Title: **Representation and Extension in Consciousness Studies**

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Representation and Extension in Consciousness Studies

"The phrase 'in the mind' has caused more confusion than almost any other in philosophy." (Wittgenstein 1979:11)

Abstract

Various theories suggest conscious phenomena are based exclusively on brain activity, while others regard them as a result of the interaction between embodied agents and their environment. In this paper, I will consider whether this divergence entails the acceptance of the fact that different theories can be applied in different scales (as in the case of physics), or if they are reconcilable. I will suggest that investigating how the term *representation* is used can reveal some hints, building upon which we can bridge the gulf between the two poles in the long run. In my argumentation I will rely on some earlier philosophical insights, such as those of Descartes, James, Wittgenstein and Merleau-Ponty, as well as research based on global workspace theory, and the conceptions of embodied and enacted cognition.

Keywords: representation, consciousness, embodied cognition, sensorimotor approach

Introduction

Mind, cognition, consciousness, and self have been regarded as closely related, both historically and functionally.[1] However, their relationship is far from unambiguous. As we will see, Ssome criticisms call attention to misinterpretations of certain scientific results (Aizawa 2010; Zahavi 2008). These criticisms underscore the differences between certain perspectives and presuppositions. I will suggest that these presuppositions and perspectives may conceal, unnoticed, differences in the usage of some key terms, hence widening the gap between different approaches.

The term *consciousness* has numerous various meaning and these various approaches overlap regarding certain aspects and are divergent in minute details. For example, Ddespite the fact that phenomenology embraces and even relies on scientific evidence and, significantly, gives space to representationalism, it regards consciousness and the self in a radically different light than cognitive science. Similarly, proponents of embodiment and enaction embrace scientific results, but because of their commitment to embodiment (which is to some extent common with phenomenology) and in some cases explicit preference for an anti-representationalist setting, their comprehension of certain key concepts differs fundamentally with that of cognitive science.

If we give credit to the evidence which Gallagher (2005) and Jacob & Jeannerod (2003) refer to when emphasizing the importance of the body, bodily skills, and activity, it may seem strange to query the role the body plays in our cognitive life. Also, considering the distinction between the minimal and the narrative self (Gallagher 2000) in light of Ramachandran's (2004) effort to give a neural, brain-based account of

[1] We can have in mind the long history of the evolution of the term of consciousness from Cudworth, via Locke to phenomenology and more recent research in psychology, cognitive neurology and philosophy (such as – just to name a few - Humphrey, Frith and Dennett).

linguistic and conceptual skills, it seems peculiar to regard the narrative self as mere abstraction (Dennett 1991) since the capabilities which Ramachandran establishes on neural settings are hardly imaginable without interaction with others, *i.e.*, without the extension of neural activity to bodily skills, which are public.

In this paper I will suggest that if we take a closer glance at the term *representation*, we will see considerable differences between various fields and authors regarding what we should we have in mind when using this term. Accordingly, if we can illuminate the diverse meanings of *representation*, we may have a chance to bridge the gap between the theories that argue for the primordial role of the brain regarding consciousness and those which suggest that the body and the encompassing environment also play an important role when consciousness enters the scene. That is, I will suggest that going beyond cranial processes is not calling the role of neuronal activity in conscious processes into question, but rather it opens up the possibility of reconsidering causal and representational relations. We can reconcile the represenationalism of cognitive science with approaches that endorse embodiment, thus it will be apparent that an extension of the cognitive system is not only necessary since representationalist accounts of neuronal and cognitive functions take into account the interaction with the body – at least on the neuronal level; but also, because some obstacles are rooted in the ambiguous use of the term *representation*.

In the first section of the present paper, as a preliminary, I will consider a number of methodological difficulties including some meta-philosophical considerations. In the subsequent section I will attempt to give a rough outline of how consciousness emerges in scientific literature as focused on intracranial coherencies. In the third section I will outline some ideas that suggest widening the scope of investigation, extending it into bodily and environmental aspects of intelligent behaviour in accordance with a holistic and non-dualist approach. In the section after that, I will focus on the divergent ways *representation* is used in the literature and the questions that are concealed due to this confusion. In conclusion, I will attempt to briefly reconcile the neuronal-based and the rather holistic approaches to consciousness.

Aims, methods, ~~interpretations~~perspectives

We must keep in mind the obstacles when attempting to take into consideration different kinds of approaches: some are considered as being so-called hard science (such as physics, and later, with the discovery of DNA, biology, and recently structural brain imaging), some as being soft science (we can have psychology in mind) (Frith 2007), and some as philosophical, since they are mostly regarded as being speculative. Nonetheless, it is an important enterprise. Despite this unfortunate constellation of diverging approaches, various applied methods, and convictions regarding measurements' objectivity vs. subjectivity, philosophy can hardly avoid taking into consideration what hard and soft sciences suggest, particularly in the case of cognitive capabilities and consciousness studies. As Richard A. Watson rightly noted:

> In the seventeenth century, the vanguard of philosophy went before science, although natural philosophers such as Galileo and Descartes were as much (or more) scientists as philosophers. Science firmly takes the lead with Newton, and by the time of Schlick and Carnap, philosophy walks behind, tidying up the language of science. If you want to be taken seriously in the philosophy of mind today, you had better know your neurophysiology. (Watson 1995:101)

Undoubtedly we need results produced by the sciences, but at the same time we have to be cautious of how we interpret them and investigate whether the scope of the evidence is not overestimated. When attempting to clarify the relation between the self and self-awareness, Dan Zahavi illuminated the dangers of thought experiments, and more importantly from our perspective, the difficulties we face when we try to interpret pathological cases. On the one hand, the interpretation of different pathological phenomena "usually depends on the framework within which one is operating", and on the other hand, "it is by no means clear what type of conclusion one should draw from" these cases. (2008:142) It is not clear whether pathological occurrences can be considered signs of anomaly within the theory, or mere exceptions. Do they reveal some hidden functions as regards normal behaviour, or show a compensatory mechanism entailed by a dysfunction? While we can in a more general manner say that "empirical data are important", their interpretation is up to the framework within which they are interpreted, hence "the theoretical impact of an empirical case is not necessarily something that can be easily determined". (Gallagher & Zahavi 2008:221)

Kenneth Aizawa recalls an experiment with Sur's rewired ferrets and reveals that it does not provide evidence for the idea propagated by some ~~extended mind~~ theorists such as Alva Noë, who suggests "that scientists should search for a broader biological correlate of consciousness" instead of focusing on intracranial neuronal processes. (Aizawa 2010b:263)

> The principal point to take away from this research is that Sur and his colleagues performed certain surgical interventions on newborn ferrets, then raised these ferrets to adulthood in the anticipation that these neonatal interventions will lead to differences in adult area A1. These anticipations have been borne out with Sur and his colleagues documenting the various ways in which rewired ferret A1 comes to resemble normal ferret V1. What these experiments suggest, contrary to Noë's view, is that when we look at the intrinsic features of the brain for a mechanistic explanation of the visual character of experience, we are probably looking in the right place. (Aizawa 2010b:271)

The experiment by Sur and his colleagues provides evidence for the plasticity of neuronal settings, but says nothing about the extension of the focus of investigation.~~Aizawa is right when he concludes that the experiment by Sur and his colleagues provides evidence for the plasticity of neuronal setting, but not for extended theories~~. However, whether we can consider it as evidence for the rightness of the theories which advocate that the brain is the right place "for a mechanistic explanation of the visual character of experience" (Ibid.) ~~is~~ remains questionable.

Beyond the difficulties of correct interpretation and abandoning too-demanding conclusions, we face arduousness posed by philosophers. Watson referred to the linguistic turn, and thanks to this we are prepared at least to notice some of the grammatical or logical and categorical mistakes. But if we go back a bit farther to the late 19th and early 20th century, we can find unnoticed indications of confusion in philosophy. As I have previously mentioned (Kondor 2015), Bergson emphasized the peculiar character of our concepts, while James indicated that we are inclined to duplicate different phenomena when we forget that the "thought-of-an-object, and the object-thought-of" are the same.

Abstract concepts, and we may add, theoretical constructs, can mislead us as Wittgenstein highlighted many times. (Wittgenstein, 1979: 31 f, 1963:109). Merlaeu-Ponty's caveat (Merleau-Ponty 1963: 216) regarding philosophy's dogmatism is also a reminder: distortion is unavoidable; however, we should keep in mind, that when something is analysed, distortion enters the scene due to the mere fact of analysis.

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Consciousness – ~~the mental and the physical~~neuronal-based vs. enacted

At the turn of the 19th and 20th centuries, consciousness was considered as a crucial element in understanding psychic or mental phenomena. With his insights regarding memory, attention, consciousness, etc., William James is regarded by many researchers to be one of the "founding father[s] of modern psychology". (Dehaene 2014:12, Baars 1988:13) His idea of an "empirical parallelism" between *"the succession of states of consciousness with the succession of total brain-processes"* (James 1932:182) is appreciated even today. However, as we will see, some of his convictions provide grounds for criticism as well. (Baars 2011:13f.)

During the 20th century there was considerable, though diverging, progress in cognitive studies and research into the mental life. After decades of the dominance of behaviourism in psychology, consciousness again entered the focus of interest thanks to technical developments. Thanks to brain imaging technologies, psychology, whose earlier methods were considered subjective because of a lack of repeatable measuring, was provided with instruments which offered a link between subjective reporting and measurable brain activity. (Frith 2007: 12) However, this link seems to be a faulty one since it can only yield data about correlation, but is not capable of affording evidence for causation or constitution. This would require other, invasive experimental techniques, such as local stimulation of brain areas and/or neurons. (Dehaene 2014:180ff.)

In the first half of the 20th century, philosophy suggested that meaning is possible only against the background of consciousness; that is, the higher order cognitive processes and faculties that make us unique among living creatures are due to consciousness. If we consider recent findings, we can see that consciousness is mostly comprehended as a capacity that provides a better chance for survival and makes higher order cognitive functions possible.

In what follows, I'll attempt to focus on two radically different approaches to consciousness. Specifically, I will outline theories that seek a neural correlate of consciousness and are aimed at creating a causal model of neuronal activity and conscious experience, and I will also delineate approaches which suggest consciousness can be understood only in a wider setting, including the body and its environment.

Focusing on intracranial processes

Most of the time when consciousness is in focus, we are reminded of the old metaphysical question of *how to relate physical and mental phenomena.* The question has been reformulated in various ways, but even now many consider it a source of considerable difficulty. "Although neuroscience has identified many empirical correspondences between brain activity and mental life, the conceptual chasm between brain and mind seems as broad as it ever was." (Dehaene 2014:190) However, Bernard J. Baars, the originator of a very influential theory, proposed that we avoid asking it entirely.

In his book titled *A Cognitive Theory of Consciousness* (1988), Baars laid the foundation of global workspace theory (GWT). Baars suggests we disregard the old metaphysical question in favour of considering consciousness as a theoretical construct, in the same way as atoms were regarded a long time ago, as gravity was later, and not that far in the past, genes, which were described based on inference rather than observation. (Baars 2003:2ff.) An additional requirement of this perspective is to find

observable and measurable states as they relate to consciousness, and contrast them with unconscious ones. We need to operationally define that which can be considered as being conscious. We must also be able to distinguish conscious states from other related theoretical constructs such as attention, memory, executive processes, etc. We can find four conditions of conscious processes which fit well into standard research practice: they "1. can be reported and acted upon, 2. with verifiable accuracy, 3. under optimal reporting conditions, 4. and which are reported as conscious". (Baars 2003:4) Following the contrastive method and taking into consideration the abovementioned operational criteria, global workspace theory can be described in an unambiguous way. It "is a cognitive architecture with an explicit role for consciousness in humans. It suggests that conscious contents involve a fleeting integrative memory capacity in the brain, in which only one consistent content can be dominant at any given moment." (Baars & Gage 2010, p. 287)

Stanislas Dehaene, while accepting the core idea of GWT, refines it with a more elaborate outline of neuronal functioning and a simulation of neuronal networks. As he wrote,

> I have elaborated a theory that we call the "global neuronal workspace." We propose that consciousness is global information broadcasting within the cortex: it arises from a neuronal network whose raison d'être is the massive sharing of pertinent information throughout the brain. …We believe that a special set of neurons diffuses conscious messages throughout the brain: giant cells whose long axons crisscross the cortex, interconnecting it into an integrated whole. (Dehaene 2014:24f.)

In accordance with the original theory, he also devotes considerable attention to unconscious processes which can be considered as being on the one hand automatic and reflexive functions, and which, importantly, can yield an informational background as a possible source of intuition on the other hand. "The unconscious clearly has a large bag of tricks, from word comprehension to numerical addition, and from error detection to problem solving. Because they operate quickly and in parallel across a broad range of stimuli and responses, these tricks often surpass conscious thought." (Deheane 2014:106) Prior studies had recognized that damage in certain brain areas can cause strange constellations of normal function and dysfunction, such as blind sight, visual form agnosia, and spatial neglect[2] – to mention a few well discussed cases where unconscious perception undoubtedly plays an important role in the patient's behaviour. Experiments that tested binocular rivalry and attentional blink provided evidence that shows there is a "constant fight for conscious access". (Dehaene 2014:42)[3] "Binocular rivalry reveals a competition between two simultaneous images. During the attentional blink, a similar competition occurs across time, between two images that are successively presented at the same location." (Dehaene 2014:45)

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[2] In the case of blind sight lesion in the primary visual cortex, conscious vision is rendered impossible (patients report they do not see, let's say a flash of light, but can accurately point to the place of the flash); patients suffering from visual form agnosia are not able to recognize form, but their motor system behaves as if the patient could recognize it; we speak about spatial neglect if, *e.g.*, the lesion is near the right inferior parietal lobe and the patient ignores the space on her left side and is impaired in her conscious judgements, though not really blind.

[3] Dehaene considers conscious access as a key condition for consciousness. "What counts as genuine consciousness, I will argue, is conscious access—the simple fact that usually, whenever we are awake, whatever we decide to focus on may become conscious. Neither vigilance nor attention alone is sufficient."(Dehaene 2014:18) As we will see, his suggestion is consonant with others' considerations.

Experiments with masking revealed that unconscious processing can facilitate or bias conscious responses. It turned out there is a well-defined threshold whereby visual stimuli are consciously perceivable or not: "an image is downright invisible when presented for 40 milliseconds, but is easily seen, on most trials, when the duration is increased to 60 milliseconds. …The length of the threshold varies across subjects, but it always falls close to 50 milliseconds." (Dehaene 2014:54)

An experiment that tested intuitions regarding probability and numerical analysis conducted in 1997, (and reinforced in 2011), nicely showed the effect unconscious processing may have in decision making. In the experiment, subjects were given four decks of cards and a symbolic loan of $2000 to manage. On each card there was a message stating that they had earned or lost $100. Two of the decks were composed to earn a lot at the beginning but lose heavily later on, whilst the other two provided a balanced, but not too high, gain. The time period when subjects randomly choose among the decks without any preconception or calculation was the focus of the experiment. "Fascinatingly, just before they choose a card from a bad deck, their hands begin to sweat, thus generating a drop in skin conductance. This physiological marker of the sympathetic nervous system indicates that their brain has already registered the risky decks and is generating a subliminal gut feeling." (Dehaene 2014: 100) According to Dehaene's suggestion, (which is based on additional experiments and Hadamard's taxonomy of problem-solving periods), the above-described experiment seems to provide evidence that we may have advantage of an unconscious incubation period. Since conscious processing entails a huge load on working memory and only one thing at a time can be consciously processed, it takes considerable time to calculate from random choices which decks yield a better gain with more security. At the same time, "[u]nconscious processes excel in assigning values to many items and averaging them to reach a decision". (Dehaene 2014:101)

The importance of unconscious processing and even unconscious perception is beyond question. Chris Frith assigns to the unconscious a curious, but significant role, *viz*. our brain provides us with illusions. These illusions suggest, among other things, that there is a separated physical and mental world, that we have direct access to the objects of the external world, and that we bear an isolated and private mental world. I will briefly delineate Frith's arguments.

He believes there is an asymmetrical relation between brain processes and mental events.

> ~~There can be changes in the activity in my brain without any changes in my mind. On the other hand I firmly believe that there cannot be changes in my mind without there also being changes in brain activity. This is because I believe that everything that happens in my mind (mental activity) is caused by, or at least depends upon, brain activity.~~ (Frith 2007:23)

As we can see in masking experiments and the above-described case of unconscious prediction, we can easily accept Frith's suggestion that "our brain doesn't tell us everything it knows". But he goes further and proposes our brain sometimes "actively misleads us". (Frith 2007:47) Visual illusions (Frith refers to Hering lines, the Pantheon illusion, and the Ames room) and the bottleneck of conscious processing underpin this suggestion. Taking into account the Ames room~~, Frith draws attention to the fact that ambiguous information must still be interpreted and our brain allows conscious access to only one interpretation. (Frith 2007:50) In the Ames room~~, we see three men who are extremely different in size (as opposed to the other possibility, which is in fact the foundation of the illusion, a modified, not normally shaped room). How does our brain

interpret and decide which interpretation to choose on the basis of "the very limited and imperfect signals provided by our senses"? (Frith 2007:85)

Correctly predicting what comes next is crucial for survival. Predictive skills are learned capabilities and, according to Frith, our brain learns in accordance with the rules of associative learning. As Pavlov's dog, Thorndike's cats, and Skinner's superstitious pigeons show, a pattern of behaviour that can be described in terms of prediction develops on the basis of trial and error plus reward and punishment. If after a given signal or action the reward emerges in a short time, subjects assign high value to it, otherwise the signal or action will not be considered as being worthy of interest. The correctness of predictions are affirmed or disaffirmed by unconscious chemical processes in the brain. Nerve cells release neurotransmitters, and these neurotransmitters are important indicators of fitness. Accordingly, the nerve cells' activity, *i.e.*, whether they send a positive signal (unexpected reward), a negative one (expected reward does not arrive) or no signal at all (the prediction was correct), helps the brain to learn in a manner similar to what associative learning describes.

This learning process entails probability. ~~"Probability provides a measure of how much I believe in something." (Frith 2007:121)~~ As the McGurk effect[4] shows, our brain combines different sense modalities, and when it receives contradicting information, it tries to fuse them together and give one unambiguous percept.

> ~~What we gain access to is not a raw sensation but an expert reconstruction of the outside world. Behind the scenes, our brain acts as a clever sleuth that ponders all the separate pieces of sensory information we receive, weighs them according to their reliability, and binds them into a coherent whole. (Dehaene 2014:78)~~

That is, we move in a world which is reconstructed by our brain in accordance with certain predictive capabilities and permanent checking. We have no access to most of this reconstruction process because these processes are not conscious. Other people's behaviour and intentions are reconstructed in the same fashion. Similarly, we do not control our body in the manner we believe we do. We are only aware of our goals and preferences but not the motor commands, the efferent and afferent copies which provide smooth execution.

Frith suggests "'I do . . .' indicates those situations where I am aware of what my brain is doing. But the 'I' in this case is still my brain." (Frith 2007:106) And moreover, the border of my body blurs, just as the imagined and believed self is modified in order to understand others. "Your prejudices and your observations of their [others'] behavior automatically make you become, for a moment, more like the person you are interacting with. This makes it easier for you to predict what they will do or say next." (Frith 2007:170)

Can brain alone~~Brain as the right place to look for~~ create consciousness?

Before we turn to conceptions which suggest an extended horizon of investigation when focusing on consciousness, I will attempt to recapitulate the arguments which support the proposal that consciousness is the result of pure brain activity. The extensive literature on phantom limb pain seems to provide evidence that the brain in itself is

[4] McGurk's experiment demonstrates how our brain combines visual and auditory perceptions. The movement of the lips suggest *ga ga ga*, the mere sounds suggest *ba ba ba*, and when we see and hear simultaneously, we hear *da da da*.

capable of creating an illusion of pain, or non-existent stimuli on non-existent limbs. Voluntary actions also seem to be a good candidate for evidence that brain is an autonomous driver of behaviour. According to Libet's experiment, "brain activity indicating that the volunteer was about to lift a finger occurred about 300 msec *before* that volunteer reported having the urge to lift his or her finger". (Frith 2007:66) That is, our brain starts to arrange the planned movement before our conscious report.[5] Hence, our brain plays a decisive role in voluntary actions, and moreover, our brain makes an unconscious choice before we become aware of it. (Frith 2007:68)

Our brain is capable of deluding us, according to Cristopher Frith, by suggesting truth underlying the illusions of the distinctness of mental and physical, direct access to the things of the world, and a separate private physical and mental life that is under control. That is, our brain is capable of framing our mental setting due to its unconscious processes. Since neuronal activity shows a pattern of connectedness in our brain, investigating neuronal networks and connectivity may provide a code which illuminates how our brain transforms our thoughts. Although, "[w]e still do not understand exactly how millions of neuronal discharges, distributed across time and space, encode a conscious representation", we do not give up trying to find "new mathematical instruments in order to understand these complicated patterns". (Dehaene 2014:164f.)

Beyond illusions, including phantom sensations and our belief in voluntary actions, there is an additional aspect underlying the brain's exhaustive role in consciousness, namely the brain's autonomous functioning. "Autonomy is the primary property of the nervous system. Intrinsic neuronal activity dominates over external excitation. As a result, our brain is never passively submitted to its environment but generates its own stochastic patterns of activity." (Dehaene 2014:222) However, a question may be asked: If we consider "ongoing background electrical oscillations" (Dehaene 2014:210) as being a facilitator of the synchronization of the cells, how can we consider the maintenance of it as autonomy against the background of an evolving brain structure which adapts to more and more complicated tasks?

Similarly, we may have doubts whether patients who have never had a certain limb could have the experience of that phantom limb or phantom pain in it. If we take into consideration that conscious processing is time-consuming as compared with non-conscious processing, why it is surprising that the conscious report is delayed compared to the onset of cerebral action?

~~*Mysterious language*~~

Summing up the unique role consciousness plays in our mental life, we can assert with Dehaene that it "fill[s] a specific cognitive niche and address[es] a problem that the specialized parallel systems of the unconscious mind could not". (2014:108) It "ceaselessly stabilizes our perception" (2014:171), and "create[s] lasting thoughts" (2014:122). Against the background of unconscious functioning "[c]onsciousness may be the brain's scale-tipping device—collapsing all unconscious probabilities into a single conscious sample, so that we can move on to further decisions." (2014:114) And importantly, "virtually by definition, whatever we are aware of can be at least partially framed in a linguistic format. Language provides a categorical and syntactic formulation of conscious thoughts that jointly lets us structure our mental world and share it with other human minds". (2014:131)

[5] Here I would like to call your attention to Ramachandran's remark according to which, "Perhaps our very notion of causation requires a radical revision …as happened in quantum mechanics". (Ramachandran 2004:89)

Language plays an important role in consciousness studies. Most of the scientists conducting research in consciousness at least call attention to the importance of linguistic skill. Though they do not deny the social character of language, they rather focus on its intracranial foundation. "Language is amazing", writes the neuroscientist V. J. Ramachandran (2004:75) who provides us with the so-called synesthetic bootstrapping theory of language. In a nutshell:

> [W]e have three things in place – first, hand to mouth; second, mouth to Broca's area to visual appearance in the fusiform and sound contours in the auditory cortex; and third, auditory to visual, the booba/kiki effect. Acting together, these three have a synergistic bootstrapping effect – an avalanche culminating in the emergence of a primitive language. (Ramachandran 2004:79)

That is, the functional map of our brain makes certain areas' connections possible, which in turn makes a certain crosstalk among different functions possible, *i.e.*, cross-domain mapping between auditory and visual, auditory and motor close to Broca's area, motor to motor areas (hand gestures, tongue, lip, and mouth movements). Thanks to some gene modification, (*i.e.*, not abrogating certain neuronal connections during the early period of ontogeny), cross-modal abstraction becomes possible and gives rise to metaphors in the long run of phylogeny.

Language as a result of cross modal mapping is processed in a curious way. On the one hand, we can process semantic content without consciousness. "Networks of neurons in our temporal lobe automatically process not only the various meanings of invisible words but also their compatibility with the past conscious context." (Dehaene 2014:90) We register the meaning of the words unconsciously. (Dehaene 2014:81) On the other hand, if for instance we read a sentence, our "conscious mind focuses on the overall gist, the logic of the argument. A glance at each word is enough to place it within the overall structure of discourse". (Dehaene 2014:80) Dehaene, who is an expert in arithmetic thinking, calls attention to the peculiar character of language, more precisely its grammar.

> Our language networks are wired to process words and phrases, but this wiring diagram is permanently inaccessible to our awareness. Global workspace theory can explain why: the knowledge is in the wrong format for conscious access.
> Grammar contrasts dramatically with arithmetic. (Dehaene 2014:230)

Dehaene suggests that "[o]nly mathematical theory can explain how the mental reduces to the neural. Neuroscience needs a series of bridging laws, analogous to the Maxwell-Boltzmann theory of gases, that connect one domain with the other". (2014:191) That is, we can find some regularity even if it can be described by a complicated probabilistic algorithm. Neuronal activity at each conscious perception creates a network within which information circulates back and forth until it distils a coherent and unambiguous interpretation of the perceived phenomena.

However, this algorithm is currently beyond our reach. The idea that grammar, or more precisely the way we apply grammar, "contrasts dramatically with arithmetic" suggests that describing how language works is even a more difficult enterprise. Perhaps it is rooted in the peculiar situation where we find gaps between rule and its application, (Wittgenstein 1979:90) or as Michal Polányi expressed it "our personal participation that governs the richness of concrete experience to which our speech can refer …the process of denotation is itself unformalizable". (1962:87) Recent AI research highlights our uneasiness toward understanding how language works. Even after the triumph of Alpha Go over human intelligence, language still remains enigmatic. As the

~~cognitive scientist Josh Tenenbaum suggests: "Language builds on other abilities that are probably more basic, that are present in young infants before they have language: perceiving the world visually, acting on our motor systems, understanding the physics of the world or other agents' goals". (Knight 2016)~~

Consciousness enframed

I will give a rather rough outline of slightly different approaches that are~~, as the above quotation suggests,~~ related to embodiment and enactment and which view consciousness from a different angle, giving it a more extended basis than the previously delineated ones.

The notion of embodiment has been explicated by Maurice Merleau-Ponty in his 1945 book, *Phénoménologie de la perception*. He suggests "far from my body's being for me no more than a fragment of space, there would be no space at all for me if I had no body" (Merleau-Ponty 2005:89); and a couple of pages later:

> if the words 'enclose' and 'between' have a meaning for us, it is because they derive it from our experience as embodied subjects. In space *itself* independently of the presence of a psychophysical subject, there is no direction, no inside and no outside. A space is 'enclosed' between the sides of a cube as we are enclosed between the walls of our room. (M-P 182)

This idea is revived in many fields, including art history thanks to Rudolf Arnheim, cognitive metaphor theory as a result of work by Mark Johnson and George Lakoff, and more importantly from our perspective, "in new sciences of the mind". (Varela et.al. 1993:xv) Merleau-Ponty's holistic view suggests transforming the dualism of the soul and body into the distinction of "the lived and the known". It is possible because a human being, the so-called subject, "lives in a universe of experience, in a milieu which is neutral with regard to the substantial distinctions between the organism, thought and extension; he lives in a direct commerce with beings, things and his own body." (Merleau-Ponty 1963:189) In his view, consciousness provides the ground for a meaningful unity where the ambient world, the acting subject and its body, thus the mental and the physical, are inseparable. In accordance with Merleau-Ponty's views, the term embodiment suggests "that cognition depends upon the kinds of experience that come from having a body with sensorimotor capacities, and …that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context."(Varela et .al. 1993:172f.) Theories built upon the idea of embodiment vary depending on how they relate to computationalism, mental representation, and to what extent they consider its validity. For now I will not go into details regarding the differentiation of the notion of embodiment, rather, I will focus on different conceptions which suggest consciousness and cognitive processes are inseparable from having a body, bearing bodily skills and interactively being immersed into our environment.

We can find many fruitful attempts in the last centuries of the history of philosophy that call attentions to the importance of the body (James), movement (Bergson), our embeddedness (Heidegger), and environment as it plays a role in our consciousness (Merleau-Ponty). All these suggestions relate in some way to the metaphysical question of dualism: these theories attempted to eliminate or a least reformulate the body-mind divide. We already touched the question of dualism when referring to Baars' suggestion that we need to abandon the metaphysical burden of body-mind dualism and in hinting at his criticism of James' doubts (Baars 1988:14).

I believe that James' scruples about consciousness' ontological status were not baseless. First, in his 1904 paper he calls into question only that consciousness "stands for an *entity*" but still believes that "it does stand for a *function*." (James 1987: 1141 f.; emphasis added) GWT is also looking for function: the distinctive criteria of consciousness are functional ones, more precisely, the neuronal patterns entail a certain capability, function, but not an entity.

At the same time, GWT is tangled up unnoticed with the metaphysical question of body-mind dualism when it tries to demonstrate a causal, sometimes constitutional, relation between brain processes and mental states. When searching for the neural correlate of consciousness or trying to illuminate the causal relation between subjective reports of phenomenal experience and brain activity, I believe it is illuminating to recall James' caveat that "any single non-perceptual experience tends to get counted twice over, just as a perceptual experience does, figuring in one context as an object or field of objects, in another as a state of mind: and all this without the least internal self-diremption on its own part into consciousness and content". (James 1987:1148)

Against the background of James' neutral monism, this duplication of the same phenomenon is avoidable. He considers *pure experience* as the only "primal stuff or material in the world, a stuff of which everything is composed". If we take pure experience as our departure (as opposed to the dualism of physical and mental),

> then knowing can easily be explained as a particular sort of relation towards one another into which portions of pure experience may enter. The relation itself is a part of pure experience; one of its "terms" becomes the subject or bearer of the knowledge, the knower, the other becomes the object known. (James 1987: 1142)

This monism may remind us of recent efforts in certain enactive and sensorimotor approaches. The *enactive approach* emphasizes "that cognition is not the representation of a pregiven world by a pregiven mind but is rather the enactment of a world and a mind on the basis of a history of a variety of actions that a being in the world performs". (Varela et. al. 1993: 9)

According to Evan Thompson, the enactive approach tries to unify the idea of autonomous agents as they generate and maintain themselves and thus their cognitive domain: the nervous system is considered as a dynamic system which creates meaning; cognition as being "the exercise of skilful know-how in situated embodied action"; the world conceived as being a relational domain enacted; and experience is conceived as crucial in the understanding of the mind and has to be investigated phenomenologically. (Thompson 2007:13) Against the background of the above-sketched scenario, the "transformation of the world into an environment happens through the organism's sense-making activity". Accordingly, cognition does not happen internally but rather it "is a relational process of sense-making that takes place between the system and its environment". (Thompson & Stapleton 2009:25f.) Since cognition is defined as a *relational process*, the cognizing agent and its environment are not separable. Additionally, the *coupling* between them is without any gap, because this cognizing agent is a physical system which therefore has direct access to its physical environment.

Radical branches of the enactive or sensorimotor approach make similar efforts to illuminate their radicalism, which is made of a kind of monism and dynamism. There is an important difference between the abovementioned enactive approaches and the subsequently outlined ones: the latter attempt to avoid the use of terms which entail reasoning, a demanding higher order cognitive function. On this basis, the so-called hard problem of consciousness is not solvable, but meaningless, and representationalism is

radically mitigated. Radical embodied cognitive science (Chemero 2009), or more recently extended cognitive-phenomenological system theory (ECPSt) (Silberstein & Chemero 2011, 2015) take the point of James' neutral monism, dynamic system theory, and J.J. Gibbson's account of affordance. ECPSt considers cognitive systems as being "extended brain-body-environment systems." But they can be regarded as being extended only "when environmental features form constitutive parts of the cognitive phenomenon". (Silberstein & Chemero 2015:189) Since experience is processed cognitively and cognition is experiential, the "phenomenological world of experience is neither in the 'head' nor in the 'external world' – it is fundamentally relational." (Ibid. 190) According to ECPSt – unlike Frith and Dehaene – "the brain is not some sort of virtual reality machine that generates a matrix-world internal to the brain. The very idea of a neural correlate of consciousness as a sufficient condition for some conscious state is a misnomer." (Ibid.)

With similar targets in mind but a slightly different focus, Hutto and Kirchhoff recapitulate the attempt, abandoning content-involving basic cognition. As they wrote:

> In *Radicalizing Enactivism*, Daniel Hutto and Erik Myin (2013) champion a vision of enactivism according to which the plethora of cognitive activity of humans and non-human organisms is best explained in terms of and understood as dynamically unfolding, situated embodied interactions and engagement with environmental affordances. Radical embodied-enactive approaches to cognition (REC, for short) thus reject the familiar assumption that the best explanation of cognition always requires positing contents that are acquired and transformed in order to create representations that then inform and guide what an organism does or experiences. (2016:348)

That is, REC takes its departure, like ECPSt, by considering the cognizing agent, its bodily conditions and environment, as a dynamically intertwined system which does not need mental representations while it is engaged in and with its environment. This idea had already emerged in 2004, formulated by Alva Noë,

> it is not just clear …why an internal representation would be any better than access to the world itself. This harkens back to Wittgenstein's idea that anything a picture in the head could do could be done by a picture held in the hand. We go a step further: Why do we need a picture at all? The world is right there, after all. We are in *the world*. (Noë 2004:218f.)

Both the REC and ECPSt approaches attempt to abandon mental representation based on the above quoted Wittgensteinian considerations on the one hand and the Jamesian caveat on the other. Both REC and ECPSt suggest that the hard problem is unsolvable, and that therefore there is no need to disprove it, but both provide a framework within which it has no sense.

> According to REC, phenomenal experience is just dynamic activity grounded in agent-environment interactions. There are not two relata – the physical and the phenomenal, qualia and brain activity. We have emphasized that the phenomenally charged embodied activity can be differently described or encountered.
> ….
> REC takes it that the phenomenal character of experiences is ultimately grounded in interactions between experiencers and features of the environment. What we experience is determined by how we engage with features of the world. Phenomenality should not be thought of as denoting qualitative properties of our experiences, but should be understood as the character of engaging with the world in different ways." (Hutto& Kirchhoff 2016:353)

The so-called *sensorimotor approach*, agreeing with the importance of active engagement when having a *feel*, or having a conscious experience[6] bearing a certain quality, goes a bit further when it suggests:

> Instead of emphasizing the fact – and it is certainly a fact – that when we are touched, there is an activation of neurons on the cortical map, the sensorimotor approach notes that what *constitutes* the fact of having a feel is that changes like those I have just listed[7] will occur when we do certain thing. … [T]his state of affairs *constitutes* the feel. What is *meant* by feeling touch is that these laws currently apply. There is nothing more to feeling a touch than the fact that the brain registered that the laws currently apply. (O'Regan 2011:158)

As we can see on the basis of earlier philosophical considerations, the enactive and sensorimotor approaches suggest that cognitive processes and, specifically, consciousness are hardly comprehensible as being exclusively intracranial. It is quite obvious that the theories referred to in the earlier section of this paper are more or less committed to a different framework than the latter ones. The former are based on a vocabulary that reaches back to cognitive psychology, which is attached to representationalism. The latter theories are committed to abandoning representationalism and taking the perspective of a rather holistic and dynamic approach to cognitive processes. In what follows, I will attempt to show that despite of the difference between the frameworks and presuppositions, the seemingly unbridgeable gulf between the descriptions can at least be attenuated.

Representations **revisited**

Authors, even those who think the brain is the right place to look if we are seeking a mechanistic explanation of the modal (*e.g.*, visual) character of a (visual) experience, express suspicion regarding the tight commitment to representations: "it is unclear just how completely cognitive states must be representational. ...Must every component of every cognitive state be a representation? This seems to be an overly strong empirical hypothesis not warranted by any data we know of." (Adams & Aizawa 2010a: 55)

Regarding the scope and limits of representations, Adams & Aizawa formulate an additional concern:

> We would not want to claim that these neurons [in different visual areas which participate in creating the visual field of an organism] are representations simply in virtue of their causal connections to environmental stimuli, but we do think they are likely to turn out to be representations. These considerations seem to us to provide defeasible reasons to accept what cognitive psychologists typically presuppose, namely that cognitive processes involve representations. (2010a:33)

This suspicion illuminates the ambiguous character of representation as it is used in psychology, and also in neurosciences as we will see. According to traditional cognitive science, representations play a role in perception, remembering, reasoning, and dreaming – to mention only a few important mental activities. Cognitive science

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[6] For a short outline of O'Regan's conception of conscious access and phenomenal consciousness see Kondor 2015:153f. For further details see O'Regan 2011.

[7] A non-exhaustive list of the kinds of laws which apply when a part of one's body is touched: "Active motion of the body part" modifies the stimuli; "active motion by a different body part" in special cases can alter the stimuli; "passive motion" induced by external force changes the stimuli; at the same time we perceive change in our visual field; and in some cases we can hear temporally correlated sound of scratching. (O'Reagan 2011:157)

maintains that representational states are content-bearing and carry information in a certain way. We perform operations over them and these operations result in problem-solving and planning. Representations presuppose certain relations, such as mapping, (*i.e.*, environmental structures are coded onto internal structures in accordance with certain rules); intentionality, since representations are about something; asymmetry; and standing-in relation (*i.e.*, that which a representation stands for is the representation's content). (Nagel 2005:5)

Richard A. Watson suggests that representations are considered from the very beginning as they are based on isomorphism. Isomorphism is meant to be "any degree or kind of resemblance, likeness, or similarity of pattern, structure, or relational organization between entities or events as defined in the broadest sense." (1995:xi) Even authors like Descartes, who denied the necessity of resemblance (in the above-described sense) between the represented entity and its idea, fall back to the route of isomorphism. Watson's argument shows that Descartes' ambiguity is rooted in his ontological commitment to the dualism of the extended and cognising substances, and his clarifying efforts often fail because the linguistic toolkit imposes an extra burden when trying to close the gap between two substances.

Beyond ambiguities, Watson quotes Descartes calling attention to an important distinction within a dualist framework:

> The subject I propose to deal with in this treatise is light, and the first point I want to draw to your attention is that there may be a difference between the [i] sensation we have of light (i.e., the idea of light which is formed in our imagination by the mediation of our eyes) and [ii] what it is that produces this sensation within us (i.e., what it is in a flame or the sun that we call by the name "light")." (1995:30)

Descartes seemed to be very distinctive when he calls our attention to two different phenomena when we attempt to understand the same process. That is, (i) the sensation of light which is mediated by our eyes and processed further in a way[8] and (ii) what is the cause of our sensation. This distinction gains a special emphasis against the background of James' previously mentioned caveat, and, at the same time, is very important as it has often been forgotten recently.

Nowadays, thanks to brain imaging techniques, neuronal activity is considered as a representation of a certain mental state. In this case, a mental state is represented via neuronal activity, *i.e.*, the neuronal state is considered a physical equivalent of a mental phenomenon. On the basis of representation as based on isomorphism, Dehaene's proposal that we can detect patterns of active and inactive cells as they are forming "an internal code for the contents of subjective perception" (2014:176) is promising. But, as Dehaene himself notes, "[p]roving that a pattern of brain activity causes a mental state is one of the hardest problems facing neuroscientists". (2014: 179) This is not mere bad luck, but rather it is rooted in in the relation labelled as representation. When it is out of concern that a living organism is not reducible to its neural activity but is rather in a symbiotic relation with its environment, the fallacy of obliterating the difference between representation and causation can enter the scene.

Nevertheless, the representation of neuronal activity via brain imaging techniques is visible, and is only a part of the process. The other part is the external stimuli: the flame or the sun. If we take exclusively intracranial processes into consideration, it will be challenging indeed to provide causal relations. Cause and

[8] It is beyond the framework of the present paper to discuss how ambiguous Descartes' notions of imagination and conception are regarding representation. For details, see Watson 1995:19-37.

representation requires different time orders: The cause is prior to its effect; a representation is a representation of something that exists in a certain way before its representation[9]. Accordingly, if we consider neural activity as being a cause of a certain brain state (*e.g*., consciousness), it cannot be considered as being its representation. The visible reconstruction (publicly available representation) of a neuronal state (thanks to brain imaging and statistical methods), I believe, does not provide satisfactory grounds for thinking that this neuronal constellation is the cause of the given mental states.

It is beyond question that if we are talking about mental representation, we need to understand it as "a theoretical object". (Baars 2011:41) But often, representation is not appropriately specified. Public representations which are accessible to others are not theoretical constructs, but artefacts. From this perspective, it is quite clear that the representation of a neural state (which is considered as being in correlation with a mental state) can cause anything in the subject's behaviour.

> A *representation* is a theoretical object that bears an abstract resemblance to something outside itself. In somewhat different terms, there is an abstract match or *isomorphism* between the representation and the thing that is represented. …We can think of knowledge, percepts, images, plans, intentions, and memories as representations. …What is the adequate evidence for the existence of a mental representation?[10] In psychology we often infer that human beings have mentally represented an object if they can correctly detect *matches and mismatches* to the object at a later time. (Baars 2011:41)

The above description is clearly about mental representation. The next one refers to public representations, as numerous ones resulted in a conclusion: "Ideas appear to be represented in the cortex in terms of *complex webs of learned connectivities*, rather than localized filing systems with neatly arranged conceptual categories." (Baars & Gage 2013: 360, emphasis added) As with Dehaene's description of a conscious percept, we have a pattern of neuronal activation.

"When I look at a tree in the garden, I don't have the tree in my mind. What I have in mind is a model (or representation) of the tree constructed by my brain. This model is built up through a series of guesses and predictions."[11] (Frith 2007: 170) The model of a tree is a mental representation and the idea of the brain as a "model-making machine" is built upon a complicated mechanism represented by brain imaging and statistical techniques and explained in a metaphoric language. "The fortress of the conscious mind possesses a small drawbridge that forces mental representations to compete with one another." (Dehaene 2014:46) This lively description of the bottleneck of consciousness (again, just to use a metaphor) suggests we have unconscious representations competing to become a conscious one. But it does not help us find out what we should think about these unconscious mental representations. In accordance with Dehaene's description of how the brain works, we can have in mind local neuronal activations in competition, but these neuronal activations are visualized as a (public) representation of an unconscious percept. Perhaps it is even more puzzling when Dehaene describes the working of certain specialized neurons: single neurons which can be activated by a definite picture, sound, etc., but only in the case of conscious perception (2014:172f.)

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[9] *Haptic images*, which are similarly interactive as virtual ones but they "were to be manipulated as part of the modification or construction of a physical object, as in nanomanipulation" (Daston & Galison 2007: 385), may confuse this time order. But cognition as a brain-based activity does not necessitate going into detail regarding how the manipulation of representations entails.

[10] Cf. Adams' & Aizawa's doubts (2010a:55)

[11] The idea of brain as a "model-making machine" is rather accepted. See also Ramachandran 2004:105.

Conscious perception is, at the same time, a special neuronal network activation within which the communication between different brain areas, even in a hierarchical sense, is highly active and bi-directional. If we suppose a causal relation between neuronal state and conscious perception, where can we find the mental representation of the percept: in the communication of the network, or in the single neuron which is sensitive to a given phenomenon?

Conclusion

In conclusion, I would like to draw attention to the curious situation where although theoretical constructs may aid inquiry and metaphoric language may help expression and the explication of a new phenomenon, they are also likely to engender confusion. If, on the one hand, *representation* is used without strict distinctiveness between mental and public and we are forgetful about mental phenomena as a theoretical construct, we may be tangled up with unsolvable paradoxes and concealed gaps. On the other hand, taking radical views on enactment and embodiment into consideration, specifically their effort to abandon representationalism and consequently its vocabulary, we can remove the obstacles from the route of clarification of how behaviour and organism, including its environment, are intertwined.

For now, while our concepts are mostly based on a dualist view, the extension of investigation can help to clarify the relation between representation and causation.

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