

# Mind between Naturalism and Phenomenology: a critical review of the book "The Unity of Mind, Brain and World: Current Perspectives on a Science of Consciousness"

organized by A. Pereira Jr. and D. Lehmann

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## Abstract

This text aims to present a critical review of the book "The Unity of Mind, Brain and World: Current Perspectives on a Science of Consciousness" organized by A. Pereira Jr. and D. Lehmann. We suggest that there are two ways strongly seeking the unity of mind, body and world: naturalism and phenomenology. We highlight that any form of naturalizing phenomenology will be widely different from philosophical phenomenology. Contributions to the book emphasize the central problem of conceiving consciousness as a material or worldly phenomenon. Phenomenally consciousness is described as consisting of feelings, affects, emotions, thoughts; briefly, it consists of an internal life, a private or subjective world. However, the physicalist uses terms of physics, chemistry and biology to describe from where consciousness comes from, or what actually is consciousness in the objective language of science. Several solutions are proposed: dual-aspect monism, triple-aspect monism, quantum theory of biosystems and mind, microstates of the brain's electric field, consciousness-generating glial-neural units, semiotics views, etc. Our critical point of view formulates that naturalizing phenomenology would be complete in one of two ways. The first one succeeds if all relations needed to explain the unity of mind, brain and world are possible to be described in terms of efficient, formal and material causes. The greatest challenge of this thinking is to describe in these terms the phenomenal mind. The second one is the claim that this unity would be dependent on a B-constituent principle, from which Aristotles causes could be derived. In this case, instead of proposing types of ad-hoc relationships, the point is to seek for some kind of more fundamental relation than the efficient cause. Research on additional quantum force directing the motion of physical particles may be an example.

**Keywords:** mind, brain, world, naturalism, phenomenology.

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## Introduction

The editors of the book have a large contribution in the field of philosophy of mind, psychology, neuroscience and cognitive science. Alfredo Pereira Jr. is Adjunct Professor in the Institute of Bioscience, São Paulo State University.

He is a Professor in Master's and Graduate programs in Public Health (Faculty of Medicine, UNESP-Botucatu) and Philosophy (Faculty of Philosophy and Sciences, UNESP-Marília).

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He was a Visiting Scientist at KEY Institute for Mind-Brain Research, linked to the University of Zurich (2012), and a Visiting Researcher at the Center for Theoretical and Empirical Consciousness Studies, Department of Psychology, University of Copenhagen (2012). Pereira also worked as a Project coordinator in the FAPESP Thematic Project "Systemics, Self-Organization and Information", linked to the Center for Logic and Epistemology at the University of Campinas (2011-2016).

He graduated in Philosophy from the Federal University of Juiz de Fora (1984), and received a degree in Business Administration from the Accounting and Administrative Sciences Foundation Machado Sobrinho (1983). Pereira is also MA in Philosophy from the Federal University of Minas Gerais (1986), PhD in Logic and Philosophy of Science from the State University of Campinas (1994) and Postdoctoral Fellow in Brain and Cognitive Science at the Massachusetts Institute of Technology (1996-98).

Dietrich Lehmann was an Emeritus Professor of Clinical Neurophysiology at the University of Zurich, and member of The KEY Institute for Brain-Mind Research at the University Hospital of Psychiatry, Zurich. He was born on December 3<sup>rd</sup>, 1929, and died on June 16<sup>th</sup>, 2014. He had completed his medical studies and received the MD degree in 1957. After internships in neurology in Heidelberg, Munich, Freiburg and Marseille, in 1963 he moved to California. Lehmann was a research fellow at the University of California Los Angeles (UCLA), and then he became an associate professor and acting chairman of the Department of Visual Science at the University of the Pacific, in San Francisco, California. In 1971, he went to the Department of Neurology at the University Hospital in Zurich, where he became a Professor of Clinical Neurophysiology in 1988. His research dealt with some matters such as visual perception, sleeping and somnambulism using evoked spontaneous field topography (Electroencephalography and Clinical Neurophysiology). About two years before retiring, he founded in 1995 the KEY

Institute for Brain-Mind Research at the University Hospital of Psychiatry in Zurich (Michel et al. 2014).

Lehmann's scientific interest focused on the emergent electroencephalographic activities related to mental properties. According to Lehmann, potentials could be divided into continuous segments of stable spatial configurations of the electric field. He called these segments "functional microstates", a concept first developed between 1971 and 1987, many years before the imaging community invented the terms "resting states" and "task states". He proposed that these brain stationary microstates might be the basic building blocks of information processing, arguing that the microstates were the basic units of cognition and consciousness (Lehmann 2013).

The focus of Pereira Jr.'s research is also on the unity of mind, brain and world. In his words "conscious experience is a fundamental aspect of reality, neither separable from nor reducible to the other two aspects (namely, the *physical-chemical-biological* - in short, "physical" - and the *informational*)." (Pereira Jr., 2013). If Lehmann comes from a naturalistic, scientific and neurophysiological tradition, Pereira Jr. brings a phenomenological contribution, looking for a deeper scope for the understanding of consciousness as a worldly phenomenon.

The authors have invited contributors to the book: Wolfgang Baer (Associate Research Professor of Information Sciences, Naval Postgraduate School, Monterey and Research Director, Nascent Systems Inc.), Ron Cottam (Researcher at Vrije Universiteit Brussel, Belgium), Adam Gazzaley (Associate Professor of Neurology, Physiology, and Psychiatry at the University of California, San Francisco), Christine A. Godwin (Master's degree student at the Department of Psychology at San Francisco State University), Bjorn Merker (Independent scholar and PhD in psychology and brain science at the Massachusetts Institute of Technology), Bernhard J. Mitterauer (Professor Emeritus of Neuropsychiatry at the University of Salzburg), Ezequiel Morsella (Associate Professor of Psychology at San Francisco State

University), Leonid Perlovsky (Visiting Scholar, Harvard University, Athinoula A. Martinos Center for Biomedical Imaging), Willy Ranson (Researcher at the Vrije Universiteit Brussel), Arnold Thehub (Adjunct Professor of Psychology at the University of Massachusetts at Amherst), Ram L. P. Vimal (Amarāvati-Hirāmani Professor at Vision Research Institute).

The contributions bring results of research on the nervous system and subjective activity, assuming information processes as a medium between neurophysiological activity and conscious contents. This collection of works promotes the debate around phenomenological and natural perspectives for the unity of mind, brain and world.

### **1 - Theoretical and methodological collaborators' positions**

Contributions to the book emphasize the central problem of conceiving consciousness as a material or worldly phenomenon.

Phenomenally consciousness is described as a consisting of feelings, sensations, affects, emotions, thoughts; briefly, of an internal life, a private or subjective world. However, physicalist descriptions use terms of physics, chemistry and biology to describe from where consciousness *comes from*, or *what actually is* consciousness in the objective language of science. Several solutions are argued: dual-aspect monism, triple-aspect monism, quantum theory of biosystems and mind, microstates of the brain's electric field, consciousness-generating glial-neural units and semiotics views.

In Chapter 1, written by Merker (2013), it is presented an ontological framework for analyzing the interaction between the brain, body and world, engaged in a dynamics that contains various selection processes. According to the author, this dynamics is responsible for generating consciousness. He argues that a neural format defines an operant conscious mode based on the way of its internal organization, different of the strictly neural information process.

Consciousness is a phenomenal subsystem of this neural information, part of the physical body, in turn making part of the physical world.

We claim that it would be difficult to exactly describe the smell according to the taste, and we also find the same difficulty in trying to describe conscious experience or *qualia* by means of a physicalist terminology. In Chapter 2, this difficulty leads the authors to present the "brutally reductionistic" approach. They sought to conceptualize consciousness "homing in on neuroanatomical loci", on basic mental processes and representations. With this intention, in this Chapter they have proposed a model, called "buffer of the perception-and-action interface" that illustrates these aspects in schematic form. The model describes a "conscious memory of perceptual consequences of action", which, if is selected, produces behaviors, emotions, feelings, etc.; they pass to the "unconscious motor programming": "If the representation is selected for production, the motor programs for executing the action are implemented unconsciously." (Godwin, 2013). In our point of view, the authors created a model combining different theories of mind, looking for a form to incorporate elements of behaviorism, cognitivism and psychoanalysis, resulting in a very interesting proposal.

In Chapter 3, Cottan and Ranson (2013) present an interesting analysis about *semiosis* and cognitive hierarchy, from the phenomenological embodied perspective of mind. "We strongly believe that high levels of conceptual consciousness are impossible without embodiment, and that therefore any idea that consciousness could transcend the physicality of life is mistaken." (p. 106).

However, according to the authors, we should not think about mind and matter as ontologically inseparable. We could ask the authors if this position does not move away from the theory of enactive cognition that describes mind as action. They suggest that subjective experience is carried by matter and that the emergence of subjective experience increases in the course of neural evolution. Awareness is conceived as a precursor of consciousness.

The universe is supposed to be alive within increasing levels of awareness. From the physical low-level of awareness, consciousness emerges with the dense networked information processing of the brain. Consciousness depends also of the complex social network to exist.

“Consciousness is the active mental processing of the existential cohesive correlation between a subject’s transparent self-image and its genetically sourced and historically-experienced proxy representation of the environment.” (Cottam and Ranson, 2013). As soon as they evoke an irreducible difference between mind and brain (also irreducible to any other entity), they take account of its complementarity, assuming dual-aspect monism. Semiotic structures are based on the biochemical hierarchy of organism, and emergent signs obey a consistent set of rules to emerge. “The process of emergence of new entities, species, or hierarchical levels *all* coincide with a single description which is related to the maintenance of stability of localized entities in a global context.” (Cottam and Ranson, 2013).

In Chapter 4, we may say that Baer (2013) presents an enactive quantum theory of mind. The author grants a way to deconstruct “the hard problem” of consciousness, saying that it is impossible to solve the problem producing detailed knowledge about consciousness from properties of biochemical structures, and that physics already describes an integrated mind-body mechanism. The ways of solutions can be glimpsed in a conceptual analysis of “our conscious experience [that] need to be re-examined in order to determine the adequacy of our physical theories to incorporate consciousness” (Baer, 2013). Following Maturana, he believes that observed experience is not linearly caused by stimuli or information inputs, but both, cognition and environment, are parts of co-construction cycles accommodating influences of the rest of the Universe.

Baer (2013) suggests that “quantum theory describes something we *do* as cognitive beings, not something we see inside our phenomenal bodies or its environment”. He argues that

measurements produce a display in our internal processing loops denoting that we accommodate influences from external reality into our internal model of physical reality. In his viewpoint, this “model of physical reality” can be defined in Hilbert space. The unity of mind, brain and world is sustained by proposing an architecture of human thought process that creates conscious experiences from physical changes converted to observable sensation. “The ontological interpretation of this physical phase is a mass-charge separation field that exactly balances the gravito-electric influences from both external and other internal cycles... (it) gives us a tool to visualize the actual mechanism of consciousness.” (Baer 2013). We emphasize that the chapter has an intelligent, clear and even didactic presentation of the proposal about quantum theory and classical physics. We also argue that cognition as action is *relative*, in physical terms: as materialized action, cognition is movement and movement is relative. In these sense, the concept of relative cognition suggests that a cognitive system is cognitive only in certain relationship. Consciousness is not assumed to be an absolute entity. The mass-energy separation described by the author to support cognition may well be present in all materials. According to Carvalho (2012), the universe and each of its parts exhibit a form of cognition, depending on the kinds of relation; on the ways that the system takes place in the world. Relations of hierarchical organization from macro to micro and vice versa are very important.

In Chapter 5 the dual-aspect monism approach is presented by Vimal (2013), arguing that we can perceive the mind-body duality the same way that physics understands the wave-particle relation. He understands that materialism takes emergence as something mysterious, or reduces emergent properties to physical structures and physical processes. In this sense, neuroscientific naturalism holds that conscious contents are nothing but functions of neural networks states. On the issue of emergence, the author follows the thought of Chalmers (2006), proposing that strong emergences results from

interactions between feed-forward signals and cognitive feedback signals in a neural network. In the proposed framework, strong emergence is embodied in matching and selection mechanisms of the nervous system. It is thus a neural Darwinian process: "This unpacking principle of emergence is based on (1) the *potential* pre-existence of irreducible entities, (2) matching of latent properties superposed in physical and mental aspects of the state of constituting entities, and then (3) selecting the best-fitted properties." (Vimal, 2013). As for Chalmers, Vimal supports consciousness as being the unique case of strongly emergent quality. However, this could not be studied from the point of view of materialism, because "SEs [subjective experiences] can not be derived from the current laws of physics." (Vimal, 2013). Vimal argues for a non-reductionist notion of complex systems. His philosophical position is an alternative to naturalism, idealism and substantial dualism. According to his Dual Aspect Monism with varying degrees of dominance (DAMv), mind and brain are "two *inseparable* aspects of a state of a fundamental entity (such as fermions and bosons, the 'primitive' quantum field/potential or unmanifested *Brahman*; they are primitive)" (Vimal, 2013). In some systems the mental side is dominant, while in others the physical dominates. We argue that research on mind as a quantum biosystem brings important contributions regarding the explanation of subjective phenomena. In the past, Gestalt psychologists were accused of naturalizing and physicalizing the mind, but this kind of approach has been important for the appearance of fMRI. This chapter presents a new physical-mental theory and we can certainly expect even more interesting innovations coming from quantum physics and science of brain and mind.

In Chapter 6, Lehmann (2013) brings a scientific perspective to consciousness research, crossing data from different studies based on different methodologies, such as neurological data and subjective reports of experiencing. Pioneering data from electroencephalogram (EEG), and also from functional magnetic resonance

imaging (fMRI) are addressed to explain consciousness in terms of brain electric activity. In fact, the author argues for "the concept that consciousness and its contents are functions/products of brain", depending on the brain's structure and functional mechanisms (Lehmann, 2013). Referencing his article on human EEG before and during cannabis hallucinations, published in 1976, he shows body image disturbances and visual hallucinations data that display strong covariance with EEG potentials analyzed from millisecond to millisecond. Lehmann focused on these emergent electroencephalographic activities related to mental properties. In his thought, potentials could be divided into continuous segments of stable spatial configurations of the electric field. He called these segments "functional microstates", a concept first developed in a network of collaborations between 1971 and 1987. He realized that the electrical activity had no static nor chaotic units, but a regularity. Then he proposed that these brain stationary microstates might be the basic building blocks of information processing. "Microstates as temporal building blocks of brain work incorporate identifiable steps and modes of brain information processing." (Lehmann, 2013). Conscious information patterns were conceived not as static, but stationary microstates in dynamical systems. In this sense, Lehmann argues that the microstates of the brain's electric field are the dynamical unities composing cognitive processes: "We propose that microstates of the brain electric field are the valid candidates for 'atoms of thoughts and emotions'" (Lehmann 2013). Following the cognitive tradition, the author supports that the concept of cognition involves thoughts, information, emotions, feelings and consciousness. We can remark that as well as in *gestalt* theory Lehmann describes mind in physical terms like nothing more than magnetic and electric fields (Köhler, 1947). Hebb (1949) also comes to be an important precursor of Lehmann's thought. According to Hebb, the association mechanisms are structured by cell assemblies. A group of neurons could form a "cell assembly" that would remain active after the presentation of a

stimulus and thus would form the unity of mental activity. Thoughts, emotions, etc. come from the activations of these sequences of neural assemblies. Moreover, Lehmann anticipated a series of contemporary studies with his concept of "stationary microstates". These studies include the dynamicist theory of cognition (Gelder and Port, 1995). According to Mitchel (1998), computers are not static process units, but dynamic, complex ones.

Hordijk and Rock (2005) understand that stationary units are emerging and serve as guides for the development of biological organisms, and for future computer systems able of self-programming. Carvalho et al. (2012) propose that representations are endogenous control parameters for complex adaptive systems and that mental development occurs through the emergence of these stationary units (representations), allowing the learning of language and reasoning.

In Chapter 7 the mind-body problem is seen in part as a semantic problem. Trehub (2013) claims that the explanatory gap between concepts of mind in first-person and third-person descriptions does not imply dual substances, but a dual-aspect view of the same thing. There is no identity established between descriptions because private events and public events occupy, in language, separate descriptive domains. "It seems to me that this state of affairs is properly captured by the metaphysical stance of dual-aspect monism where private descriptions and public descriptions are separate accounts of a common underlying physical reality" (Trehub, 2013). The author claims that, in alliance with metaphysics, consciousness can be investigated from the norms and the language of Science, in which the scientific task is the development of theoretical models. With this aim, he says that it is instructive: (1) to assume dual-aspect monism, understanding the private and public descriptions as separated accounts of the same fundamental reality; (2) to propose a bridging principle that consists of explaining consciousness by means of neuronal activity within a specialized system of the brain. According to him, this specialized system is the

*retinoid network*, which activity encompasses the entire current content of conscious experience into subjective egocentric space; and (3) adopt that consciousness is a "transparent brain representation", claiming that the perceived world consists of a subjective neuronal activation in retinoid space.

In Chapter 8, Mitterauer (2013) proposes to describe a mechanism of observer-observed reflexivity in glial-neuronal synaptic units (GNUs), assigning a new role to the astrocytic syncytium. The author assumes that the problem of subjective systems and self-consciousness is fundamentally philosophical, at least for now. "Since these issues cannot be resolved with natural-philosophical methods, the philosophical discussions may continue going round in circles." (Mitterauer, 2013). In this sense, because we cannot actually put subjectivity as an object in an experimental protocol, he confesses that his theory about synaptic information processing as a fundamental mechanism of subjective reflection is a philosophical speculation. However, we believe that one of the most interesting positions taken by Mitterauer in the text is that robotics and autonomous multiagent systems may be an alternative approach, because using a machine "we can learn from its behavior where we are right and where we are wrong or where we are confronted with metaphysical limits of our scientific investigations.". He stresses that brain is ontologically composed of GNUs and that the astroglial syncytium is the subjective side of the brain generating intentional programs. "According to the combinatorics proposed in an astrocytic syncytium, cycles of various length are permanently generated, and interpreted as intentional reflection mechanisms" (p. 258). Indeed these combinatorics offers a structure to define different circuits supporting different computational processes. Some of them maintain high levels of complexity and circularity. The Hamilton loop is used as mathematical formalism to demonstrate that our brain has unimaginable reflection potency, once the number of loops is not computable even in a pentavalent permutation system. This ability to self-referential acting is

important to embody subjective and intentional processes involved in self-consciousness: “an intentional program generates a specific multi-relational structure in an inner or outer appropriate environment, based on the principle of feasibility of that program.” (Mitterauer, 2013). We understand that the concept of intentionality used by the author is perfectly compatible with the causal theory of reference. Furthermore, he presents in the chapter a very instructive schema about the basic pathways of information processing in a glial-neuronal synapse as an elementary device of the brain.

In Chapter 9, Perlovsky (2013) claims for a new mathematical model of mind with implications on language and conscious processing studies. He stresses that science builds its knowledge by means of models involving theory and experimentation. This way, mathematical modeling is important for computer simulations, but it should be linked to experimental data: “Whereas it is possible to have many different intuitions about complex phenomena, mathematics leads to unambiguous predictions that could be experimentally verified, thus proving or disproving the theory.” (Perlovsky, 2013). He suggests that cognitive systems are hierarchical system. The duality of language and cognition suggests that language processes are involved in all levels of mental hierarchy. The fundamental mental mechanism inter levels is the matching of bottom-up and top-down signals. For him, “the entire humanity is unified by essentially similar mechanisms of consciousness”. As one of the main points of the text, he has an interesting theory about mental mechanisms. He argues that mental processes are not based on formal logic, as assumed in the cognitive science tradition. Following the inconsistency of logical systems demonstrated by Gödel, Perlovsky (2013) suggests that “the mind is modeled by dynamic logic describing processes from vague representations to crisp”. In this sense, the author believes that an alternative mathematical model (Dynamic Logics) can amplify our understanding about cognitive processes and indicate solutions to vexing problems such as the

reduction of the mind to physical and biological systems, and also launch new possibilities for understanding free will.

In Chapter 10, Pereira Jr. (2013) argues his Triple-Aspect Monism (TAM) assuming consciousness in a continuously evolving reality that departs from the physical-chemical-biological world, passing by the informational world towards consciousness. Conscious is presented as a dynamical system. The author holds five kinds of relation in his concept of dynamical system: the causal (Aristotle efficient cause), the informational, the symbolic and two others linking these levels. “An *information pattern* corresponds, in the Aristotelian framework, to a potential form that can be actualized by different substances and then transmitted to other substances.” (Pereira Jr., 2013). Each one of these relations is independent and non-reducible to another. Together they compose a whole, a dynamical system, working by hierarchical processes.

Conscious activity is described as “*the actualization of forms (P) in substances (S)... witnessed by a conscious subject (CS)*”. It is a natural fact that a form (P property) is actualized (using a contemporary term, “instantiated”) in substance S *and* this process is witnessed by a CS.” (Pereira Jr., 2013). Conscious states are related by symbolic relations, mental states by informational relations and physical states by causal relations. This aspects of the system cannot be separated, says the author. Ascendants and descendants relations are proposed to be system’s internal kinds of relation to understand feelings and affections. These relations are mainly important because “what makes an individual’s mental activity conscious is *the presence of sensitive and affective feelings* about the content of recognized information.” (Pereira Jr. 2013). A kind of ascending causation has origins in physical states and, through information states, modifies the conscious states. This ascending hierarchical process then reports the occurrence of sensitive feelings, where things from the outside world and the body can become conscious. Otherwise, a kind of descending causation makes

possible the mental states influence, through information states, physical causal relationships. This descending process describes affective feelings, in which mental states are somatized and experienced as corporeal states, like chills up the spine, says the author. In the perspective of Pereira Jr. (2013), TAM is close to the philosophy of Hegel, giving a twist: from Mind-Nature to Nature-Mind, a type of maneuver already used by Marx, he says. "TAM suggests a re-conceptualization of natural sciences, pointing to the existence of potentialities present in Nature." (Pereira Jr., 2013). The author's ontology is described by himself as a contribution to "re-enchantment of the world". Pereira Jr. (2013) judges that his theory is not a derivation of Husserl's phenomenology, but is compatible with versions of Martin Heidegger and Maurice Merleau-Ponty. We believe that TAM is a beautiful and intelligent theory on an integral and integrative approach to consciousness as unity of mind, brain and the world.

## Conclusion

Research on consciousness, whether it is scientific or philosophical, brings a fascinating context of ideas, technological data, and devices. This book is a significant sample of the strength of this research. Conscious activity is contextualized and situated in the most current researches in neuroscience, cognitive science, psychology, philosophy of mind and other disciplines. It is an encouraging book, and especially represents a great challenge at the intersection of naturalism and phenomenology. In consonance with this issue, we would like to make a critical point.

In a naturalistic or worldly interpretation, the mind is nothing but a natural or worldly thing.

We found two thoughts that we could understand seeking a unified view of mind, brain and world, the naturalist and phenomenological discourses. The work of Maurice Merleau-Ponty is of great importance for the project of naturalizing phenomenology. Bouyer (2014) even says that "this naturalizing of the husserlian

phenomenology, which gains force in philosophy and Cognitive Science, had its starting point in the phenomenology of Merleau-Ponty". Certainly, the large gap that separates cognitive approaches and phenomenology began to be reduced when approaching the reality of human consciousness and its physical and chemical properties. However, De Castro & Gomes (2008) emphasize that any form of naturalizing phenomenology will be widely different from philosophical phenomenology.

One way to analyze the concept of nature is taking into consideration the Aristotelian causes. They were proposed to describe the constituent principles of the world. Nature is seen as being composed of matter (material cause), that has a form (formal cause) and that can transform (efficient cause). We can say that this trans-form-action occurs by the action that can produce, as an effect, changes of the form of a system. In the history of philosophy and science, there are several examples of metaphysical ontologies, which are now considered natural ontologies. In Leibniz, motion is treated as a metaphysical phenomenon, while modern science considers it as one of its main natural phenomena.

In natural philosophy, we can understand that the efficient cause is seen as a necessary and sufficient relation to explain the movement of bodies. Any other relationship could mean an insufficient analysis of the phenomena studied. On the other hand, the phenomenological thought advocates a broader notion of worldliness than the notion of nature. However, it still expects not to share what exists on two or more factions, such as mental substance, corporeal substance and God. In the world of phenomenology, there are things that open the causal closure of nature, such as free will, *lieber*, intentionality and new types of relation we can imagine. Under strong influence of this phenomenological thought, Searle (2010) argues that the causal theory of reference will completely fail because he believes that intentionality goes beyond the causal relationship. Following Thompson (2007), naturalizing phenomenology means to pass to a radical change of perspective on mind, body and

world. This occurs with the risk of falling over the same classic problems of the mind-body interaction of Cartesianism.

We argue that naturalizing phenomenology would be completed if all ongoing relationships to explain the unity of mind, brain and world are possible to be described in terms of efficient, formal and material causes. If this reduction is possible then we have indeed naturalized phenomenology, we have a natural explanation of the phenomena studied. Another way to naturalizing phenomenology is suggesting that the unity could pass by a  $\beta$  constituent principle from which a project may be proposed to reduce Aristotle causes. The use of reduction is no longer a stranger to the phenomenological thought. In this case, instead of proposing types of *ad-hoc* relationships, the point is to seek for a more fundamental kind of relation, more basic than the efficient cause. A  $\beta$  relation involves the efficient cause and others, such as ascending causation, descending causation, etc. The  $\beta$  constituent principle may be a simple and particular kind of relation from which the others are derived or deployed. In personal communication, the  $\beta$  constituent principle led Pereira Jr. thinking about B. Russell's "neutral monism," Anaximander's "apeiron" or the "bridge principle" in the sense of Chalmers. Chalmers and Jackson (2001) bridge principle links the microphysical level to the macroscopic level. We understand that all these positions are different. We call  $\beta$  constituent principle the hypothetical principle that is a simple and particular kind of relation from which the others are derived or deployed. This constituent principle would be the fundamental kind of relation for a wider world, replacing or reducing efficient cause solving the mind-body interaction problem. We highlight this kind of thought is useful for a renewal of classical physics by quantum theory, looking for additional quantum forces directing the motion of physical particles.

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