MIND AND BRAIN STATES: EMBEDDING THE MENTAL IN THE LIVING ORGANISM

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With neurons emergence, life alters itself in a remarkable way. This embodied neurons become carriers of signals, and processing devices: it begins an inexorable progression of functional complexity, from increasingly drawn behaviors to the mind and eventually to consciousness [Damasio, 2010]. In which moment has awareness arisen in the history of life? The emergence of human consciousness is associated with evolutionary developments in brain, behavior and mind, which ultimately lead to the creation of culture, a radical novelty in natural history.

It is in this context of biological evolution of conscious brains that we raise the question: how conscious brains connect with each other? In order to answer it, I will explore how brain states and conscious states each participate in dynamic interactive processes involving the whole organism. I will argue that a possible way to overcome the hard problem of consciousness might be based on the notion of embodiment as a process of embedding the mental in the living organism relating dynamically with the environment through the sensory-motor experience. In order to do so, I will provide an assembly between an anthropologic perspective of consciousness with contemporary Philosophy of Mind, Interaction Theory [Gallagher 2001, 2008; Zahavi 2001, 2008; Fuchs and De Jaegher 2009].

***Key words*:** biological evolution; consciousness; interaction theory.

1. Consciousness on Biological Evolution

In the evolutionary process, how did the consciousness arise in a world where, until then, it did not existed? In animals' development, when did they first experienced mental events emerging from the darkness of unconsciousness?

These mental events must be related to the neuronal events that continually were posted in the brain, but how did they improved brain performance, making it so useful for evolutionary survival? In fact, the question that needs to be addressed is the following: what ontological status can be attributed to mental events that appeared in a world that could be once considered as a monastic physical world, this is, the world of matter and energy?

The instinctive performance of an animal is based on ontogenetic construction of the nervous system and related structures via genetic instructions. From the materialistic viewpoint, learning, meanwhile, can be regarded as an increasing the synaptic efficiency in repeated use. We can thus consider: which advantage has been produced by experiences associated with mental actions? William James suggested that the mind was a property acquired by a brain that is now too complex to control himself. It has been suggested that consciousness is useful regarding that it provided the animal a certain holistic experience. The immense diversity of standardized neuron activity conveyed coded information that could be used to reconstitute the image,

but a holistic operation like this cannot be performed by cortex machinery; it is, rather, achieved in conscious experience that arise when we open our eyes and that changes itself every moment in an apparent synchrony with visual information [see Hipólito, 2014a].

The Darwinian theory of evolution is imperfect since it does not recognize the extraordinary problem that is posed by the living organisms that acquire mental experiences of non-material type. Moreover and for another hand, the Cartesian solution cannot be accepted, given that it argues that humans conscious experiences are attributable to divine creation of souls, and therefore humans are mechanical automates empty of mental activity; as Popper [1982: 150] states "the emergence of consciousness in the animal kingdom is perhaps as great mystery as the origin of life itself. We must admit, however, and despite its impenetrable difficulty, that it is a product of evolution, of natural selection".

1.1. Mind-Brain: the rising of Self-Awareness

The materialist critics argue that there are insuperable difficulties in the case of immaterial mental events such as thinking acting over material structures such as the neurons of the cerebral cortex. Such action is alleged to be inconsistent with the conservation laws of physics, in particular the first law of thermodynamics. This objection would, obviously, be supported by the physicists of the nineteenth century and by neuroscientists and philosophers who lie still ideologically in nineteenth-century physics, not recognizing the evolution produced by quantum physicists of the twentieth century. Unfortunately, it is rare for a quantum physicist, to dare meddling in the mind-brain issue. Margenau (1984), affords a fundamental contribution «that some fields, such as the field of mechanical probability quantum, do not transport energy or matter" which means a remarkable transformation of nineteenth-century physics. Margenau continues stating:

> "In very complicated physical systems as the brain, neurons and the sense organs, whose constituents are small enough to be governed by quantum laws of probability, the physical body is always positioned for a number of possible modifications, each with a probability defined; if it occurs a modification which requires more energy or less energy than another, the intricate body provides it automatically. The mind would not be called upon to provide energy." (p. 96).

Shortly, what Margeneau asserts is that: "mind can be seen as a field in the physical sense of the term. But, as a non material field, for which the closest analogy is, perhaps, a field of probability" (p. 97). According to Margeneau (1984), the hypothesis is that of the mind-brain intersection being analogous to a quantum mechanics probabilistic field, which has no

mass nor energy but that can, however, lead to effective action in microsites. It is proposed more specifically, that the intentions involved in mental concentration or planned thought may lead to neuronal events by a procedure analogous to quantum mechanics probability fields. In this context, one may question which neural events could be proper recipients of mental events, which are analogous of quantum probability fields. The answer can be found in recent discoveries about the nature of the synoptic mechanism by which a nerve cell communicates with another, specially regarding mini-sites operation. To this extent, the microsites in the brain may have transcendental capabilities to be channels of communication between these two distinctive entities (mind-brain). If one accepts the fact that mental events can effectively act on brain, then the philosophical implications are far reaching.

It is in this context of biological evolution of conscious brains that we raise the question: how conscious brains engage with each other? In order to answer it, we will explore how brain states and conscious states each participate in dynamic interactive processes involving the whole organism and therefore, that human brains learn by interaction and that this occurs at the level of the *second-person* perspective [Gallagher, 2001, 2008; Zahavi 2001, 2005; Reddy 2003; Fuchs, 2005]. In the early years of social neuroscience, attempts had already been made to investigate two brains in interaction through "hyper-scanning," which was hailed as a break-through technology [Montague et al., 2002]. Although the application of this method has, indeed, provided invaluable insights into the neural basis of social cognition (SoCog) in conditions of health and pathology [e.g., King-Casas et al., 2005; 2008], the approach never really caught on. At least in part this is due to the fact that using it to its full potential would have required establishing more ecologically valid ways for two or more participants to interact [cf. Redcay et al., 2010]. However, first steps are now being taken to investigate the neural mechanisms of interaction dynamics.

Brain is an organ of modulation and transformation that mediates the cycles of organism-environment interaction. According to Fuchs (2009), the mind is not in the brain, but it is rather distributed among the brain, the body and the environment, this is, the brain is not only the organ of the mind since it is connected to a human head and body, and this body is connected to its environment and to other embodied human beings.

Contemporary Philosophy of Mind is mainly based on the assumption of a profound distinction between consciousness and biological life, in other words, the one conceived as internal and purely mental and the other as an external, functional property of physical systems: the so called hard problem of consciousness, which cannot be solved as long as the mind and life are conceptualized as exclusive concepts. However, according to new studies in Embodied Cognitive Science, the person must be thought not as pure subjectivity experienced from within and not as a complex physiolo-

gical system observed from without, but as a living being interacting with others within the second person perspective on the "you" perspective.

2. Brain, Body and World: Learning by Interaction

In Philosophy of Mind there is a duality between the first and third person perspective, but this seems insufficient since there is a gap between a person's mental states and another's perception of that person's body which is the only experienced from within and the other observable from without.

To overcome the antagonism of first and third person perspective, it has recently been proposed to introduce the notion of the second person perspective [Gallagher, 2001, 2008; Zahavi 2001, 2005; Reddy 2003, Fuchs, 2005].

In spite of the remarkable progress made in the burgeoning field of neuroscience, the neural mechanisms that underlie social encounters are only beginning to be studied and could – paradoxically – be seen as "dark matter" [Schilbach et al., 2013]. The field of Neuroscience has begun to illuminate the complex biological bases of human social cognitive (SoCog) abilities [Frith & Frith, 2010; Ochsner & Lieberman, 2001]. Two new neuroatomically distinct large-scale networks have gained center stage as the neural substrates of social cognition (SoCog): the so-called *mirror system* (MNS) and the *mentalizing network* (MENT). The formed is believed to give us a "first-person grasp" of the motor goals and intentions of other individuals [Rizolatti & Sinigaglia, 2010]. The later has been seen as providing evidence for a "Theory-Theory" account of SoCog believed to give us an inferential, reflective and what might be called a *third-person* grasp of the others' mental states (Frith & Frith, 2006, 2010). However it remains unclear whether, and how, activity in the large-scale neural networks described above is modulated by the degree to which a person does or does not feel actively involved in an ongoing interaction.

The duality of the first and third person perspective (1PP and 3PP) is an established opposition in philosophy of mind where it is mainly used to demonstrate the irreducibility of subject as against a physicality concept of the world [Fuchs, 2012]. The experiential perspective of a subject and the observational perspective (i.e. neuroscientist) cannot be brought to a final congruence because even the sum of any possible knowledge about objective process occurring in the subject's brain, body and surrounding world would not include what it is like for the subject to have the experience in question [Nagel, 1974]. It has recently been proposed to introduce the notion of the second person or intersubjective perspective (2PP) in order to overcome the antagonism of first and third person or subjective and objec-

tive perspective [Gallagher, 2001, 2008; Zahavi, 2001, 2005: 206–214; Reddy, 2003; Fuchs, 2012].

From this context results a triad of perspectives that has gained importance in contemporary Philosophy of Mind and SoCog. Each theory defining the access we use in understanding other persons:

1. Theory of Mind or Theory-Theory, claims traditionally, that other minds are known by reference to the best suitable hypotesis on the resins and motives for their behavior, this is, on the basis of observation, which means from a *third-person perspective.* This means that interacting with others does not add anything to this access in principle [Perner, 1991].
2. According to Simulation Theory, other minds are known by reference to a first person perspective. This means that understanding others requires to run an inner simulation of their behavior, thus creating an "as-if" mental state which then has to be somehow projected onto the other [Gallese and Goldman, 1998; Goldman, 2006].
3. The Interaction Theory is the most recent approach to Philosophy of Mind and SoCog and it claims that it is though immediate perception of, and embodied interaction with others that we gain our primary experience of their feelings and intentions, without recourse to inner theories or simulations. This approach focuses on the expressive bodily behavior, inter-bodily resonance, intentions as visible in action and the shared situational context in order to explain social understanding [Gallagher, 2001, 2008; Zahavi, 2001, 2008; de Jaegher and Di Paolo, 2007; Fuchs and De Jaegher, 2009].

The second-person approach has already begun to prove productive within SoCog, pointing out the importance of experiencing and interacting with others as our primarily ways of knowing them, preliminary evidence from neuroimaging demonstrates profound differences in neural processing related to the reciprocity of social interaction [Schilbach et al., 2013], which is consistent with our proposal that the second-person perspective can make an important contribution to the neuroscientific study of social encounters and could, in fact, lead to the development of second person neuroscience. In respect to developing awareness of minds though second-person engagements the role of social interaction for cognitive and social development has begun to gain center in several scientific discourses [de Jaegher et al., 2010]: the role of interaction as a vehicle for the acquisition of knowledge has, for instance, been demonstrated in language development. In contrast with the Chomskian idea of a "language acquisition device" [Chomsky, 1979], the perception of structure in social engagement has been shown to guide vocal development and language learning [Bruner, 1983; Goldstein & Schwade, 2010], both in terms of speech perception or turn-taking.

In other areas of research interaction has been investigated by focusing on processes such as involuntary mimicry [Chartrand & Bargh, 1999; Nie-

denthal et al., 2010], which leads to enhanced rapport and linking, but is also influenced by differences in affiliate motives and independent self-construal [van Baaren et al., 2003; Baaren et al., 2004]. Social interaction, however, involves more complex forms of coordination present from early on life [cf. Harrist & Waugh, 2002]. In this respect, Knoblish & Sebanz (2008) distinguish between "action simulation" [Rizzolatti & Sinigaglia, 2010], "joint attention" and "shared intentionality" [Tomasello & Carpenter, 2007]. The development of a shared perceptual and attentional space within early mutual attentional engagements is curtail, because it paves the way for triade interactions in which we share our mental states about a third object or person with other [Tomasello, 1995]. Such triadic attentional engagements may be crucial for developing complex joint actions [Fiebich & Gallagher, 2012].

A second-person account does not replace first and third person accounts, but bookers them to a large degree. Developing approaches for data collection and analysis from two interacting persons (and possibly two brains) is relevant, as is revisiting and modifying established experimental paradigms to incorporate an emotionally engaged, interactive perspective. How is it that largely automatic, implicit forms of interaction develop into explicit social cognitive capacities and how does explicit mind knowledge contribute to ongoing interactions? If one considers interaction as developmentally prior to mentalizing or mirroring, then the question remains: what drives interaction? How insights from a second-person account could be put to use in future research using computational neuroscience techniques and in the emerging file of social neuroendocrinology?

In this article, we argue for the conception of a second-person approach to other minds, suggesting that interpersonal understanding is primarily a matter of social interaction and emotional engagement with others. This hypothesis – well grounded in contemporary philosophical considerations – provides a different route to the investigation of intersubjectivity by emphasizing aspects of SoCog specifically related to the procedural nature and experiential aspects of social integrations [See Hipólito, 2014b].

Conclusions

Although neurons have the capacity to send electrochemically signals, send that signals to a set of destinations in the body and generate circuits and systems of an enormous complexity, they are, nevertheless, body cells, profoundly reliant on nutrients – as all cells in the body – and that are distinguishable by their ability to do things that other cells cannot do.

The traditional Cartesian and ontological division between mind and brain is, to our knowledge, inconceivable, considering that the neurons that compose the brain are body cells and this fact must be considered closely

when we assess the hard problem of consciousness. As neurons emerge in the body interior, endowed with movement possibility, life revises itself in the way denied to plants. It begins an inexorable progression of functional complexity, from behaviors increasingly elaborated to mind itself, and, eventually, to consciousness.

The functional meaning of the number of neurons and their organizational patterns is the reason by which it is not possible to assess behavior and mind problems by excessively an isolated research on neurons or on molecules that act upon them, or the genes involved in the management of its life. Nervous systems develop themselves as life managers and healers of the biological value, at the beginning supported by innate provisions, but afterwards by images, this is, by minds. On biological evolution, behavior based in mind became very complex in numerous non-human species, however it is possible that flexibility and creativity that distinguish human performance could not appear in a genetic mind. [Damasio, 2010] Mind must have been carried and enhanced by the self-process that would come up in its core.

As the self comes to mind, life alters itself: interior and exterior mental images are now coherently organized by the proto-self [Damasio, 2010] and are now guided by the homeostatic demands of the body. SoCog begins now to be flexible, this is, the presence of the core self is followed by an expansion in cognitive processing space, of conventional memory, working memory and reasoning. Autobiographical self emerges and with this phenomenon, vital regulation changes radically. The emergence of consciousness is associated to evolutionary developments in the brain, behavior and mind that end conducting to culture, a radical novelty on the natural history route. The emergence of neurons with its consequent behavior diversification and preparation of the tack to the mind must be a remarkable even on a grand journey. However, the emergence of conscious brains capable of self-awareness is the grand event that follows.

A possible way to overcome the hard problem of consciousness might be based on the notion of embodiment as a process of embedding the mental in the living organism relating dynamically with the environment through the sensory-motor experience. Therefore, the brain must be considered primarily as an organ of the living being, and only by this becomes an organ of the mind. In such conditions, consciousness is not an object or state that can be localized: but a process relating to something [Fuchs, 2009]. It is possible to overcome the hard problem if mind, consciousness and life relate in co-existence from the second person perspective.

Lived embodiment on the one hand, and the physical body (including the brain) on the other hand (Leib and Korper) are two aspects of one living organism in relation to others – one corresponding to the first and the second person perspective, the other to the third person perspective. Having this considerations accepted, we might be able to overcome the two radically different ontology (the mental and the physical). In order to do so, we need to challenge the Cartesian idea that others' mental states are hidden

away and inaccessible and reject the notion that we ordinarily act as a spectator of others' behavior. Theory-Theory fails to grape the primary way in which we relate to and interact with others. Learning by interaction or the second perspective approach explains how two minds connect with each other in a form of embodied practice that is emotion, sensory-motor, perceptual and non-perceptual. Second-person interactions comprehends the innate developing capacity to interact with others manifested at a perceptual experience and, at this level, the others' mind is not entirely hidden or private, but is given and manifested in others' embodied behavior.

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