

The Mind of the Beholder

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Abstract

In Physics Quantum Mechanics has focused the role of the observer in relation to the measurement problem, thereby calling upon the implication of the brain as the source of our knowledge. Since the brain is a piece of living matter, the question for the possible extension of the laws of quantum theory to biological structures has risen, whereby, in the case of the brain, quantum physical laws are applied to research for the emergence of consciousness. In this paper I propose the use of Quantum Theory in its Transactional Interpretation (TIQM) to extend the scope of consciousness research in the psychic domain. Analogies are established between the measurement problem in quantum theory and Jung's *valuation* concept in psychology as the equivalent of the "interaction-with-the-environment" in physics. In particular, this paper describes how the experience of an altered state of consciousness can be described with the presentation of a properly obtained introspective report of conscious experience, taking into account the objective reality of the psychic factor. The case is discussed in terms of TIQM to describe, by way of a Psychic Field, a process that runs parallel to the biophysical process sustaining the communication across neurons, thus establishing a bridge between the Psyche and Quantum Theory, as already correctly guessed by Pauli and Jung.

Key Words: Consciousness, quantum effects, psychic entanglement, psychic field, valuation, psychic boson.

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Riddle: *"The reason why our sentient, percipient and thinking self is met nowhere within our scientific world picture can easily be indicated in seven words: because it is itself that world picture. It is identical with the whole and therefore it cannot be contained in it as part of it" (Schrödinger, Mind and Matter).*

Brhadaranyaka Upanisad: "...when the Whole has become one's very self...who is there for one to perceive and by what means?...By what means can one perceive the perceiver?"

Introduction

In a recent review (Tarlaci and Pregnotato, 2015), the authors mention two important points of discussion concerning the beginnings of quantum physics: the role of the observer in determining the outcome of a quantum measurement and the possible extension of the laws of quantum physics to biological structures.

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The discussion of both problems requires a larger psychophysical context.

The brain is a special biological structure that is the source and the seat of the Psyche. Even if it worked strictly according to quantum physical laws, the possibility of describing the brain's workings based on quantum coherence is controversial. However, it is possible to interpret the brain's workings "as if" quantum coherence existed and were at work as a parallel psychophysical process.

In this scenario, quantum processes would determine macroscopic processes in the brain, but they need not be causally related to consciousness or, in other words, they are unlikely to be reflected in conscious experience (Rapparini, 2011). Although biophysical processes are necessary and sufficient conditions for the immaterial psychic feeling of consciousness to be experienced, it is difficult to conceive of something immaterial to emerge from matter unless - in agreement with Wheeler's "it from bit" hypothesis - we define the stuff of perception as being information: information about the 'outer physical world' as well as the 'inner psychic world' (thoughts, emotions, dreams, hallucinations, etc.). Then mind and body would be more like different states of information, different informational patterns (Floridi, 2014). "Material" and "immaterial" may be two aspects of some underlying informational stuff that would naturally include psychic content.

Having introduced the principle of double aspect information, I apply it to the conscious experience of being conscious – consciousness is always conscious of itself – in agreement with Libet's observation that a properly obtained introspective report of conscious experience should be looked on like other kinds of objective experience (Libet, 2004). I will do this application by taking into account the objective reality of the psychic factor.

The introduction of the psychic dimension seems unavoidable in consciousness studies, in fact Jung had already stated it in 1951:

"... science believed fervently in absolute objectivity and assiduously overlooked the fundamental difficulty that the real vehicle and begetter of all knowledge is the psyche, the very thing

that scientists knew the least about. [...] It is only quite recently that they have been obliged to take into their calculations the objective reality of this psychic factor". (Jung, 1978)

According to these words, I postulate the existence of a Psychic Entanglement (PE) emerging from the introspection between the observer and the observed: *"The brain (the observer) is part of the physical world (the observed), whose representation, as generated by the brain's neural processes, includes the perception of the brain itself"* (Rapparini, 2011). This postulate is the answer to the [Riddle](#) at the beginning of this paper.

The concept of entanglement is the feature that marks most the departure from classic (i.e. Newtonian) mechanics: *"I would not call [entanglement] one but rather the characteristic trait of quantum mechanics, the one that enforces its entire departure from classical lines of thought"* (Schrödinger, 1935). Relativity has changed our perception of space and time but not even relativity theory is so markedly different from classic mechanics as quantum theory. In relativity the observer and the world are still two separate entities that do not interfere with each other; quantum entanglement challenges orthodox ideas about the involvement and the influence of our brain in cognition. Psychic quantum entanglement does away with the distinction between observer and observed (brain and world), although they are needed in traditional theories of knowledge – the differentiation of subject and object makes possible a relation between them.

In psychology, the exact measurement of quantities determined by the "interaction-with-the-environment" is replaced by an approximate determination on intensities, for which purpose, in strict

contrast to physics, we enlist the function of feeling (*valuation*). The latter takes the place, in psychology, of concrete measurement in physics (Jung, 1973).

Such would be the case with very strong emotions related to altered states of consciousness: decoherence would happen as a consequence of a stroke, an emotion - the equivalent of a measurement device.

In this case we feel as awakening to a new introspective condition, whereby the observer (the brain) becomes aware that something has abruptly changed in its own perception, revealing its separation from the observed (the world).

The inseparability of observer and observed suggests a new order that requires that non-separability is built in from the very beginning: this is the case with psychic entanglement, a novel approach which recognises the involvement and the influence of our brain in cognition. Quantum entanglement is what marks the upgrading of cognition to the psychic dimension.

This approach allows to formally extend the analogies between Quantum Theory and the Psyche. I will thus specifically highlight this approach by mentioning a personal experience: a mild stroke that hit my brain on Christmas Eve 2007. In Section 2 I present the Introspective Report discussing the physical fact (2.1), the psychophysical "awakening" in terms of a relativistic spacetime manifold à la Minkowski (2.2) and its psychic quantum transactional interpretation (2.3). Section 3 is devoted to the conclusions with some interesting considerations about the problem of psychophysical observation or "reduction process" in relation to the concept of free will that then comes to be directly connected to decoherence in quantum theory.

2. Introspective Report

A properly obtained introspective report of conscious experience should be looked on like other kinds of objective experience (Libet, 2004) by taking into account the objective reality of the psychic factor.

The introspective report contains the physical facts (the ictus), the description of the psychophysical feelings induced by the ictus (disorientation, timelessness) and the interpretation of the psychic memories that had been repressed in the subconscious and as a result of the ictus resurfaced in consciousness.

2.1. The Ictus

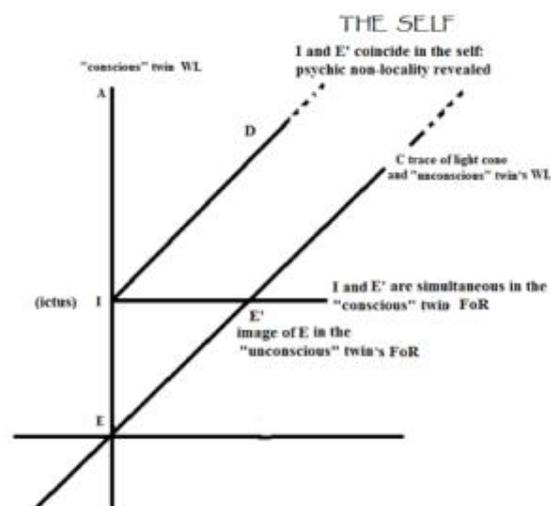
I must refer here to a mild stroke (ictus) that I suffered on Christmas Eve 2007. My brain was temporarily impaired due a blood clot that had occluded the supply of oxygenated blood to my Broca and adjacent area. I was able to speak but I uttered words out of the context and could not bring myself to make even a short, meaningful sentence. This indicated that my Broca area had been affected, furthermore I was unable to move my right thumb for a few minutes, another indication that the ictus had occurred in the left hemisphere of my brain. These were the manifestations of the biophysical facts that had taken place in my neural networks, they were accompanied by feelings of disorientation and timelessness, as if time had stopped. I was experiencing an altered state of consciousness, a *valuation* in Jung's terminology. Jung enlisted the function of *feeling* (valuation) to take the place in a psychophysical context of concrete "measurement" in a physical context (Jung, 1973).

2.2. The Psychophysical Relativity

This "awakening" to a new condition - occurring at the moment of the stroke (**I**) - brought back memories (**E'**) of a past event (**E**) that had not been forgotten but repressed, reappearing in my conscious life from the depth of the unconscious.

This is a case where a specific physical event **I** (ictus) well defined in space and time, sets in motion a flow of psychic events **E'**: sensations, feelings, memories. Such a causal chain of events is not unusual, what makes it special though, is that the cause was *inside* my brain. A little neuroplasticity was enough to restore the physical damage in my brain, but it had lasting psychophysical consequences on my mind.

Let me now introduce a description of what happened during my stroke based on the twin's paradox. Einstein's thought experiment about the twins moving at a constant velocity V relative to each other is here presented in the case $V \Rightarrow c$. In this case the frame of reference (FoR) of the second twin as seen from the laboratory FoR of the first twin collapses onto the trace of the light cone or photon worldline and his clock will stop. Time stretches indefinitely and distance shrinks into nothing. This is exactly the feeling that I had: timelessness and being stuck on the spot although I could see the pointers of the clock moving and could move around in the kitchen. I was very much conscious of myself and at the same time I had this eerie feeling as if I were another person. The twins paradox seemed the obvious choice. The "twins" that I am referring to are the children of the self: they live entangled lives in a psychic space-time continuum *à la* Minkowski and do not take notice of each other unless something unusual happens (a stroke) (Rapparini, 2014).



I=ictus, E=Event, E'=memories
Fig. 1 Relativistic model of the valuation

Their names are "Conscious" and "Unconscious". At the moment of the ictus the unconscious twin leaves the common house at the speed of light with regard to the conscious twin's frame of reference, and it joins it again to complete the self as being "the psyche image of totality and wholeness". It all happened as if the clock of the unconscious twin had stopped at the clock time of event **E** only to re-emerge at the moment **I** (the ictus that occurred to the conscious twin) coincidental with memory **E'** in the unconscious twin frame of reference. If we apply Einstein's situation to the conscious/unconscious twins, we can describe it in the following way: the conscious observer in the laboratory frame of reference measures the coordinate time interval between events **E** and **I** as being t , however his proper time as measured by a clock between the same events is given by T in general larger than t . The unconscious inertial observer – within the assumption of the locally co-moving unaccelerated frame (Bohm, 1996) – measures the coordinate time interval along the photon worldline between events **E** and **E'** as t as well since the two observers are one and the same person.

Proper time however as measured by a clock between the same events for the unconscious observer will be, say, $T^* = 0$ because for the unconscious twin event **E** and its memory **E'** coincide (remember: the clock stops on the photon worldline, in other words there is no time to be measured). We know that **I** and **E'** are simultaneous in the laboratory frame of reference (t equal in both cases), but then what does $T^* = 0$ mean on the photon worldline? It does not mean that **E** and **E'** are simultaneous, what it means is that the unconscious twin is re-living event **E** in the here-and-now although it may have happened years before! A short-circuit in time as it were: this is what happens on a lightlike interval. Clock time is replaced by psychic time.

2.3. The Psychic Quantum Field

In this section I explicitly highlight the analogies between the description of quantum physical phenomena and their psychophysical perception. I do this on Jung's and Pauli's authority:

"...we are concerned first and foremost to establish certain analogies, and no more than that; the existence of such analogies do not entitle us to conclude that the connection is already proven. We must, in the present state of our physical and psychological knowledge, be content with the mere resemblance to one another of certain basic reflections. The existing analogies, however, are significant enough in themselves to warrant the prominence we have given them." (Jung, 1973).

The analogy between the inner process of sense-perception and observation in physics had not escaped Pauli's attention:

"Complementarity in quantum physics introduces the concept of probability fields that cannot be measured simultaneously at different places. Making a measurement at one place means that we pass to a new phenomenon with altered initial conditions for which a new field has to be stated everywhere. Thus quantum phenomena have a new property of wholeness in that they cannot be decomposed into partial phenomena without thereby in each case changing the whole phenomenon in an essential way and since every extension of consciousness ("bringing into consciousness") must by reaction alter the unconscious, we may expect a "problem of observation" in relation to the unconscious. Such an alteration is a psychophysical process in so far as physiological processes in the brain necessarily accompany it." (Pauli, 2010).

Rightly, Pauli establishes a parallel between quantum theory and the psychic processes that took place in the mind, I feel therefore confident in putting forward a description of my experience establishing a parallel between the biophysical process of the electrochemical communication (action potential, neurotransmitters), the neurons (dendrite-synapse-axon) and its psychophysical description. I formally cast the relativistic model of the "valuation" that I experienced (Fig. 1) into the Transactional Interpretation of Quantum Mechanics (TIQM) (Cramer, 1988).

TIQM in this case is seen as a convenient formal device whose application to the particular context of psychophysical processes in the brain must be understood "as if" TIQM were used in its own field of application.

I will talk about neurons “as if” they were elementary particles; this is of course not the case but it is a valuable heuristic tool to reach conclusions in agreement with the quantum physical description of psychic phenomena. TIQM is used to give a description of the interactions between neurons considered as the constituent elementary objects of the brain and in this sense it is possible to apply TIQM terminology to describe psychophysical processes in the brain. TIQM is a way of thinking rather than a way of calculating.

Therefore, information is exchanged between neurons “as if” a Psychic Field existed where “transactions” are established between neurons acting as waves emitters and receiving an “echo” back from neurons acting as absorbers of confirmation waves. Under normal conditions there are many neurons in the brain which can act as potential future absorbers and if all provide such “echoes” then transactions are established with satisfaction of quantum boundary conditions at emitter and absorber loci, in analogy to a standing wave between terminating walls. An observer (the brain itself) would perceive only the completed transaction, which he could reinterpret as the passage of a single retarded (i.e. positive energy) boson from emitter to absorber. Such bosons or psychic quanta ψ are not meant to be real physical “particles”; they are “true” bosons living in the brain, the quanta of the standing waves that sustain the neural structures. They have no independent existence, and have no meaningful identity independent of their role and function in the whole. They emerge from the brain’s neural processes – just as phonons cannot be physically found in crystals, but emerge from the process of lattice vibrations (Vitiello, 1996). The ψ ’s or standing waves are in fact the messengers exchanged by neurons and are responsible for the emergence of the mind.

If you dissect a brain on a dissecting table you will not find any ψ but they will appear as soon as a brain is formed in the womb of a pregnant women. Psyche is the only begetter of knowledge, even concerning psyche itself. It is all in the mind of the beholder.

The Psychic Field is a quantum field with entangled modes; in psychic entanglement the properties of the whole are conditioning the properties of the individual neurons. The whole gives form to the parts, it organizes the parts so that one can say there is a kind of organic process involved. Their ensemble is the mind. In fact while we are speaking of a biophysical process (how neurons exchange information via chemical neurotransmitters across synapses) we are at the same time exposing the characteristic traits of *Gestalt* psychology i.e. the top-down approach and its wholeness (Amann, 1993).

The psychic quanta ψ emerge from this process. Quantum processes determine macroscopic behaviour in the brain but they need not to be causally related to the emergence of consciousness or, in other words, they are unlikely to be reflected in conscious experience (Rapparini, 2011). The transactional interpretation of QM describes quantum interactions in term of a standing wave formed by both retarded (“forward-in-time”) waves, in addition to advanced (“backward-in-time”) waves. In this interpretation, the collapse of the wave function does not happen at any specific point in time - but is “atemporal” in agreement with the fact that physical decoherence in the brain cannot be pinpointed - and occurs along the whole transaction, and the emission/absorption process is time-symmetric. The waves are seen as being physically real, rather than a mere mathematical device to record the observer's knowledge.

There is only one brain: "*Conscious*" and "*Unconscious*" (the "*Twins*") are two modes of the Psychic Quantum Field that the brain can switch into. It all happens as if quantum decoherence occurred at the moment of the ictus **I** (the equivalent of physical measurement) revealing the splitting of the two modes which remain however entangled.

In TIQM interpretation, the collapse of the wave function (the "*awakening*"), occurred when ictus **I** struck the conscious twin at the time *t*, which feels "*atemporal*" in the unconscious twin's frame of reference: decoherence occurs along the whole transaction, and the emission/absorption process is time-symmetric. This explains that $T^* = 0$ in agreement with the relativity-based description and the feeling that time had stopped, in other words it is possible to say that the psychic boson ψ had instantly carried the message between the twins.

Proper time coincides here with psychic time. Psychic time emerges from the psychic entanglement of the two 'twins'; from the moment **I = E'** psychic time and clock time coincide again and the two twins merge into one observer.

3. Conclusions

I have presented here a psychophysical case in which a properly obtained introspective report of conscious experience is looked on like other kinds of objective experience (Libet, 2004) by taking into account the objective reality of the psychic factor. Specifically it is discussed a first person description of stroke experience: a very clear-cut case where the jungian *valuation* happened when a stroke well pinpointed in space and time hit my brain.

An analysis of the psychophysical feelings arisen from this experience has been given in relativistic terms based on the Twins Paradox. The Twins have been

further considered as two modes of a Psychic Quantum Field in TIQM, thereby introducing quantum effects on neural processes. In this way it has been possible to describe the unfolding of psychophysical events induced by the stroke: the physical event itself, the psychophysical feelings and the psychic emotions.

The case is discussed in terms of a psychic process that runs parallel to the biophysical process sustaining the communication across neurons, thus establishing a bridge between the Psyche and Quantum Theory, as already correctly guessed by Pauli and Jung. The TIQM interpretation of Quantum Field Theory (QFT) has made possible to find the analogies between quantum theory and psychic emotions, under the epistemological assumption that it is possible to interpret the brain's workings "*as if*" quantum coherence existed and were at work. Decoherence happens as a consequence of "*psychophysical observation*" (*valuation* in jungian terminology) or "*reduction process*", the equivalent of decoherence in quantum theory as a consequence of a physical measurement. The problem of observation was strictly associated with self-consciousness - specifically in cases of altered states of consciousness (by means of stroke, hallucinations, drugs).

When being pushed to choose among different possibilities, because of psychophysical constraints one has to make a choice. In this perspective, the concept of free will becomes directly connected to the decoherence or reduction process.

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