

Towards an Understanding of Mirror Mechanism, Between Phenomenology and Natural Sciences

Nicola Simonetti¹

¹ High School Teacher of Philosophy and Social Sciences, PhD in Cognitive Science, University of Siena

Correspondence: Nicola Simonetti, High School Teacher of Philosophy and Social Sciences, PhD in Cognitive Science, University of Siena.

doi:10.56397/IST.2023.01.02

Abstract

Naturalizing phenomenology or phenomenologizing neurosciences? This is the provocative and stimulating question that Gallese asks himself/us (taken from Enciclopedia Treccani, 2009) to try to better understand the explanatory significance of the mirror mechanism. The attempt to make neurosciences and phenomenology interact originally took shape as a project for the naturalization of phenomenological research to which, in recent decades, Francisco Varela has contributed (*Autopoiesis and Cognition*, 1980).

Like classical cognitivism, cognitive neuroscience, until not many years ago, favored a model according to which functions such as sensation, perception and motor control would be “localized” in different cortical areas. The experimental data acquired over the last twenty years, however, give us a completely different picture. The motor cortex of the frontal lobe, as well as the posterior parietal cortex, are made up of a mosaic of distinct areas on the anatomical-functional level that contract reciprocally connection relationships to form distinct cortico-cortical circuits (Rizzolatti & Sinigaglia, 2006).

Both things and objects acquire full signification only insofar as they constitute one of the poles of a dynamic relationship with the acting subject, which constitutes the second pole of this relationship. This type of approach allows us to redefine the triad perception, action and cognition in a new perspective, and, above all, in a perspective compatible with an “embodied” meaning.

Instead, A. Attanasio and A. Oliverio propose a Darwinian reading mirror mechanism, centered on a “social-embodied-emotional mind”, rooted in the “reason-instinct” of D. Hume and in the “emotional revolution” of W James. Mirror mechanism does not make any logical-mental inference: the action is the result of a motor simulation. Furthermore, this audio-visual mirror mechanism, also present among non-linguistic species, confirms that the understanding of sounds, images, motor acts are inserted within “a simpler level of semantic reference.”

In his *Ecology of the brain. The phenomenology and biology of the embodied mind*, 2017 T. Fuchs focuses his arguing on the concept of embodiment. The basic self-awareness is something that emerges from the whole body in interaction with the brain, of course, and the brain is necessary to integrate bodily afferences and bodily states, but it is in constant interaction with the body and only through this homeostatic regulation our embodied self-awareness emerges.

So, if we are conscious beings, we are already embodied conscious beings. The other major dimension is the sensorimotor dimension. Here we transcend our organic body to interact with the environment by the limbs, by connecting ourselves with objects, by transcending the body when we deal with objects or by transcending the body when we deal with other subjects.

Finally, I believe that the naturalistic phenomenology of Varela and Maturana is closer to the philosophy of

complexity, to Bateson's ecological approach and to an evolutionary approach, supported, for example, by the psychobiologist A. Oliverio, in agreement with which I believe it is better the essential adaptive, social and communicative role of the mirror mechanism at a species-specific level can be explained. I think that Fuchs' idea of the ecology of brain, the body as a living whole and the organism as not just composed of parts, but as a self-reproducing autopoietic whole which is the basis of my embodied experience, might be a good explicative meeting point for phenomenology and natural sciences, in the direction of a holistic and comprehensive view for mirror mechanism in human being.

Keywords: mind/body problem, mirror neurons, mirror mechanism, neurosciences, action, perception, naturalizing phenomenology, phenomenology, natural sciences, cognitive neuroscience, subjectivity, cortical representations, embodied simulation, embodied cognition, ecologic brain, embodiment, enactivism, embodied experience, psychopathology, autopoiesis, cognition, V. Gallese, E. Husserl, C. Sinigaglia, H. Maturana, F. Varela, A. Attanasio, A. Oliverio, T. Fuchs, K. Jaspers, G. Bateson

1. Introduction

Naturalizing phenomenology or phenomenologizing neurosciences? This is the provocative and stimulating question that Gallese asks himself/us (taken from Enciclopedia Treccani, 2009) to try to better understand the explanatory significance of the mirror mechanism.

The attempt to make neurosciences and phenomenology interact originally took shape as a project for the naturalization of phenomenological research to which, in recent decades, Francisco Varela has contributed (*Autopoiesis and Cognition*, 1980). The Chilean scientist acquired international notoriety for having introduced, together with Humberto Maturana, the concept of *autopoiesis*, through which the intrinsic link between function and structure, typical of every living form, was underlined. Throughout his career, Varela explored the role of body-environment interaction in cognitive processes, finally arriving at the programmatic formulation of a new approach to the study of consciousness and cognitive processes called neurophenomenology.

According to Varela and his project of *naturalizing phenomenology*, neurophenomenology would constitute an interdisciplinary approach to the study of the problem of consciousness capable of combining the empirical methodology of neurosciences with the first-person analysis of phenomenology. In this way, according to Varela, the mind/body dualism can be overcome, placing the *Leib* at the center of the empirical investigation, i.e. the body in the heart of experience, which can be considered both from the point of view of a transcendental philosophical analysis and from the point of view of the empirical study of the nervous processes that underlie it.

This approach, however, can be very problematic, if not paradoxical, especially if we keep in mind that since its inception phenomenology has been programmatically opposed to the naturalistic attitude of psychological science, as well as, according to many, of current neuroscience.

Even before E. Husserl, F. Brentano and W. Dilthey had placed the investigation of the experiences (*Erlebnisse*) of conscience at the center of their reflections. The original project of phenomenology developed by Husserl consisted in refining this investigation in an attempt to bring out the constitutive dimension of experience. Such a project was proposed as an alternative to the epistemic strategies of contemporary natural psychology, in particular physiological psychology, unable to grasp, according to Husserl, the actual experience of the psychic reduced to a mere thing among things. These issues are particularly evident in the study of social cognition.

Automatically transferring into the brain, a model of the human mind, such as that of the classical cognitive sciences, which flattens and exhausts social cognition to a mere use of the propositional attitudes of naive psychology, beliefs, desires, intentions, can lead us to erroneous results. There is no doubt that in everyday life we describe the behavior of others using the vocabulary of naive psychology. In this way we can, for example, say that others do certain things on the basis of a given intention to do them, in turn aimed at the satisfaction of a desire, given a certain belief system.

From this point of view, rather than naturalizing phenomenology, it seems more promising to "phenomenologize" cognitive neuroscience, using the stimuli that come from phenomenological reflection, in particular from the analysis (Husserlian, but not only) on the living body (*Leib*) and on the role that it has in the constitution of our experience with regard to the things of the world and to others.

This may allow an empirical study of the subjective and intersubjective dimensions carried out on a new basis with respect to those hitherto largely adopted by cognitive neuroscience. Above all, without sacrificing or eliminating the first-person aspects of the experience we make every day of the world of objects as well as that populated by other human beings and without minimizing the pre-theoretical and pragmatic aspects of our relationship with the world.

It is worth noting in this regard how, in the field of cognitive neuroscience, we are beginning to investigate the neural correlates of the "embodied" components of world experience. In other words, we are witnessing the

development of a neuroscientific approach that places the living body and its sensorimotor neural correlates at the center of its investigation.

The standard approach of cognitive neuroscience to social cognition has to face another problem, that of the “mereological fallacy”, namely the problem of attributing to the parts of an organism characteristics that are properties of the whole. “Mentalization”, the way we explain the behavior of others by attributing a causal role to internal mental states, involves a level of personal competence, and, for this reason, “mentalization” cannot be entirely reduced to sub-personal activity of groups of neurons in the areas of the cerebral cortex, hypothetically specialized in “mind reading”.

In fact, neurons are not epistemic agents, they are not subjects of knowledge. Neurons “know” only the passage of ions through their membranes. The “mentalizing” needs a person, which we could define as a system of interconnection between brain and body that interacts in a situated way with a specific environment populated by other brain-body systems.

2. Action, Perception and Cognitive Processes

Our relationship with reality is primarily mediated by the senses, privileged channels of access to the world around us. It is commonly believed that there is an objective world to which we are constantly linked, but from which at the same time we distinguish ourselves, as subjects of experiences relating to that same world. The notion of subjectivity thus becomes a dividing line, a sort of definition by contrast, from which we draw solid foundation of our personal individuality.

Like classical cognitivism, cognitive neuroscience, until not many years ago, favored a model according to which functions such as sensation, perception and motor control would be “localized” in different cortical areas. The experimental data acquired over the last twenty years, however, give us a completely different picture. The motor cortex of the frontal lobe, as well as the posterior parietal cortex, are made up of a mosaic of distinct areas on the anatomical-functional level that contract reciprocally connection relationships to form distinct cortico-cortical circuits (Rizzolatti & Sinigaglia, 2006).

Each of these parieto-premotor circuits integrates sensory and motor information relating to a certain body part and ensures its control within distinct spatial coordinate systems of reference. In other words, we are witnessing a multiplicity of “cortical representations” of distinct effectors that perform different functions.

But what exactly does it mean to propose a definition of representation in terms of control models of the various organism-world interactions? It means highlighting its relational and intentional connotations. If we adopt this perspective, representations and models of relational control appear to us as two sides of the same coin.

As it is well known, a series of experiments for recording single neurons from the premotor cortex of a monkey conducted in the early 1980s by G. Rizzolatti and his research group, led to the discovery in the F5 area of motor neurons that are activated not during the execution of simple movements, but of motor acts, that is movements aimed at achieving a goal (Rizzolatti & Sinigaglia, 2006).

These results show that what these neurons represent, and control is the purpose of the motor act and not the means, ie the movements, required to achieve it. These findings allow us to empirically clarify what makes an action of a movement. Before the conceptualization of the notion of purpose there is a pragmatic correlate, a cornerstone of the way our brain-body system structures and organizes our interaction with the world.

According to this perspective, the object thus acquires a significant value only by virtue of its dynamic relationship with the subject/agent who uses this relationship. This dynamic relationship is manifold, as are the ways in which we can interact with the world by moving in it. The closeness to the Heideggerian philosophical perspective is evident here. According to Heidegger, in fact, man is always simultaneously outside himself, near things, and, as transcendent to himself, only man opens up a world as a project of his own actions.

We are open to the world and at the same time we are in the world because in the world we identify not only something that is in front of us, which is in front of our hand (*vor-handen*), but which is at the same time within reach (*zu-handen*). The results of neuroscientific research show that even parts of the animal world, notably non-human primates, share, at least partially with our species, this characteristic.

3. Representation as a Relational Model

So far, we have talked about “grasping” actions which, however, do not exhaust the range of possibilities of interaction with the world of objects. We can approach an object, move away from it, look at it from different visual angles by turning around it, or we can explore it with the movement of our eyes. All these different modes of interaction are united by the same relational value. The object ceases to exist for itself and is for us only insofar as it is in a relationship of intentional, that is, pragmatic, relationship with a potential agent.

So, what is the meaning of an observed object? A pure and simple description of its characteristics of shape,

color and size, or rather not its intentional-relational value, its character of dynamic complementarity with the agent of perceptual experience, which is always also potentially pragmatic?

The intentional/pragmatic aspect of the notion of representation, as a functional attribute of the brain-body system, should thus be clearer. We could venture to speculatively hypothesize that the mental representations thus understood do not arise—neither in phylogenetic nor ontogenetic terms—with a specific linguistic-symbolic value, but that, instead, this characteristic is a subsequent acquisition through a process of functional redefinition of processes already present. For another purpose, such as, precisely, the modeling of the system-organism in the course of its pragmatic relations with the world, which is never completely external, as Kantian transcendental philosophy, idealism and Gestalt psychology have already said and shown.

The sensory-motor schemes that characterize the multiple and parallel fronto-parietal cortical circuits which we have briefly referred to so far, are used not only to generate and control the finalized behaviors typical of social life, but also to understand—already at a level preconceptual and prelinguistic—the meaning of worldly things. Both things and objects acquire full signification only insofar as they constitute one of the poles of a dynamic relationship with the acting subject, which constitutes the second pole of this relationship.

This type of approach allows us to redefine the triad perception, action and cognition in a new perspective, and, above all, in a perspective compatible with an “embodied” meaning, that is, located in the body, of cognitive processes, in line with principle akin to the vision offered by phenomenology, but also to philosophical and neuroscientific traditions of an evolutionary and naturalistic nature, such as those advocated by A. Clark, D. Dennett, G. Edelman, A. Damasio, etc., also including the introspective approach -narrative of the neurologist O. Sacks, etc.

In accordance with the phenomenological conception of perception, with particular reference to Husserl’s philosopher, M. Merleau Ponty, with his classic *The phenomenology of perception* (1945), as well as with the concept of “affordance” of the ecological psychologist J. J. Gibson (1979), the visual perception of an object brings with it the immediate and automatic activation of the properties or modalities that allow us to interact with it. They are “practical opportunities” that the object stimulates in the organism that perceives them. For example, in the well-known example of the cup, the “affordances” that it stimulates concern the selective activation of groups of visual-motor neurons in the F5 area, which encode the motor acts congruent with the action of gripping the cup. Such selective activation would occur over time through evolutionary feedback mechanisms.

Finally, as Rizzolatti and Sinigaglia (2019) affirm, “Sensory representations evoked by seeing actions performed by others in one way (let us say, kind) rather than another (energetic) or by hearing words spoken with a certain tone (kind) rather than another (energetic) would be transformed in the DCI (Insula Dorso-Central cerebrale) in the motor representations that give those actions or those verbal utterances, when planned and performed in the first person, a manner, a tone, a vital form (“gentile”), Stern would say, rather than another (energetic)” (translation is mine), pp. 135-36.

4. Attanasio-Oliverio’s Naturalistic-Evolutionary Approach to Mirror Mechanism

In conclusion to the analysis of the ongoing debate on mirror neurons and on the functioning of mirror mechanism, I intend to take into consideration an interesting article by A. Attanasio and A. Oliverio, “Empatia e cognizione sociale, una lettura darwiniana del mirror neuron system” in *Rivista di critica filosofica Paradigmi*, anno XXX, n. 3—nuova serie, settembre-dicembre 2012 (“Empathy and social cognition, a Darwinian reading of the mirror neuron system” in the Review of philosophical criticism *Paradigmi*, year XXX, n. 3—new series, September-December 2012 -translation is mine).

In this article the authors argue that to understand the complexity of the phenomena of the mind, empathy and social cognition, it is essential to integrate neuroscience and philosophy. In particular, although the reading of the neuroscientific results regarding the “mirror neuron system” has mostly followed a Darwinian perspective, in fact, according to Attanasio and Oliverio, this discovery has so far been interpreted in a phenomenological key. On the contrary, the authors intend to show the incompatibility between the “social embodied cognition” of mirror mechanism and phenomenology, which is characterized from the outset by its critique of every empirical science and every form of naturalism.

The intellectualistic structure of phenomenology makes the so-called “transcendental self” a substitute for the old cartesian soul-substance. Instead, Attanasio-Oliverio propose a Darwinian reading mirror mechanism, centered on a “social-embodied-emotional mind”, rooted in the “reason-instinct” of D. Hume and in the “emotional revolution” of W James.

According to the two authors, the first attempt at a Darwinian reading of the complex phenomena of consciousness and social values was that of G. Edelman, who, integrating philosophy and neuroscience, proposed an innovative theory of consciousness based on the theory of applied Darwinian selection. to the brain

system: the so-called “neural Darwinism”. Starting from the discovery (which earned him the Nobel Prize for Medicine in 1972) that the immune system is a population system governed by the same principles as Darwin’s natural selection, he extends Darwinism to the selection of neuronal groups (TSGN) on which “emerges.” The primary consciousness common to all living organisms. It is a “supervening” consciousness from neural processes, in which it is indissolubly rooted and which is able to scientifically explain how “matter becomes imagination” (subtitle by Edelman & Tononi, 2000).

As regards the SS, according to Attanasio and Oliverio, the first philosophical approach aimed at explaining this discovery and the functioning of the mirror “mechanism” dates back to Jean-Luc Petit, a French phenomenologist who influenced Welsh in a decisive way (see the two-handed work by Gallese & Petit, 1998, presented at the “Towards a Science of Consciousness” Conference).

Paradoxically, according to Attanasio and Oliverio, despite the references to Darwin and the recognition that the primacy of the metaphor of the “mirror” mind belongs to the philosopher D. Hume, the discoverers of the NS did not interact either with pragmatism à la James or with naturalism à la Darwin, nor, finally, with empiricism à la Hume, that is, with none of those who would be their natural philosophical interlocutors.

The “mirror neuron mechanism” is, in conclusion, according to Attanasio and Oliverio, a selective socio-cognitive, biological and cultural system, which, gradually sedimented, becomes an original vehicle of communication-cognition, directed and automatic. The similarity of responses between macaques and humans, as well as confirming the continuity of species, demonstrates that the SS is active among social species and is therefore characterized by being a social system interwoven with the biological and cultural history of the species.

The same theory of Gallese’s “embodied simulation”, that is the ability to empathize with others in ways other than those of mentalization (Gallese, 2001), is framed, according to the authors, in a completely Darwinian reading, since for to trace this functional mechanism in the various animal species, it is necessary to look for what differentiates humans from non-humans, analyzing the multiple evolutionary strategies of the different species in the social sphere.

Unlike mentalist models, neurosciences show us, according to Attanasio and Oliverio, that social cognition is a process based on embodied simulation. Mirror mechanism does not make any logical-mental inference: the action is the result of a motor simulation. Furthermore, this audio-visual mirror mechanism, also present among non-linguistic species, confirms that the understanding of sounds, images, motor acts are inserted within “a simpler level of semantic reference” (a simpler level of semantic reference) which can be interpreted as a “conceptualization mechanism” (Gallese, 2007, pp. 660) or as “action concepts of grasping”, interactional schemes derived from the nature of our bodies, of our brain and of our “social and physical interactions in the world” (Gallese & Lakoff, 2005, pp. 12-13).

5. From Mind/Body Problem to Ecologic Brain and Embodied Human Being

T. Fuchs, psychiatrist, philosopher and Karl Jasper professor for philosophy and psychiatry at Heidelberg University in Germany, is one of the most interesting researchers in the intersection of phenomenology, psychopathology and cognitive neurosciences, with a main emphasis on embodiment and enactivism, temporality and intersubjectivity. In his *Ecology of the brain. The phenomenology and biology of the embodied mind*, 2017 he focuses his arguing on the concept of embodiment.

It is a very pervasive term at the moment that everybody understands. In my view, we should start with a short look at the still dominant Western dualism, which goes back to Descartes. Dominant Western dualism sees the body as something which is a mechanistic whole and which is outside of our embodied experience. That is one part of the dualistic side. The other dualistic pole is the subjective experience of the body but this subjective experience of the body is completely inserted into the brain. On the one hand, our current paradigm sees the body as a mechanistic system. On the other hand, my bodily experience is something that is completely different: the body is not just a mechanistic system, the body is a living system. The body is a living whole and the organism is not just composed of parts, but it is a self-reproducing autopoietic whole which is the basis of my embodied experience. And the other pole is completely different, but they can’t see it. It is not just a kind of body model in the brain, but it is my embodied experience, which builds upon the holistic system of the organism.

So embodiment in the end means that my being-a-subject is not within my brain, but I’m an embodied subject which is extended over my whole body, which is well moving and feeling with my limbs and acting over my whole body, which is well moving and feeling with my limbs and acting. I’m this living body and this embodied organism. Now, to put it a bit more precisely, there are two major aspects or dimensions of this embodiment: first, we have to think of the body and the organism as the basis of our feeling of being alive, I would say.

The basic self-awareness is something that emerges from the whole body in interaction with the brain, of course,

and the brain is necessary to integrate bodily affereces and bodily states, but it is in constant interaction with the body and only through this homeostatic regulation our embodied self-awareness emerges. So, if we are conscious beings, we are already embodied conscious beings. The other major dimension is the sensorimotor dimension. Here we transcend our organic body to interact with the environment by the limbs, by connecting ourselves with objects, by transcending the body when we deal with objects or by transcending the body when we deal with other subjects.

We have a kind of mutual embodiment here right now when we look at each other, and I see you nodding and you see me talking, then we are kind of extended bodies that interact with each other. So, also here we do not stop here, at the skin, or at the skull, what we are is extended in space, so to speak. So that is the second major dimension of embodiment.

The human being is often taken to be something that I am as a subject, that I am as a self-conscious being, and somehow reduced to a psychological state or psychological entity that continues over time. From an embodied point of view I'm, of course, not only a subject when I'm aware of myself but I'm still continuous, I'm living on when, for example, I fall asleep. So, I'm not just vanishing when I fall asleep but I'm still a living being. The continuity of myself essentially rests on the continuity of the life of my organism, on the life of my body. And that means that we cannot reduce the human being, the human self or the human person to something psychologically, to something psychological which is then somehow em-brained, or somehow localizable in the brain. But the human being is always the embodied person that I am, whether I'm conscious or not conscious during sleep. It doesn't play the decisive role, so the continuity of myself is the continuity of an embodied being and that is what we usually call, in Western philosophy and in Western thought, "the person". Because the person is not something that we can localize within the organism. The person is always the human being as a whole.

6. My Interpretative Position on the Mirror Mechanism

Personally, I believe that certainly the phenomenological approach to the "mirror mechanism" has the undoubted merit, well explained by Gallese, of rehabilitating and enhancing subjectivity and its holistic and autopoietic dynamics, including first of all intentionality, in the context of neurosciences, both to explain motor acts and perceptual mechanisms and partly cognitive faculties.

However, I believe that the phenomenology of which Gallese claims to be a supporter for the foundation of the new cognitive neurosciences is a "naturalized" phenomenology, far from the orthodox one of Husserl, closer to the phenomenology of Merleau-Ponty perception and even closer to naturalistic phenomenology by Varela and Maturana, and not conceptually dissimilar from the evolutionary, naturalistic and introspective approaches of philosophers, neuroscientists and psychologists such as Clark, Dennett, Damasio, Gibson, etc., also including the introspective-narrative approach of the neurologist O. Sacks, etc.

Finally, I believe that the naturalistic phenomenology of Varela and Maturana is closer to the philosophy of complexity, to Bateson's ecological approach and to an evolutionary approach, supported, for example, by the psychobiologist A. Oliverio, in agreement with which I believe it is better the essential adaptive, social and communicative role of the mirror mechanism at a species-specific level can be explained.

Dulcis in Fundo I judge very interesting the approach of T. Fuchs, whose research areas, as I told, lie at the intersection of phenomenology, psychopathology and cognitive neuroscience with a main emphasis on embodiment and enactivism, temporality and intersubjectivity. I think that his idea of the ecology of brain, the body as a living whole and the organism as not just composed of parts, but as a self-reproducing autopoietic whole which is the basis of my embodied experience, might be a good explicative meeting point for phenomenology and natural sciences, in the direction of a holistic and comprehensive view for mirror mechanism in human being.

References

- Attanasio, A., Oliverio, A., (2012). Empatia e cognizione sociale. Una lettura darwiniana del *mirror neuron system*, in *Paradigmi 3*, Rivista di Critica Filosofica, Franco Angeli, Anno XXX, Settembre-Dicembre 2012.
- Fuchs, T., (2017). *Ecology of the Brain: The phenomenology and biology of the embodied mind*, Oxford University Press.
- Gallese, V., (2009). Neuroscienze e fenomenologia in *Enciclopedia Treccani*.
- Merleau-Ponty, M., (1945). *La fenomenologia della percezione*, tr. it a cura di A. Biondi, Il Saggiatore, Milano 1965.
- Rizzolatti, G., Sinigaglia, C., (2006). *So quel che fai. Il cervello che agisce e i neuroni specchio*, Raffaello Cortina Editore, Milano.

- Rizzolatti, G., Sinigaglia, C., (2019). *Specchi nel cervello. Come comprendiamo gli altri dall'interno*, Raffaello Cortina Editore, Milano.
- Simonetti, N., (2015). *Neurosciences and Philosophy of Mind. A reductive interpretation of Mirror Neurons System*, Lambert Academic Publishing (LAP), Saarbrücken.
- Simonetti, N., (2019). *Il problema mente-corpo e i neuroni specchio*, Diogene Multimedia Ricerca, Bologna.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).