is unavoidably coupled. System and environment are time-reversed, in that when one gains energy, the other loses it, and vice versa. The system is labeled the ‘non-tilde mode’ (non~mode) and the environment is labeled the ‘tilde mode’ (~mode). The ~mode is the time-reversed copy of the non~ mode, i.e. its conjugate image, its “Double,” as Vitiello likes to say. These dual modes are inseparable, entangled in the common vacuum state, lacking independent existence in the dynamic of their dialectic. The Now emerges in the match of these conjugate images. *Consciousness is between-two*, according to Vitiello.

I point out two reservations with Vitiello’s formulation. First, the dual modes that match in the between-two of the ground state are complex conjugates, *so their match is real ... and consciousness is not real*. Indeed, the very vexation of the unresolved consciousness problem is the immateriality of consciousness and how that might be reconciled with the physically real brain.

Descartes’ unsatisfactory “just so story” that mind and matter interact in the pineal gland typifies the problematic. Since Vitiello’s dual mode match of a memory trace with a sensory signal gives a real state between two, this seems incompatible with a conscious state.

The second objection is that external inputs, transduced at the brain’s sensory and somatic receptors and eventually dissipating their energy and falling into the vacuum state, comprise only one portion of that movement. The brain itself generates a plethora of signals which dissipate their energy and fall into the ground state. These are “intentional,” or better, “self-tuning” signals which *qua* signals are no different from signals arising from sensory inputs. But they are on the system side of the sharp demarcation Vitiello makes between dissipative system and environment. So it is unclear how intentional self-tuning might be incorporated into the dissipative model.

An alternative formulation of quantum thermofield brain dynamics begins with Umezawa’s (1993; section 2.2.3) discussion of two mode squeezed states. Here the vacua are states with a condensation of *dual mode entanglements*. Every non-tilde quantum is paired with a tilde quantum so that the vacuum is a dual mode superposition of pair states. Our (non-tilde) universe, which encompasses *both* dissipative system and its environment in Vitiello’s sense, is entangled in the ground state with an alter (tilde) universe. When a sensory signal to (or intentional signal within) the brain dissipates its energy and falls into the vacuum, the increase in non-tilde quanta must be accompanied in the alter universe by a decrease in tilde quanta, so that the total remains constant. The traces of sensory and intentional inputs consist in particle/hole non-tilde/tilde pairs.

When the sensory or intentional signal is repeated, this repetition signal energizes the non~ trace out of the vacuum (as in the original model of Umezawa and coworkers), from which it follows that quanta are created in the ~mode (thereby keeping the total constant as required by energy conservation law). Thus whereas the memory trace of the signal is of the form particle/hole, the trace of that signal’s recognition is hole/particle. Memory traces and recognition traces are thereby distinguished in the ground state.



Now when the repetition of the sensory or intentional signal is again repeated, there is a match between-two, the belonging-together not of signal and memory trace but of signal and recognition trace. This match is not consciousness but existence, *Existenz* as world-thrownness. That the match is real is fully consistent with world-thrownness. The match between-two—the sensory and self-tuning signals fall into the ground state belonging-together with recognition traces of past such signals—dis-closes, discloses world with us always already amidst it. The philosophical consequences of this existential dual mode formulation are seriously extreme, as will be discussed below. Of course the quantum thermofield brain dynamics on which these ideas are based awaits experimental confirmation. Quantum neurophilosophy participates in a hermeneutic circle with empirical quantum brain science, which bootstraps neuroquantology forward.

The Problematic of World

It is certainly difficult to question world—to deconstruct it—since we live amidst world throughout our quotidian lives, and world's presence seems always unremarkably justified, confirmed in every pragmatic moment. Science as disciplined common sense begins with world, augustly renamed “observables,” and builds its edifice on verifiable observations. (Yet this catches the deconstructive eye: world lies at the heart of the interminable debate over the “measurement problem,” and may be the key to its resolution.) Quantum science has by no means denied world, only plumbed it at a different level, where the laws of classical physics no longer apply.

We must think of it as the level of physical things that are in some sense “small enough,” like molecules, atoms or fundamental particles (Penrose, 1994; p.257).

Furthermore, quantum physics developed to encompass not only “small enough” waves and particles but macroscopic objects at the scale of ordinary life and cosmological objects as well. Umezawa (1993; Chapter 6) emphasizes that macroscopic behavior does not mean that Planck's constant vanishes but only that there has been condensation of a large number of particles. Indeed “any boson can form a condensate in a vacuum to create a variety of

forms of macroscopic objects” (p.99). *The quantum realm is scale independent.*

As detailed above, Bohr and Heidegger derive world from the operations of the unspeakable. For Bohr we are simply conscious of the world given by the unspeakable. Heidegger is more complicated. We as *Dasein*, as ex-istences, find ourselves always already amidst the gifted world in virtues of our *ek-stases*, by which we get outside ourselves to encounter a world that is *actually there*. With Kantian scientific realism augmented by the burgeoning development of brain science, we re-present as phenomena the noumenal world reality. Velmans (2000; p.164) puts it bluntly, “... there really is something there *to experience or to think* about, whether we perceive it, have thoughts about it, or not.” The only seeming demurrals to the reality of world would be along the lines of Berkeleyan idealism (Foster and Robinson, 1985) or Leibnizian monadology (Leibniz, 1991). But looked at more closely, even here the belief in world remains. According to Berkeley the world *does* actually subsist ... in the mind of the Eternal Spirit. For Leibniz a fulgurating God in his divine Goodness *does* create an external world, even though windowless monadic beings such as we have no access to it. Berkeley the idealist and Leibniz the monadologist thus reassure us that there is indeed a world actually there, though not in the way that quotidian common sense thinks.

The existential formulation of dual mode thermofield brain dynamics outlined above is a radical form of monadology which departs from Leibniz, whose loving God is succeeded by the unspeakable and even terrifying *Abgrund*. Physical reality is quantum and only quantum at all scales. Physical reality appears humanly world-like only “between two” for the human brain. The dis-closure in this match between-two is worldly. These are human worlds projected only within monadological human brains in parallel, in the belonging-together of complex sensory and self-tuning input with complex conjugate recognition traces of those inputs. *Existenz* is between-two in parallel.

It should be recognized that the bat brain, say, also has a between-two, where sensory inputs and self-tuning inputs, different from ours, match with memory traces of recognitions. The bat brain also dis-closes,



revealing a bat world. And *pari passu* for all brainy creatures, however limited their worlds might be. Of course an inanimate object—say, a crystal—does not disclose a world. It is boringly in-itself, nothing world-like, yet still a dis-closure. (We might begin to imagine it as a severe primitivization of our existence in deep sleep, barely thrown but not amidst anything.) It does not follow that *everything* dis-closes in its between-two. The present proposal is no panpsychism, since the formation of a Nambu-Goldstone condensate requires the number of quanta to be on the order of Avogadro's number. Lesser numbers of quanta do not support a match between-two, hence no dis-closure, which “halts the descent into panpsychism” (Globus, 2009b).

It bears emphasis, since the idea is so strange to common sense, that according to

the present formulation the unspeakable does not gift the world (as Bohr and Heidegger both believed) but provides quantum objects at all scales. This gift must include the embodied dissipative brain as quantum macroscopic object. We are no meta-physical conscious exception! World is disclosed in parallel across multiple observers, each monadological existence thrown rapt amidst his or her own world as a function of impinging energies, self-tuning intention, and memory traces. *Existenz* is continually thrown anew by the unspeakable, a severely monadological dis-closure between-two. Given the historical revolutionary surprises of quantum physics we should not expect that quantum neurophilosophy would bring us much comfort.



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