

Science and the Self-Referentiality of Consciousness

Michel Bitbol, Ph.D.¹, and Pier-Luigi Luisi, Ph.D.²,

¹CREA, CNRS/Ecole Polytechnique, ENSTA, 32, Boulevard
Victor, 75015 Paris, France. ²Department of Biology, University of
Roma 3, Viale G. Marconi 446, 00146 Rome, Italy

Abstract

In this paper, we study the extent and limits of scientific inquiry about consciousness. We first insist on the exceptional status of conscious experience, which is no proper object of investigation, but rather an actual presence and a precondition of any investigation. To better characterize this status, we develop the concept of “radical self-reference”. Questioning about consciousness is radically self-referential in so far as it is itself an act of consciousness. This suggests that consciousness is *existentially* primary; a kind of primacy which clearly departs from the *ontological* primacy advocated by property dualists or panpsychists. We then notice that, accordingly, science has some basic features which hinder in principle its approach of consciousness: it distantiates from its objet, whereas consciousness is at no distance; it tends to formulate truths that do not depend on one’s situation, whereas consciousness is what it is like to be situated; it claims that physical explanations are self-sufficient, thus threatening to reduce consciousness to an epiphenomenon. These remarks tend to increase the “hardness” of the “hard problem” of the *origin and existence* of consciousness. Yet, we also point out that scientific inquiries are able to clarify a host of interesting issues about the *forms and development* of consciousness. We thus present a discussion about the significance of evolutionary arguments about consciousness. We wonder whether higher order features of consciousness such as reflectivity or self-knowledge can be considered as “spandrels” of evolution (mere side consequence of other features),

or rather as adaptative features that were selected in the same way as love behavior. We also discuss the adaptative value of an important byproduct of the higher-order features of consciousness, namely belief in supernatural powers. We finally examine the evolutionary relevance of a conception according to which the brain is a modulator of consciousness rather than its source.

KEY WORDS: consciousness, phenomenology, first-person experience, objectivity, hard problem, darwinism, evolution,

1. INTRODUCTION

This paper is the coordinate effort of a philosopher and a scientist to tackle the question of consciousness. Its aim is to investigate whether and to what extent a harmony or even better a synergy of view is possible on the subject. From the beginning of this endeavor, we were well aware of the difficulty of the task, our advantage being that we also had a common background. Both of us tend to criticize classical reductionist science, and to advocate the systemic conceptions of life and knowledge developed by Maturana and Varela under the names of *autopoiesis* and *enaction*. We also accept the fact of elementary consciousness, or pure lived experience, as *primary*, although with small (but profound) nuances. And we both share interest in Husserl's (1970) and Heidegger's (2010) phenomenology, that we consider as a pioneering attempt at exploring the field of consciousness in the first person. Thus, we were close to each other and nevertheless not ready to completely yield to the other. In particular, the scientist was not ready to accept that science has nothing *really* significant to say about the origin of consciousness; and the philosopher was somehow reluctant to complement his views about the lived immediacy of conscious experience with empirical inquiry, that he saw as a distraction from the truly central issue. So, let's see where this debate leads us in the field of consciousness studies.

Before we come to the heart of the subject, some precisions about words are necessary, since when they use the term "consciousness" people mean the most disparate things. We are not concerned here with acts of volition, possibly connected with the moral problem of discriminating the good from the evil – we leave that to St Augustine (2009); and we acknowledge the restriction of this field of meaning to the parent term "conscience". We are rather interested in the actuality of lived experience attending to any act of feeling, thinking, doing, and more generally being. Within it, we make a difference between three layers of this experience: (a) pure non-reflective experience (the mere "feel" of

sensing and being, without awareness of this feel); (b) reflective consciousness, namely the second-order awareness of having the experience of something; (c) self-consciousness, in the sense of being aware of one's own identity and local embodiment. Of course, we admit a certain amount of blending between the three layers. Firstly, in human life, non-reflective experience is usually associated with reflective consciousness (Joseph 1982). It is precisely reflection that gives us access to experience, thus allowing to speak of it. Secondly, self-consciousness is a special case of reflection: it is reflection about the experience of one's body and biographical memory. However, despite this large amount of interdependence between the levels of consciousness, making the distinction proves useful to understand many familiar situations. For instance, the connection of the two first layers appears to break in cases of displaced attention: when a person is skilfully driving a car while being distracted by talking to somebody, one can easily understand this as a case of nonreflective experience of the road associated with reflective consciousness of the discussion.

We then start, in section 2, with a strong statement of the givenness of pure experience. In section 3 we draw some consequences from this universal condition of scientific inquiry. With this epistemological proviso in mind, we turn to science in section 4 and discuss the evolutionary background of the elaborate forms of consciousness, namely reflective consciousness, full self-consciousness, and the spiritual quest that arises from them. In section 5, we address the relevance of quantum mechanics to consciousness. Our conclusive remarks are devoted to embedding the philosophical and scientific aspects of our investigation in a broader picture.

2. ON THE RADICAL SELF-REFERENTIALITY OF CONSCIOUSNESS

According to Maurice Merleau-Ponty (1964), philosophy is “(...) the set of questions in which the one who questions is himself implicated in the question”. Any question about consciousness (here understood as pure experience revealed by reflection) is then utterly philosophical. For when we raise a question about consciousness, we are not only implicated in it *in abstracto*, timelessly, as generic human beings ; we are fully implicated in it by what we *are* at this precise moment. We are fully and presently implicated in it because *formulating* a question about consciousness is an act of consciousness; *understanding* a question about consciousness is an act of consciousness ; figuring out how we could *answer* a question about consciousness is yet another act of consciousness. In short, questions about consciousness are radically self-referential.

Let us ponder about this notion of *radical* self-referentiality, because it may bring us closer to the heart of the issue of consciousness. A sentence such as “this sentence uses five words” is self-referential.

It is easy to see that it indeed refers to itself, provided one shifts attention from the meaning of the sentence to its lexicon, from what it says to the graphemes it is made of. Here, the required attention shift goes from one object of consciousness (what is meant) to another object of consciousness (the written words). By contrast, the self-referential character of a question about consciousness is seen only if attention shifts from the meaning of the question to present conscious experience as the background of this very act of attention. In this case, the second focus of attention is no “object” at all ; rather, it is the condition for anything to be taken as an object. This is why questions about consciousness are more than self-referential : they are *radically* self-referential. In fact, the radical self-referentiality of questions about consciousness is no abstract circumstance: it can be recognized as a fundamental feature of our lived experience in certain educated practices such as the phenomenological “suspension of judgment”, or Zen meditation (Bertossa & Ferrari, 2004).

The question “*where* does consciousness come from ?” provides us with a good illustration of how misguided one can be if this kind of self-referentiality is ignored. When we ask the question “where?”, we usually prepare ourselves to focus our attention on some restricted region of our conscious experience : right or left, up or down, nearby or far away, inside or outside the skull, in this or that part of the brain cortex or nuclei, in this or that spatio-temporal phase of neural firings, in cognitive functions or in their material substrate. And when we think we have got the answer, after a deep speculative reflection or after a long experimental inquiry, this answer often consists in pointing towards an *object* or a process that we can describe, think about, or even sometimes *imagine*. Only advanced spiritual thinkers are ready to endow their “where” with a cosmic dimension, and ascribe consciousness a locus which is much broader than any object of possible perception or standard conceptualization (e.g. the well-known Indian metaphor which represents our *personal* conscious life as a small ripple on the global ocean of being). In our culture, answering a question about the origin of consciousness is usually tantamount to singling out a given *content* of our consciousness, and encouraging others to modulate their own consciousness accordingly. Everything looks as if we were trying to ascribe consciousness as a *whole* to some *part* of it ; as if conscious experience, this all-pervasive fact that constitutes our lives, were tentatively encapsulated in a *fraction* of it. This sounds awkward indeed! There is an easy way to alleviate this feeling of awkwardness, though.

Turning our attention to the background condition of any act of attention (in line with radical self-referentiality), we are bound to reply that “consciousness comes from nowhere else than ... *here*”. True, “here” does not look like a serious answer, because it does not refer to a special place, a special object, or a special process. But should we dismiss it so quickly ? Let us think a little further. “Here” is an indexical (or deictic, or demonstrative) term, like “I”, “now”,

and “this”. As any indexical term, it fully *commits* the person who utters it. It thereby invites other persons to figure out how things appear from the standpoint of the utterer, or more generally how things appear from the standpoint of any utterer whatsoever. “Here” is a verbal operator that brings each one of us back to one’s own situation. Saying that “consciousness comes from *here*” then means that consciousness has no other obvious origin than the present situation. Consciousness is the name we give to the astounding realization of immediate existence, even before its more intricate connotations such as reflective consciousness, self-consciousness, or moral conscience. Consciousness, in this very elementary sense, is *existentially primary*.

These obvious (yet destabilizing) remarks are not derived from any argument. They rather arise when we suspend any judgment, and just state the elementary features of what we are living. They express what E. Husserl (1913/1931) called a *phenomenological description*; a plain statement of what is immediately experienced, irrespective of any interpretation of the contents of experience in naturalistic terms. So, asserting that consciousness is “existentially primary” was no metaphysical doctrine. Asserting the existential primacy of consciousness was no idealist, property dualist (Chalmers, 1996), or panpsychist (Strawson, 2007) doctrine of the ontological primacy of consciousness to be contrasted with a doctrine of the ontological primacy of matter. Unlike Chalmers, who claims that consciousness is a fundamental (yet non-physical) property of information processors, and unlike Strawson who spreads experience (or proto-experience) on matter in general, we refrain from any such doctrine. We just invite our readers to be faithful to their own lived experience in its most pristine form.

3. THE SCIENTIFIC APPROACH TO CONSCIOUSNESS: GENERAL REMARKS

What about science? What about the physics that physicalist doctrines of consciousness summon? What about the neurobiology that reductionism or eliminativism put forward? To begin with, we must ponder about the fact that the physical sciences cannot avoid using language and symbols. This use is not innocent; it has momentous consequences. Two features of language have an especially strong impact on what science can say about conscious experience (Joseph 1982). Two features that are so elementary that one usually does not even pay serious attention to them: language *means* and *discriminates* (Joseph 1982, 1988a,b).

Meaning is tantamount to displacing attention. It displaces attention from the sound of a word to what it signifies, from the pointed finger to what it aims at showing. Meaning thereby pushes us outwards, towards the future, towards something that is not close at hand. When we use a word for “consciousness”,

we are then automatically led astray, because conscious experience is not *something* over *there* to be *meant* in any way. Once again consciousness is plainly *here*; this “here” that submerges us ; this “here” that is presupposed by any location in space. Trying to mean consciousness is self-defeating, since what is allegedly meant is not beyond the very act of meaning it. It is radically self-referring.

The same holds for the discriminative power of language (Joseph 1982). How can we discriminate present conscious experience from anything else? This can be done in everyday use for making a difference between somebody else’s *apparent* states of wakefulness and sleep ; but not in the proper existential (and radically self-referential) sense, since *at this precise moment* that contains in it all the memories of the past and all the projects for the future, there is nothing that can be contrasted with it.

Classical science can be biased about consciousness in the same way as language itself: it attempts to put a distance to what is at no distance from us, and to discriminate what can be contrasted with nothing. Drawing from language, many scientists tend to treat consciousness as a *property* of human organisms. However, when ascribing a “property” to something it must be based on reliable criteria bearing on this thing, whereas any external bodily consciousness-criterion, be it presence or absence of verbal report, or presence or absence of certain waves on an electroencephalogram, is weak and ambiguous. One proof of consciousness is that we are living at this precise moment (an embodied living as opposed to a contemplated body); this testifies to no property, but rather to the most basic condition for ascribing properties at all.

More specifically, classical science was born from the decision to *objectify*, namely to select the elements of experience that are invariant across persons and situations. Its aim is to formulate *universal* truths, namely truths that can be accepted by anyone irrespective of one’s situation. Therefore, the kind of truths science can reach is quite peculiar: they take the form of universal and necessary connections between phenomena (the so-called scientific laws). This epistemological remark has devastating consequences. It means that *in virtue of the very methodological presupposition on which it is based*, classical science has little to say about the mere fact that there are phenomena (ultimately construed as appearances experienced by someone), let alone on the qualitative content of these phenomena/appearances (Wright, 2008).

Let us give a few examples. Physics establishes laws about phenomena that are characterized as electromagnetic. It classifies the waves that give rise to the perception of colours according to their wavelengths. But classical physics has little to say about the very existence of an experience of colour and even less about its lived quality. Psychophysics and neurology of occipital cortex areas add more and more precise knowledge about the structure of colour perception in humans, about the mutual relations of various perceived colours,

about the physiological states in which colour perception is reported to be altered. But often those who study this phenomenon remain mute about how and why there should be any lived experience of colour at all when neuronal activity occurs in these brain areas, and about what it is like to experience blue or red. More generally, we have witnessed amazing advances of neurophysiology about how the brain stores information, binds its maps and programs for action, and even elaborates self-mapping (Joseph 2009, 2011). These discoveries have also been actively correlated with human subjects' descriptions of their own conscious experience, thus allowing some scientists to speak of memory or unified consciousness instead of information binding, and of self-awareness instead of self-mapping. But only a few neuroscientists have sought to explain why and how these neuronal processes should generate anything like conscious experience (Joseph 1982, 1988a,b, 2009). In other terms, borrowed from David Chalmers, physical and neurological sciences have shown their ability to solve an unlimited number of "easy problems" about the structure and neural correlates of conscious events, but most remain silent about the "hard problem" of the existence, origin, and "feel" of conscious experience itself. This is just a consequence of the methodological decision by some scientists to *objectify* that has been taken at the very foundation of science. Objectification automatically pushes situated lived experience in the "blind spot" of research.

This fundamental limitation of the classical scientific inquiry about consciousness has serious consequences. One of them arises from the so-called "causal closure" of physical and physiological explanations (the conviction that the system of causes of physics is complete, that it is sufficient to explain any event without resorting to any non-physical cause). Nothing prevents one from offering a purely physical or physiological account of the chain of causes operating from a sensory input received by an organism to the behaviour of this organism. At no point does one need to invoke the circumstance that this organism is perceiving and acting consciously; *that* it has a *feel*. The fact of consciousness here appears as irrelevant or incidental. This is what Max Velmans (2009, p. 300) calls the "causal paradox" of consciousness. Therefore, the more a scientific/objective account of mental processes is complete (namely the more it complies with the norm of causal closure), the more some believe conscious experience to be bound or to be construed as a mere *epiphenomenon*. A confirmation of this impression can be found in a recent about turn concerning the meaning of the word "mind".

Formerly, this word implied consciousness in a tacit way, be it pure non-reflective experience or reflective consciousness. But later on, the word "mind" became, for some, a synonym of "system of cognitive functions". One insisted that many mental operations are unconscious, and that only a few of them give rise to conscious experience. So much so that the question as to whether or

not consciousness is a property of our mind arose, thus suggesting that consciousness might be somehow subsidiary with respect to mind.

The same is true in principle of evolutionist arguments, which are documented in the next section. Evolution can select certain useful functions ascribed to consciousness (such as unification of information, or behavioral emotivity of the organism, or reflectivity), but not the mere fact that there is something it is like to implement these functions. In other terms, borrowed from N. Block et al. (1997), evolution can select features of access consciousness but not phenomenal consciousness itself. Some scientists (e.g. Hardcastle, 1996) have indirectly acknowledged this fundamental lacuna by arguing that scientists should be allowed to completely ignore the “hard problem” of the existence and origin of elementary consciousness, and just proceed with the many interesting “easy” problems about the structure and correlates of consciousness it is able to clarify.

4. AN EVOLUTIONARY VIEW OF CONSCIOUSNESS

We have just outlined a series of cautious remarks on why a strictly third person approach to consciousness, in particular to the hard problem of the physical origin of experience, is bound to fail. These remarks actually point towards the necessity of introducing and taking seriously first person reports in science (Joseph 1982, 1988a,b; Petitmengin & Bitbol, 2009).

This does not mean that we claim that no scientific inquiry should be carried out on the subject, but only that either one should be permanently aware of the scope and limits of such inquiry, or that one should include first person approaches in a broadened definition of science, as Varela (1996) did.

Even though strictly classical science is often mute about the stubborn and isolated “hard problem”, it is able to highlight and elucidate a growing number of the so-called “easy” aspects of consciousness, which are remarkably rich and important. An objective scientific approach is therefore complementary to the view of the radical self-referentiality discussed above. Actually, it may be interesting to see what this complementary aspect is – and this is one of the main aims of this section.

We can start from a very general, apparently harmless statement: *consciousness is connected to our biology of human beings*. This rather innocent statement becomes less trivial, however, as soon as we recall, and attach to it, the famous 1973 predicament of Theodosius Dobzhansky, “Nothing in Biology Makes Sense Except in the Light of Evolution”. Once we accept this corollary, namely a link between consciousness and evolution, we are almost automatically bound to ask questions such as: “is consciousness, or at least some crucial aspects of it, then part of biological evolution?” “Does it mean that it is some-

how based on evolving genes?” “What is consciousness good for, in terms of reproductive advantage?” And also “where was consciousness before mankind arose?”

The main point here is the acceptance of the notion that some crucial features of consciousness, such as, say, reflectivity or self-awareness are part of the biological evolution and therefore important for mankind development and reproduction (see e.g. Joseph 1982, about how “extended consciousness”, or reflective consciousness, emerges out of primary consciousness).

But is there any scientific way to establish a relation between evolution and consciousness without falling into the machinery of the Darwinian natural selection theory? Something that comes to mind is the notion of “spandrels” as advocated by Jay Stephen Gould and Lewontin (1979) after having visited San Marco’ cathedral in Venice. There they noticed beautiful curved area of masonry which were not originally planned by the architects, but arose as necessary architectural byproducts. Gould and Lewontin thus defined spandrels in evolutionary biology to mean any biological feature that arises as a necessary side consequence of other features, a type of feature which is not directly determined by natural selection.

Should we then consider the subjective experience of being and knowing it, namely reflective consciousness, as a spandrel of evolution? This idea would have the advantage that we do not have to care about evolving genes for consciousness. Of course, all this is difficult to prove, and it is difficult to argue against or in favour of it. So, let us go back for a moment to the main stream, and ask: what would really mean to consider consciousness as part of the Darwinian evolutionary pathway?

To understand this question somehow, let us make the analogy with another important genetic determinant of the animal kingdom, love (or at least love behavior). We can say that love behavior is an important mechanism of evolution, in the sense that without the love of the mother for her puppies, or without sexual attraction between man and woman, there would be no reproduction and therefore no survival of the species. So, with all the great beauty and poetic respect for this most important and noblest element of mankind, we should also say that love is an animal instinct, somehow linked to genetic determinants. Are we ready to say that the same is true for consciousness?

Clearly, things are not so simple as in the case of love behavior. In particular, the reproductive advantage of the highest forms of consciousness (especially reflectivity, self-awareness, and even social awareness) is far from being obvious. But one can make the point that there is indeed something like that, once we consider an important “spin off” of consciousness, which is spirituality/religiosity.

There is by now a vast literature in anthropology about men being “born to believe” as a Darwinian evolutionary trait (Boyer 1994, Giroto et al., 2008,

Feierman 2009). To see this relation in a kind of pictorial/poetic way, let us go back 6 million year ago, when the common ancestors *homo* and chimpanzee separated from each other, and *homo*, moving in the savanna, eventually started to walk on two legs and developing a bi-pedal consciousness.

Imagine then the awe, and fear, of our early ancestors looking at the immensity of the sky, feeling on the one hand the inner experience of being, and at the same time strongly believing that the motion of the sun and the terrifying lightening in the storm is likely to be due to the presence of some superior powers that also have inner experience and will – the Gods (Joseph 2001). The gods to whom human beings first devoted rituals which enabled the tribe to have more internal cohesion and strength – thus enabling reproductive advantage, and later erected altars and temples.

The equation consciousness (as subject's reflective feeling of being) = inclination for religiosity (desire of contact with the mysteries of the universe), may be a valid and important one. Can we then also assume their mutual co-evolution?

Difficult to say, difficult to prove. We have no way of testing the evolution of consciousness. Actually, at this point, when we talk about evolution of consciousness, we may depart from the notion of consciousness as subjective experience – to embrace a broader notion of consciousness which also includes the dimensions we have eliminated from the start: decision making and moral code.

The hard-core classical scientist at this point would certainly intervene, to say that what has been evolving and growing is the brain – from the 500 cm or so of the first *homo* to the final value of 1500 cm (with an apparent maximum at the time of the Cro-Magnon people 30,000 years ago) – and with that, certainly, the optimization of certain human skills and intelligence (Joseph, 2000). Then, would it not be the easiest thing to say – he would add – that by increasing the brain size a critical value was reached, by which consciousness arose? Isn't this precisely what Crick was advocating with his "Astonishing Hypothesis" over 15 years ago?

According to us, this does not have to follow. These relevant evolutionary theories must not be mistaken for a true reductionist scientific account of the radical origin of conscious experience. Rather, they can easily be understood in terms of a non-reductionist conception of the relation between the lived and the living, between conscious experience and biological processes. One such conception was remarkably expressed by Beauregard and O'leary (2007) : "More than a century ago, William James proposed that the brain may serve as a permissive / transmissive / expressive function rather than a productive one, in terms of the mental events and experiences it allows (just as a prism, which is not the source of the light, changes the incoming light to form the coloured spectrum). Following James, Bergson and Huxley speculated that the brain acts as a filter or reducing valve by blocking out much of, and allowing registration and expression of only a narrow band of, perceivable reality. They

believed that over the course of evolution, the brain has been trained to eliminate most of those perceptions that do not directly aid our everyday survival. This outlook implies that the brain normally limits the human capacity to have spiritual experiences". Here, the brain is no longer seen as the "cause and place" of experience in general, but as the cause and place of its narrowed down variety which includes reflection and self-knowledge. Such vision of the brain and body as modulators makes sense of many scientific theories and experiments about the many-layered functionalities and amplifications of consciousness, without weakening our knowledge that raw experience is our most immediate given, a feature that is so basic and pervasive that nothing more basic is to be found to account for it. This vision even helps us to gain a better understanding of a true wonder : that there is not only "something it is like to be", but that there is also at this very moment *reflective realization* of being.

In terms of evolution of consciousness this hypothesis contains something potentially mischievous: it could mean that mankind becomes less and less capable of having peak spiritual experiences, that it is less and less capable to connect with what Rilke (2009), in his eighth Duino elegy, called "openness" – while the brain evolves in order to develop the skill and intelligence for everyday life-hunting, housing and making better weapons. A strange conclusion indeed: a negative evolution of spiritual capability and a positive evolution for technicalities.

All this relates to the old question, whether there is, or whether there has been, instead, a perceivable evolution of human consciousness. Can we say that human consciousness has made some progress in the course of evolution, or not? Is there any hope, expectancy, that mankind will develop towards more tolerance, less aggressivity, no war, etc?

Biological evolution moves at a slow pace and the distance that separates us from Lucy or our Neanderthal relatives is probably too small – a few million years – to clearly detect a difference. And for the same reason, we cannot prove the hypothesis of Bergson and Huxley. What can we conclude from this brief analysis using a scientific approach based on evolution? Certainly we did not learn anything new about the ultimate nature of consciousness - as we had foreseen. We have perceived the limit of this approach by acknowledging that we are not able to provide "proofs" for or against the idea of the evolution of consciousness in general. Yet, an evolutionary approach of certain important features of our consciousness (such as self-awareness and spiritual experience) has opened up and enriched our knowledge.

5. SOME LESSONS OF QUANTUM PHYSICS

Can't at least quantum physics, which clearly departs from classical science, provide us with some unconventional understanding of the status of

consciousness in nature? In past literature, there have been two major, but diametrically opposite, ways of seeing the putative connection between consciousness and quantum mechanics : consciousness as the cause of state vector reduction (Von Neumann, 1955, London and Bauer, 1939, Wigner, 1967, French, 2002), and state vector reduction as the physical basis of consciousness (Penrose, 1994, Hameroff & Penrose, 1996, Stapp, 2007). To understand why such connections were assumed, let us first remember that in Heisenberg's (1958) and Popper's (1982) realist reading, the state vector represents a complex of potentialities (or propensities) of physical systems. Now, an event has to be actualized out of the many potentialities, in order to enter into a univocal description of what is the case. According to a straightforward view, actualization should occur as soon as an interaction between the system and a measuring apparatus has taken place. Unfortunately, when this interaction is accounted for quantum mechanically, a new (entangled) state vector is to be ascribed to the compound system that includes the measuring apparatus, thus extending the domain of potentiality and apparently leaving no room to actuality. This is the well-known measurement problem of quantum mechanics. Decoherence only half-solves the problem by showing how the structure of quantum potentialities quickly tends towards a classical probabilistic structure as the interaction between the measurement chain and its environment develops (Joos et al., 2003). So, it is quite natural that many physicists have summoned consciousness as their last resource. On the one hand, conscious experience is precisely what is realized here and now as actual: it is the very paradigm of actuality and it then automatically stops the apparently infinite regress of potentialities as soon as it enters the scene. On the other hand, conversely, actualization by state vector reduction can be construed as what is needed in order to give birth to consciousness as a paradigm of actuality. Alternative challenging conceptions have insisted that, in order to account for what is witnessed in laboratories and in nature, it is not necessary to suppose that a *single* actuality is realized. It may be the case that several actualities co-exist and evolve in parallel, yet self-interpreting themselves as unique. This is the case in the many-worlds (Everett, 1957) or many-minds (Lockwood, 1989) interpretations, as well as in a recent interpretation that cogently points out the multiplicity of functions and mental states processed by various areas of the brain (Joseph, 2009).

One must pause at this point and ponder about the hidden assumptions of the whole debate. What has been assumed until now is a realist interpretation of quantum mechanical state vectors as intrinsic propensities of physical systems. But state vectors can also be interpreted anti-realistically as mere bearers of presently available experimental information, used for predicting outcomes of future experiments (Bruckner & Zeilinger, 2005; Bitbol, 1996, 1998, 2010). State vector reduction then only represents a convenient way of updat-

ing the available information. Along with this anti-realist interpretation, the relations between quantum mechanics and consciousness are seen in a very different light. One no longer has to believe that consciousness bursts in the outer world to reduce the state vector, nor to figure out that the outer world generates consciousness by a spontaneous process of actualization. Here, consciousness is no longer an object of the theory, but rather its most basic presupposition : it is that for which information makes sense.

This does not mean, however, that quantum mechanics interpreted in this non-realist way has nothing to teach us about consciousness. In fact, this theory has important clarifications in store for the philosophy of mind and consciousness (Bohr, 1987). The first clarification arises from the contextuality of quantum phenomena. Quantum phenomena adhere to the experimental situation in which they arise ; they are not independent of the measurement context in which they manifest ; accordingly, they cannot be said to “reveal” an intrinsic property. Despite this, quantum physicists were able to build a theory which holds independently of particular experimental situations. They obtained intersituational consent without detachment of an object.

Now, the epistemological status of a science of mind and consciousness is remarkably isomorphic to the epistemological status of quantum physics (Bitbol, 2000, 2002). Just as microphysical phenomena cannot be detached from measuring apparatuses, conscious experiences cannot be detached from the very state of being aware. Just as there are no true “properties” in quantum physics but only “observables”, there are no properties when consciousness is at stake, but only “livables” (first-person experiences). Just as in quantum physics one formulated an intersituational theory about “observables”, one can look for ways of obtaining intersubjective consensus about “livables” (Bitbol, 2008a,b). The latter strategy is similar to the one advocated by Varela (1996) in his neurophenomenology.

The second clarification to be obtained from quantum physics has to do with our concept of matter. Indeed, the conception of matter favored by quantum physics, in my opinion, hardly supports the materialist view (Bitbol, 2007). To sum up, this conception is that matter in the classical sense (namely bodies extended in space) is nothing else than a *phenomenon* shaped by our sense-organs or experimental apparatuses. What is left is only an abstract pattern of field-like dispositions out of which matter-like *appearances* manifest at our scale. As a consequence, ordinary matter can no longer be taken as the fundamental stuff out of which anything else emerges, including consciousness. At most, one could figure out that matter (*qua* macroscopic appearance) and consciousness (for which appearances make sense) are both immediately implied by the same background vaguely indicated through the concept of a dispositional quantum field. The latter view is speculative, but it is at least consistent with the former evolutionary picture of the brain as a mere modulator, amplifier, and self-monitoring device of ubiquitous elementary consciousness.

6. CONCLUDING REMARKS

The exercise of using the evolutionary approach was interesting in many ways. It did not elucidate the absolute origin of consciousness (we left untouched most of the questions listed at the beginning of the former section) but it was instrumental to bring out the shortcomings and the advantages of the scientific method in this area.

Let us take an example of shortcoming, which echoes our initial insistence on the radical self-referentiality of questions about consciousness. As any scientific approach should be, our evolutionary considerations were based on a typical combination of experiments and reasoning.

But, strangely enough for those who consider reasoning and rationality in general as their highest value, the use of reasoning turns out to be a major loophole when consciousness is at stake. Indeed, as E. Schrödinger (1964, p. 19) noticed, when the issues of mind and consciousness are dealt with, *the reasoning is part of the overall phenomenon to be explained, not a tool for any genuine explanation*. As any reasoning, a reasoning about consciousness involves conscious experience ; *acknowledging the validity* of a personal reasoning or of a mechanical inference performed by a Turing machine, is still a conscious experience. To sum up, any reasoning bearing on consciousness is included in what is reasoned about. So, when consciousness is presented as an object (rather than a background condition) of reasoning, this can only be in a fake sense.

This being granted, the most promising approach to fundamental questions about consciousness seems to be phenomenology, a method that (as we noticed in section 1) does not rely on reasoning, but on pure description of what is lived in the first person. Far from being a defect of the phenomenological approach, this bracketing of reasoning might well be its major quality.

The implication of what has been said until now is on the one hand that traditional science cannot help to shed light on the ultimate nature of consciousness; and on the other hand that pursuing the scientific inquiry, as indicated even by the coarse exercise carried out in section 4, is capable to enrich us immensely with complementary notions about the successive forms, restrictions, or ability to self-representation, of consciousness. Thinking of consciousness in terms of genes, in the same way as we do when love behavior is dealt with, is a hard pill to swallow for many philosophers and cognitive scientists, and because of that, possibly, a very useful exercise. The bold hypothesis of the development of the brain in two opposite directions (improvement of technical and logical abilities, yet loss of contemplative/spiritual potential) is something challenging from all kinds of perspectives. And asking questions about the origin of human forms of consciousness in the broad scenario of a development of our species is another useful intellectual enterprise.

To sum up, we emphasize the radical self-referentiality of consciousness which may be beyond the reach of objective science, and also beyond any ontological categorization unlike Chalmers' "fundamental properties". Yet, we also add that the scientific approach is the appropriate avenue to investigate and clarify the paraphernalia of conscious life.

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