"This is novel and innovative work. It is philosophy in the grand synoptic style - influenced and aware of contemporary science, but not beholden to it. Epistemologically different worlds may be a tool for untying many current philosophical knots."
John Bickle, Professor and Head, Philosophy, Professor, Neuroscience Graduate Program, University of Cincinnati

"In this work Gabriel Vacariu tackles a long standing assumption of Western thought – that there is only one world. This assumption appears equally in the background to the works of the great philosophers as well as being presupposed in contemporary physics and psychology. Through a series of ingenious arguments the author shows that by making use of the idea of the distinctess of observational conditions, the pretensions of neuroscience to unify psychology is deeply flawed. He extends the argument to well known Unitarian views in philophical of psychology, with the aim of disrupting the alleged unity of the human person, despite the multiplicity of ways that knowledge is gained of what must be admitted to be a fragmentary domain. This is a bold project and the author brings not only a high degree of philosophical sophistication to the task, but also a wide and deep knowledge of the various sciences which inform his analysis of the many forms taken by the unitarian claim."
Rom Harre, Emeritus Fellow, Linacre College, Oxford and Distinguished Research Professor, Georgetown University, Washington DC

"... the idea of epistemologically different worlds can generate a new approach not only to the mind-body problem, but also to many other fields of philosophical theorizing, from general ontology to more specific problems in the philosophy of special sciences." (see the preface)
Ilie Parvu, Professor, Department of Philosophy, University of Bucharest

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Gabriel Vacariu Epistemologically Different Worlds

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GABRIEL VACARIU

EPISTEMOLOGICALLY DIFFERENT WORLDS

To Ilie Parvu

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by Magda Vacariu

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Part II. Applications

Preface

The book of Gabriel Vacariu proposes a new philosophical theory with many important implications for all the domains of philosophical reflection. The starting point of the approach is one of the best known and most important problems of philosophy, both classical and contemporary, namely the mind-body problem. From the traditional status of a problem for metaphysics, the mind-body problem has been transformed into a central problem for philosophy of mind and the cognitive sciences in the last decades. In spite of great analytical and instrumental progress, this problem remains unsolved. No theory or hypothesis formulated so far has gained the assent of the majority of researchers. In the terms of Thomas Kuhn, it remains a problem that characterizes the pre-history of a particular science that has not yet found the road to normal science.

The author of the book thinks that this situation is determined by the fact that something is wrong at a fundamental level – the level of the general presuppositions of scientific reasoning and theorizing about the mind-body problem. Vacariu identifies one element ("error") of that framework that has generated the series of unsuccessful approaches to the problem, an idea deeply entrenched by the philosophers and scientists: the belief in the existence of a unique world, the singular conception of the world, the universe or reality. In order to make possible a viable solution to this very important problem, Vacariu argues for the necessity of changing the traditional approach to the philosophy of mind, a kind of paradigm shift in this domain of philosophy, by completely abandoning the ontological and epistemological idea of a unique universe or reality (world) to which can be ascribed two kinds of being interrelated in the traditional formulation of the mind-body problem. This proposal has important consequences for many fields of theoretical philosophy, because nowadays the philosophy of mind plays an important role in analytical philosophy, both as a subject of inquiry in its own right, and as an important landmark in the broader philosophical landscape.

The importance of this philosophical hypothesis cannot be underestimated: the idea of epistemologically different worlds can generate a new approach not only to the mind-body problem, but also to many other fields of philosophical theorizing, from general ontology to more specific problems in the philosophy of special sciences.

The main contributions of this book consist of a clarification of the traditional "ontological category mistake" that is characteristic of all classical, or contemporary perspectives or types of rational reconstruction of the mind-body problem: the attempt to subsume subjectivity into objectivity. In this kind of approach, the mind-body problem is simply the problem of relating subjective, internal, mental phenomena to objective, external, material phenomena, and assuming that this can be done in the framework of a unique world. Vacariu introduces the idea of epistemological different worlds as a rational generalization of some approaches from the general theory of knowledge (Kant) or the foundations of quantum mechanics (Bohr). From this perspective, the concept of an epistemological world includes not only certain epistemological elements such as an observer and the conditions of observation, but also an ontological element, the “conditions of interaction”. Thus, a purely methodological-epistemological concept is transformed into an ontological one. In this sense, every observed entity “observes” or interacts only with other entities that belong to the same epistemological world.

The author formulates his theory, constructing a set of epistemological-ontological postulates that express various aspects of the fundamental idea. These are conceived not as mysterious metaphysical postulations but as necessary presuppositions for a theoretically precise and empirically well-defined approach, something very similar to the “transcendental” principles of Kant’s theory of reason. In tone with the modern definition of scientific abstract concepts, this seems to be a sort of structural definition of the second-order concept “epistemological world”. By this procedure, this concept becomes an abstract-structural frame theory of a large research program in philosophy and theoretical science. This epistemological and methodological status of the theory proposed in this work implies a special kind of testing or assaying not through a direct confrontation with empirical data or experimental findings but by virtue of its capacity to generate a large number of new special hypotheses or theoretical models in particular areas of research, to solve some important, significant and persistent problems (“anomalies”) in these domains, to open new avenues of fruitful research and to contribute to the improvement of the methodological instruments of theoretical reasoning. This kind of testing of the philosophical theories contrasts with the “normal” methodology of analytic philosophy, in which the ontological models are justified by appeal to intuitions and/or to general, context-free “foundational arguments”. From this point of view, the present book is highly successful, not only in its comprehensive and original treatment of some major themes, but also in its methodological lesson. It represents a very original example of an important trend in contemporary analytic philosophy, which is taking either a naturalistic turn or turning back to ontology. In either case, the idea that philosophers can only assert what an analysis of language affords is being left behind.

Drawing on a wide range of recent scholarship, the work of Gabriel Vacariu gives a balanced account of the most recent and important theoretical contributions from the philosophy of mind and cognitive science. The reconsideration of their signification from the point of view of the philosophical hypothesis formulated in the dissertation represents the main theoretical achievement of Vacariu. As a first step in the development of a new research program, this part of the book is, in itself, a very consistent theoretical work, full of important "local analyses" and philosophical interpretations. This kind of research is an example of a very fine and critical conceptual analysis, one which is not reducible to a logical-linguistic elucidation of some pre-existing ideas (a method very peculiar to the great majority of contemporary analytic philosophers), but includes many constructive moments by which the results of the rational analyses are "reinvested" in the field of theoretical research itself. Rather than focusing on semantic or logical questions about the meaning of the old concepts and procedures of the philosophy of mind and cognition, Vacariu introduces, and beautifully exemplifies, a novel approach to the mind-body problem which has many possible consequences not only to the philosophy but also to the ongoing practice of science.

In the last part of the book, the author tries to extend this interpretive framework to other domains of the philosophy such as the philosophy of physics. I would be interested to see further elaboration of this perspective, because it seems to me that there are some similarities between Vacariu's approach and the non-reductive perspectives in the physical sciences, such as the physics of condensed matter (Ph. Anderson, L. Kadanoff etc.) or the program of Effective Field Theories in various domains of theoretical physics. The possibility of constructing methodological bridges between such distant fields of science represents a very good test for a theoretical framework such as the one presented in this book.

To conclude briefly, the book of Gabriel Vacariu introduces into the philosophy of mind and philosophy *tout court* a novel approach which is rich and illuminating. Not only does it bring a fresh perspective to the much debated historical problems of the field, but, at the same time, it introduces a powerful framework for further research.

Ilie Parvu

Introduction

One of the most important problems in philosophy, the mind-body (or mind-brain) problem, is still up in the air. Paradoxically, since Descartes nobody has proposed a viable alternative solution to this problem. During this time, technological developments have helped us to deal with complex problems regarding the external world and our own being. We have made great progress in trying to scientifically explain the origins of our universe, but we are not able to make progress regarding the mind-body problem. In recent decades philosophers have offered many approaches to the mind-body problem; yet none of these approaches has gained the assent of the majority of the thinkers. Even if the majority of philosophers consider that, ontologically, mind is a physical entity, many of them do not admit the epistemological reduction of the mind to the brain. The relation of mind to body remains a mystery. From this paradoxical situation we can draw the conclusion that something is wrong with the problem itself. Therefore, we should look to the foundation of the problem, i.e., its conceptual framework.

Throughout history there have been certain key elements that have constituted the framework of human thinking. The main two elements are the *human subject* (as in the Cartesian expression a "thinking thing") and the *world* (the real world, the Universe, etc.). In this sense, there have been different directions in philosophy such as rationalism (Descartes), idealism (Berkeley), transcendentalist idealism (Kant), etc. There is, however, a third key element: the conceptual-perceptual framework through which the subject observes/conceives the world. Let us label this notion the *conditions of observation*. Using different conditions of observation, the subject can observe one or more objects. Such objects are made from a certain substance which introduces the fourth element in this equation or framework: the *substance(s)* that make(s) the objects, i.e., all the objects that belong to the world. Now let me write the equation of this universal framework: *the subject, the conditions of observation (conceptual-perceptual conditions), the substance(s), and the world.* The relationships among all these key elements are very strong. Practically you cannot discuss one element in isolation from the others. All the elements are strongly interwoven with each other. In fact these relationships represent the physical and explanatory *causality* among the main elements.

Descartes, the grandfather of the mind-body problem, provides the most paradigmatic example of the above framework. In Chapter 1 we will see that Descartes' key elements are: the subject ("I" as "thinking thing"); two kinds of clear, distinct and complete perceptions/conceptions; two substances – material and immaterial; one world with different entities like God, angels, and mind, body, animals, and inanimate things and their relationships. From perceiving clearly, distinctly and completely two substances, the mind and the body, Descartes infers the existence of those substances.

There is a fundamental issue here which needs to be noticed: Descartes' approach is grounded in a pre-existing framework (paradigm) which has dominated human thinking since the Ancient Greeks. Within this framework, there is one key element that represents the major error: the postulation of "*one world*", one single ontological world in which everything has been placed (all the entities like Gods, angels, and mind and body, planets, tables and micro-particles). Paradoxically, everyone before Descartes and after him, including his critics, has embraced the same framework. And here is, I think, where the mistake resides: assuming the existence of one world, the universe. Metaphorically, I call this unique world or "uni-verse" the *"unicorn-world"* to emphasize its mythological-religious roots. It is one of the oldest and most dominant paradigms (see below) in human thinking that has generated many pseudo-problems in philosophy and science. We can identify this thinking paradigm, the unicorn-world, within the majority of myths, theological doctrines, philosophical approaches, scientific theories, etc. Since the Ancient period, philosophers and scientists have tried to find the foundations of this unicorn-world in which human beings have their own place. Moreover, they have tried to explain the ontological or epistemological status of the mind and brain. Consequently, fundamental pseudo-notions such as "levels", "fundamental particles", the relationships between "microparticles and macroparticles" or between "brain and mind", the "theory of everything", "essence of things", "ontology" and "epistemology" have dominated philosophy and science precisely because of the unicorn-world paradigm of thinking.

Since Descartes, there have been many alternatives to the mind-body problem and other related problems. None of these alternatives has been accepted. The main reason for such inevitable rejections has been, of course, the old framework of this problem, the unicorn-world. Within the unicorn-world paradigm, some "anomalies" such as the interaction between mind and brain, levels, the explanatory gap, emergence, mental causation, supervenience, and reduction have dominated philosophy of mind in recent decades. The majority of philosophers (including the proponents of identity theory but not the eliminativists) have believed that mental and physical phenomena somehow coexist. Thus, within the unicorn-world, all their efforts were towards “saving the phenomena”. However, nobody offered an alternative to Cartesian dualism until the beginning of the last century. The reason was that within the same old paradigm, it was difficult to create a viable alternative. In one ontological world, it has been impossible to reconcile two ontologically different substances. However, all the approaches from philosophy of mind since Descartes until our day seem to be wrong because they are constructed within the unicorn-world.

Everyone who proposed an alternative account to the relation between mind and body (even those who contradicted Descartes’ dualism – and we have to remember that Spinoza proposed his monism only few decades later than Descartes) has worked more or less within the same conceptual framework. Even if these days almost everyone rejects the dualist approach, there is still an acceptance of the unicorn-world. The Cartesian framework consists in two different substances (*res extensa* and *res cogitans*) together with the subject who uses different mechanisms of observation for observing these substances. The main problem for Descartes has been the unity of mind and body within one individual. What we have here is two substances with contradictory properties, which are unified within the same subject, situated in the unicorn-world. However, some questions could be raised here: Is the subject observing two different ontological substances (Descartes) or two attributes of the same substance (Spinoza)? Moreover, do we need to follow Berkeley and Leibniz (for “intellectualizing the sensible”) or Locke and

Hume (for “sensibilizing the intellectual”- regarding these expression, see Waxman about Kant in Chapter 2) in explaining the relationship between the “I” and the “world”? Is the subject observing a real thing (noumena) or real attributes of the substance or only an appearance (phenomena) (Kant and Bohr) of the thing-in-itself?

The main aim of this book is to replace the “unicorn-world” notion or paradigm with the “epistemologically different worlds” paradigm. I will show that the consequence of the existence of epistemologically different worlds (EDWs) is that the famous mind-body problem is a false problem or a pseudo-problem. Moreover, I will show that the notion of the unicorn-world is the origin of major pseudo-problems in philosophy and science. The conclusion of this thesis is that we need to abandon this paradigm – the “unicorn-world” paradigm– in order to avoid all these pseudo-problems.

According to Kuhn, in the history of human thinking, some deeply entrenched problems have been eliminated by a change of paradigm. However, the most difficult thing is this process of changing a paradigm. If a paradigm that belongs to “normal science” creates paradoxes, puzzles, and “anomalies” that cannot be solved, the accumulation of such anomalies can produce a “revolution”, i.e., the change of a paradigm. The classical example of such change is the Copernican revolution. In order to “save the phenomena”, Ptolemy introduced his epicycles, according to which, during their trajectory around the earth, each planet has rotates around other circles. Copernicus changed Ptolemy’s paradigm concerning the rotation of the planets. The eradication of Ptolemaic epicycles was merely a consequence of changing the paradigm: earth and all other planets from our solar system rotate around the sun. Within the old paradigm, the problems are pseudo-problems that forced thinkers to create, as rationally as possible, certain Ptolemaic epicycles. Regarding the mind-body problem, since Descartes, the main reason for such inevitable rejections has been, of course, the old framework of this problem, the unicorn-world.

In the Chapter 1, I illustrate Descartes' religious and philosophical framework grounded within the unicorn-world. We will see that Descartes was aware of the impossibility of solving the mind-body problem. Evidently, working within the unicorn-world, it was impossible for Descartes to find an alternative to this problem.

In Chapter 2, I analyze in detail Kant's transcendental idealism. I need to do this just because my approach – the "epistemologically different worlds" perspective – is an extended transcendental idealism. I will try to grasp the relation between sensibility and understanding and the role of understanding in constructing the external phenomenal world. Kant's transcendental idealism is generalized to all entities that belong to EDWs by replacing the Kantian role of "understanding" ("conditions of observation") with "conditions of interaction".

In my attempt to reject the unicorn-world framework, in Chapter 3 I try to relate and to develop some elements from the perspectives of Descartes, Spinoza, Kant and Bohr. The aim is to replace this framework with a perspective which shows that the mind-body problem is a pseudo-problem. I continue by introducing a new dimension given by the role of the observer and the conditions of the observation and I look at the role of the observational conditions in grasping mental states or neural patterns of activation. The conditions of observation for a human observer are extended to epistemologically different interactions that constitute epistemologically different entities belonging to epistemologically different worlds. The unicorn-world is replaced with epistemologically different worlds (EDWs). Mental states and neural patterns of activation belong to EDWs. Applying the EDWs perspective, through an extension of the definition of existence I show that the "I" has the same ontological status as every entity from EDWs.

In Chapter 4, I analyze some notions in the philosophy of mind from the EDWs perspective ("levels" reduction" vs. "emergence", the "self", "mental causation" and "supervenience") that are related to the mind-body problem.

In Chapter 5, I apply the EDWs perspective to some key elements (levels of analysis, primitives, processes, structures, threshold, self-organization, bidirectionality, and emergence) that are related to different approaches from cognitive science (computationalism, connectionism and the dynamical systems approach). We will see that these key elements entail certain philosophical distinctions such as continuity-discontinuity, (state of) motion-(state of) rest, variability-stability, part-whole, and "micro-macro". Within this context, I analyze the status of cognitive neuroscience (implicitly, the relationship between neuroscience and psychology). I end this chapter by defining the status of any living entity.

The (anti)metaphysical basis of an alternative to the mind-body solution has to explain the existence of all kinds of entities from the entire "Cosmos". In Chapter 6, I analyze the relationship between my approach and other anti-metaphysical approaches of the last century that try to introduce a new, ontological, notion of the "relativity of the world". I offer an explanation regarding the existence of macro- and micro-entities in EDWs. Consequently, I analyze the relationship between Einstein's theory of relativity and quantum mechanics and some old and new problematic concepts from quantum mechanics. I will show that these notions can be avoided if we replace the unicorn-world with the EDWs. Through the EDWs perspective, I first analyze one philosopher's study (Putnam) about the main interpretations of quantum mechanics. Then I filter through my perspective certain ideas from physicists (Penrose, Young's two-slit experiment, Wheelers' delayed-choice experiment and his idea that human observer "*participates* in deciding whether light is made up of waves or particles", Feynman's "sum over histories" framework, Heisenberg's uncertainty principle, Schrödinger's cat, Deutsch's parallel universes, Zeh's definition about wave function) related to some "mysteries" from quantum mechanics (decoherence and the multiverse approach, superposition of various states of a particle before our measurement or superposition of wave and particle, non-locality, etc.) Finally, I interrogate the relationship between some non-reductive perspectives in physical sciences (Anderson, Morrison, Teller) and the EDWs perspective. I use all these examples to illustrate that, working within the unicorn-world paradigm, the physicists have been forced to invented Ptolemaic epicycles in attempting to solve "infamous" pseudo-problems.

How has it been possible for such a paradigm to frame our thinking for so long a time? The acceptance of this perspective by scientists and philosophers was quite understandable when the theory of Newton was an accepted scientific theory that explained the macroscopic world, that is, until the end of 19th Century. Kant constructed his transcendental idealism as a foundation of Newton's' theory. (Chapter 2) The trouble is, however, that after the introduction of Einstein's theory of relativity and the theory of quantum mechanics at the beginning of 20th Century the error has persisted. Both scientists and philosophers have remained contented with this paradigm for several reasons: (a) The projection of a specific human transcendental characteristic – the singularity of the self or the individuality of each person, the “I” as a single person – onto external space. (Chapter 3) Each human being perceives/conceives her self as single person with one identity. The consequence of this is that each individual searches for the identities of all the external objects in only *one* external space, i.e., one external world. (b) The powerful distinction between epistemology and ontology itself leads us to accept the unicorn-world framework. (Chapter 3) (c) The notion of the threshold (Chapter 3). (d) In explaining the world, the elimination of human subjectivity and especially of intuitions as elements of *constituting* the external world at the end of the 19th and beginning of the 20th Century. (Chapter 6)

Part I
The "epistemologically different worlds" perspective and its background

CHAPTER 1

The Cartesian framework for the mind-body problem

Descartes' dualism constitutes the foundation of one essential route of Western thinking, namely, rationalism. In this section, I present not only Descartes' dualism but also the framework in which the French philosopher elaborated his approach. I claim that the framework in which Descartes created his theory is fundamental for his dualism. Because the first topic of my book is the mind-body problem, I begin my presentation with Descartes' approach and its relation to the unicorn-world.

As is very well known, even Descartes' contemporaries (like Regius, Gassendi, Arnauld, Princess Elisabeth, etc.) criticized his dualist perspective. One of the main problems for Descartes (and he had tried to reply to it) was the union between mind and body. I think that the source of Descartes' error is that he created his dualist approach in the already pre-existent framework of thinking (the unicorn-world perspective). This perspective involves a major error that has produced eternal disputes in philosophy. The attacks on dualism have been continuing in our day (for instance, identity theory, eliminative materialism, anomalous monism, property dualism, epiphenomenalism, etc.).

The first step is the application of the universal framework to Descartes. Then we analyze each member of the equation and the relationships among them. The primitives of Descartes' equation are (1) the subject ("I" as "thinking thing"), (2) two kinds of perceptions, (3) two kinds of substances (on one side God, angels, and mind and on the other side, the body, the animals, and inanimate things), (4) one world and (5) the relationships perceptions-substances, mind-body, "I"-world.

1.1. The Cartesian "I"

For Descartes, the first step is the introduction of the demon hypothesis through which he claims that our knowledge of the existence of all external things and the body is under doubt because it is produced by our senses or by our dreams. (Descartes 1994, Meditation I, 74–5) All the external objects and (parts of our) bodies belong to "corporeal nature in general and its extension". (p. 76) This kind of knowledge that refers to "composite objects" (like those of physics, astronomy, medicine, etc.) has a doubtful character. On the contrary, sciences that deal with simple and general objects – like arithmetic, geometry, etc. – are built on indubitable and certain knowledge. (p. 76) Thus, the second step refers to something that we can know that exists without any doubt, representing the certain and indubitable Archimedean point: the "I". Since "I" is deceived then "I" exists. The conclusion is:

> this proposition (pronunciatum) I am, I exist, is necessarily true each time it is expressed by me, or conceived in my mind. (p. 80)

I mention that this idea appears first in his *Discourse on the Method* and then in *The Meditations*:

> … while I was trying to think everything is false, it must needs be that I, who was thinking this, was something. And observing that this truth "I am thinking, therefore I exist" was so solid and secure that the most extravagant supposition of the skeptics could not overthrow it, I judged that I need not scruple to accept it as the first principle of philosophy

> that I was seeking. (Descartes 1954, pp. 31–32, *Discourse on the Method* part IV, Anscombe and Geach 1954)

In the Second Meditation, after the sentence "I am, I exist; that is certain", Descartes rejects the similarity between "I" and other entities because we cannot know something certain about them. He maintains that:

> I can only judge of things that are known to me: I am conscious that I exist, and I who know that I exist inquire into what I am. It is, however, perfectly certain that the knowledge of my existence, thus precisely taken, is not dependent on things, the existence of which is as yet unknown to me: feign in imagination. (Descartes 1994, p. 82)

As a thinking thing, "I" has different functions (or properties) such of doubting, understanding, denying, willing, sensing and imagination. (Descartes 1994, p.82) "Je pense, donc je suis" (I am thinking, therefore I exist) is "the first principle of the philosophy I was seeking" (Descartes in AT VI, 32; CSM I, 127 in Fowler 1999, p. 63) A human being is defined as a "thinking thing"[1]. But what does Descartes understand by the process of thinking?

> By the term *thought*, I understand everything which we are aware of us happening within us, in so far as we have awareness of it. Hence, thinking is to be identified not merely with understanding, willing and imagining, but also with sensory awareness. (Principles, I, p. 9, AT VII 7; Cottingham, Stoothoff and Murdoch 1984, p. 195)

Descartes' method is vital: the existence of everything is in doubt except "I" as a "thinking thing"[2]. From the certain

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[1] Descartes repreats many times the expression "thinking thing" in the Mediation II.
[2] Cottingham translates the term "thought" as something which I am immediately aware. (Cottingham, 1986, p. 34) However, in one footnote, Anscombe and Geach remark that the definition of "thinking" is blurred. (Descartes 1954, Anscombe and Geach 1954)

existence of "I", we can reconstruct the existence of body and then the existence of all the things in the external world. The next step is the introduction of the body within the equation:

> By *body* I mean whatever is capable of being bounded by some shape, and comprehended by some place, and occupying space in such a way that all other bodies are excluded; moreover, of being perceived by touch, sight, hearing, taste, or smell; (p. 68)

Of course, Descartes' main doctrine is his dualism: mind and body are completely different substances. The final step (p. 71) is because "I" has certain sensations "I" perceives corporeal objects that belong to the external world.

1.2. Clear, distinct and complete perceptions

In Descartes' framework, perception has three features: *clear, distinct, and complete.* Perception presupposes the relation between the subject who is able to perceive and the objects that are perceived. The substance from which the objects are made is taken for granted. In this equation we have three elements: the subject as a perceiver, the mechanisms of perceiving, and the objects (substances) that are perceived. One of the foremost Cartesian ideas is that something exists only if we can perceive that entity clearly and distinctly. From perceiving clearly and distinctly two substances, the mind and the body, we infer the existence of those substances. "These claims about distinct perception are important because Descartes very consciously held the position that *only* clear and distinct perceptions or conceptions will suffice as the basis for positive affirmations about the nature of a thing (see especially *Notes on* *a Programme*, AT VIII 351–2 [CSM I 299], and AT III 215 [CSMK 155].” (Wilson 1998, p. 188)

Again, the Cartesian idea is that mind and body are two distinct substances because we perceive both clearly and distinctly. The role of perceiving clearly and distinctly (to use Descartes’ term) is fundamental because it makes “a connection between thinking and existing”. (Wahl 1998, p. 185) We can now infer that Descartes creates a strong interdependence between epistemology and ontology. Besides, at the beginning of the Third Meditation and Forth Mediation, we can notice that even semantics has a direct relationship with epistemology: “Whatever I perceive very clearly and distinctly is true”. (Third Mediation and Forth Meditation, in Wahl 1998 and Descartes 1954, Anscombe and Geach, p. 76)

The old objection against this idea is its *vicious circularity*: I exist only if I perceive my self clearly and distinctly. But I perceive myself only if I exist. This circle, specified by Arnauld, is available between “I” and external objects too. There is a gap between subjective cognition and objective reality that has been difficult for Descartes to bridge. (Cottingham 1986, p. 245) Therefore, to break this circle Descartes needs to introduce another element in this circle, namely God. The Fourth Meditation proves the existence of God; meanwhile the Fifth Meditation is about the nature of material things and again about God’s existence. In the Sixth Mediation we understand that we perceive material things and ourselves clearly and distinctly just because of God’s willing:

> And I never judged that anything could not be brought about him, except for the reason that it was impossible for me to perceive it distinctly. (AT VII 71; CSM II 50 in Wilson 1998, p. 189)

We can remark that this *vicious circularity* remains even if Descartes tries to avoid it: the existence of God proves the existence of "I" and vice-versa. Nonetheless, Gaukroger shows that Descartes applies the principle of "the essence before the existence" to God. (Gaukroger 2002, p. 73) We can identify something when we grasp the essence of that thing. And Descartes applies this rule to his fundamental substances: God, the mind, and the external world. (Gaukroger 2002, p. 73) The role of God is to guarantee the very clear and distinct perceptions; these perceptions "cannot come from nothingness, but must have God for its author".[3] (Descartes 1954, Forth Meditation, p. 100, Anscombe and Geach) What does clear and distinct perception mean for Descartes? When we use one of our senses (including thinking) we perceive something and to perceive this thing *clearly* means that that object is in front (or inside) of us and this presence has a tangible effect upon us. *Distinct* means that we can distinguish that thing from all other things.

> I call a perception *clear* when, if the mind attends to it, it is present and manifest; just as we say we see clearly what is present to the gaze of our eye and has sufficiently strong and manifest effect upon it. I call a perception *distinct* if it is not only clear but also precisely distinguished from all others, so that it contains no element that is not clear. (Descartes, Principle of Philosophy, I, XLV, p. 190, in *Descartes*, Anscombe and Geach 1954)

There are different types of perception since we can perceive different substances like the mind and the body. For instance, a human being has mental perception and sensory

[3] We will see below the mixture between philosophy and Christian doctrine in Descartes' theory.

perception. The fundamental characteristic of *rationalism* is that sensory perception cannot grasp the real nature of things, the only essential property of matter being extension (Principle, II). We can truly understand even this property, extension, not by sense but only by mental perception. In this sense, mental perception has the major role in justifying the existence of entities, more exactly the essences of entities. To support his idea, Descartes offers the famous example with wax (Second Meditation). We can understand the real nature of wax not through the information received by the senses but only by "purely mental perception". (Descartes, Second Mediation, p. 73, Anscombe and Geach) The essence of this material thing, wax, is its extension in three dimensions that is a geometrical property. "And for an understanding of this we must look not to the senses, but to abstract mathematical reasoning." (Cottingham 1986, p. 80) If God guaranties for us clear and distinct perceptions, we have to apply this principle first to institute the "possible existence of "physical things conceived as the object of pure mathematics'." (Wilson 1998, p. 189)[4]

As I said above, clear and distinct cognitive perception is our guide to reality. God guarantees the veridicality of clear and distinct ideas that offer us information about the world and ourselves and not the veridicality of sensations. (Gaukroger 2002, p. 74) Why does Descartes insist on this idea that represents in truth the crux of rationalism? The main argument is that the human mind and God have the same nature. As a consequence, the mind is an immaterial

[4] "The difference between information offered by sense and mathematical reasoning is made clear by the example between a triangle and a chiliagon that presupposes the difference between imagination and pure understanding." (Descartes, Meditation VI, Anscombe and Geach)

substance. Only through the mind can we understand/perceive the essences of things.

1.3. The two substances and the bi-directional relationship between epistemology and ontology

1.3.1. The epistemological argument

If we already have in Descartes' equation "I" and perceptions what we can say about substances? What does *substance* mean for Descartes? "We can mean by *substance* nothing other than a thing existing in such a manner that it has need of no other thing in order to exist." (Descartes 1954, Principle I, LI, p. 192, Anscombe and Geach) To understand Cartesian dualism, we need to clarify this definition. "I" clearly and distinctly perceives/conceives two substances, mind and brain, one without the other (Descartes 1954, Pr, I, LX, p. 193, Anscombe and Geach 1954) and as we saw above God guarantees our perception. Here is one of the most quoted passages from Descartes in which Wilson identifies the *epistemological argument*:

> Because I know that all that I clearly and distinctly understand can be brought about by God as I understand it, it is enough that I can clearly and distinctly understand one thing apart from another [unam rem absque altera], for me to be certain that one is different from another, because they can be placed apart [seorsim poni] at least by God; and it doesn't matter by which power this is done in order for us to judge them to be different; and thus, from this fact that I know I exist, and that meanwhile I notice nothing else to pertain to my nature or essence, except this alone that I am a thinking thing, I rightly conclude that my essence consists in this one [thing] that I am a thinking thing. And although probably (or rather as I will afterward say, certainly) I have a body, which is very closely conjoined to me, because nevertheless on the one hand I have a clear and distinct idea of myself,

> in so far as I am only a thinking thing, not extended, and on the other hand I have a distinct idea of body, in so far as it is only an extended thing, not thinking, it is certain that I am really distinct from my body and can exist apart from it. (AT VII 78 [CSM II 54] in Wilson 1998, p. 189)[5]

What do we understand from this passage? We can distinguish the following string of ideas: "I" can perceive clearly and distinctly two different substances, the mind and the body; the conjunction of between mind and body (see below) and the relation between the essence and existence. We comprehend again the Cartesian argument as to why the mind is distinct and different from the body: "because they can be placed apart at least by God; and it doesn't matter by which power this is done in order for us to judge them to be different".

We judge those two substances as different substances because God has created this power in us. Even if the "I", as an Archimedean point, is the point of reconstruction of the world, for Descartes, God remains the foundation of his edifice.[6] In fact, God and faith represent for Descartes (of course, before Kant) the leap of human beings beyond their perceptual/conceptual limits.

Each reality has specific properties that represent the essence of that thing. The existence of a particular thing is guaranteed if we understand its essential properties.

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[5] In another passage "I" can perceive only two "realities': "intellectual or mental (cogitativarum) realities, i.e. such as belong to a mind or conscious (cogitaten) substance; and material realities, i.e. such as belong to extended substance, a body." (Descartes 1954, Pr. I, XLVIII, p. 190)

[6] We will see in the last section that even for the unity of mind-body Descartes appeals in the end to God.

(Gaukroger 2002, p. 74) But understanding means perceiving: the subject understands the nature of a thing by clear and distinct perception, intellectual perception, of it. (Descartes, Sixth Mediation, and Wilson 1998, p. 184)[7] As we saw above this is available for understanding the wax. However, for the mind it is a little bit problematic: "we clearly know the existence of the mind, and this means we must somehow already understand its essence clearly".[8] (Gaukroger 2002, p. 74) But even in this case the knowledge of the mind, our mind, is given by its properties and not by its existence.

It is very clearly known through the natural light [of reason] that no properties or qualities belong to nothingness; whenever we perceive some properties or qualities, we must necessarily find a thing or substance to which they belong; and that the more properties or qualities we perceive in the thing or substance, the more clearly we know it. However, it is obvious that we perceive more properties or qualities in the mind than in any other thing, since absolutely nothing can cause us to know something other than our mind, without at the same time bringing us with even more certainty to the knowledge of our mind itself.[9] (AT VII, 359 in Gaukroger 2002, p. 74)

Let us carry on the role played by the "great differences" between the properties of the mind and body that constitute an

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[7] We will see in Chapter 3, that there are essential correlations between the properties of the perceived object and the properties of tools of observation.

[8] Descartes replies to Gassendi: "I am surprised that you should say here that all my considerations about the wax demonstrate distinctly how I exist, but not that I know what I am or what my nature is for the one cannot be demonstrated without the other." (AT VII, 359 in Gaukroger 2002, p. 74)

[9] This argument corresponds to Searle's argument for the rediscovery of mind: we cannot clearly make the distinction between the existence and the appearance of the mind because mind is in this case the perceived object and the perceiver.

argument for their difference in nature. Mind is "wholly" indivisible. In being aware of myself I cannot distinguished any parts within myself. Descartes perceives "myself" or "I" as a single and complete thing. Body is always divisible "in thought". "This would be enough to show me the total difference between mind and body". (Descartes, Second Meditation, 121, Anscombe and Geach or AT VII, 86; CSM II, p. 59) Mind and body are not only distinct but also "defined in mutually exclusive terms".[10] (Cottingham 1986, p. 116) If the main property of the body is its extension, the mind, having the property of thinking, is a non-corporeal thing. We perceive the body and external objects with our sensory systems; they are located in a spatio-temporal framework and, consequently, they are divisible. Meanwhile, the mind has no spatial framework.

1.3.2. Complete things/knowledge

From an epistemological point of view, clear and distinct perception/conception of one thing is not enough to guarantee the existence of that thing apart from others. Wilson shows us the importance of the new distinction between *complete* and i*ncomplete* beings/knowledge, introduced by Descartes in replying to Caterus' first set of objections. (Wilson 1998, pp. 191–2) Descartes' example – a thing that is in motion – reflects this distinction. We can understand the concept of "motion" apart from that of "thing" (*or* vice-versa). This understanding would be an incomplete knowledge of that thing in motion. Nevertheless, we cannot completely understand the motion apart from that thing in motion. On the

[10] Another passage: "We cannot conceive of half of a mind while we can always conceive of half of a body, however small." (AT VII 13; CSM II in Cottingham 1986, p. 117)

contrary, the body is completely understood without the appeal to the mind (*and* vice-versa). (AT VII 120, [CSM II 85–6] in Wilson p. 191)

> But I completely understand what body is [French version: that is to say, I conceive of a body as a complete thing] merely by thinking that it is extended figure, mobile, etc., and denying of it all those things which pertain to the nature of the mind; and vice versa I understand the mind to be a complete thing, that doubts, understand, wills, and so forth, although I deny that any of those things contained in the idea of body are in it. (AT VII 120 [CSM II 85–6] in Wilson 1998, p. 192)

Wilson (Wilson, 1998, part III) emphasizes that to understand the expression "they can be placed apart, at least by God". (AT VII 78 [CSM II 54]) we have to add to the main features of perception /conception as clear and distinct that of *completeness*. (Wilson 1998, p. 192) She presents Arnauld's objection to the distinction between complete and incomplete understanding. Arnauld asks Descartes whether it is possible to exclude the body from the essence of the self even when we have complete and adequate knowledge of the mind. (AT VII [CSM 141] in Wilson 1998, p. 193) As Wilson remarks, Descartes replies to Arnauld (that to presuppose complete knowledge means exhaustive knowledge) by showing the difference between these kinds of knowledge. Complete knowledge means the knowledge that is sufficient for someone to recognize something as a substance. (See the quotation from previous page AT VII 219 [CSM II 154] in Wilson 1998, p. 194) The existence of a particular complete being is given by our complete knowledge about it.

1.3.3. The relationship between ontology and epistemology

Again, we can see the crucial relationship between the epistemology and ontology in Descartes' philosophy. The identification of one thing, and thus its ontological status, is furnished by our capacities for knowledge. If we have a complete knowledge about one thing then we do not need to add more attributes to that thing in order to understand its essence. The essence of a thing represents its ontological status. Thus, our complete knowledge about one thing eliminates all other possibilities for that thing to have a different ontological status. If our object of perception- that is clear and distinct - is just the body *or* the mind then they are completely different things. Thus, they are different substances because we can perceive clearly and distinctly that they have different properties.

We now understand better why mind and body are different substances for Descartes: we have for both things clear, distinct and *complete* knowledge. If the terms "clear" and "distinct" terms refer to the epistemological status of our knowledge, "complete" refers to the ontological status of those known objects. This specific property of knowledge assures a different ontological status for mind and body.

> Mind can be perceived clearly and distinctly, or sufficiently for it to be considered a complete thing, without any of those forms or attributes by which we recognize that body is a substance, *as I think* I have sufficiently shown in the Second meditation; and a body is understood distinctly and as a complete thing without those which pertain to mind. (AT VII 223 [CSM II 157]; emphasis added by Wilson in Wilson 1998/1975, p. 194)

There is a relation of bi-directionality between two elements: we can conceive the mind and the body as complete things and the "mind" and the "body" are defined in "mutually exclusive terms". (Cottingham 1986)

If Kant introduces noumena and leaves space for faith, it seems that Descartes somehow reduces ontology to epistemology. In what sense? God assures the existence of all the objects. But as we saw above, God guarantees the process of clear and distinct perceptions of objects. At the first level[11], avoiding theology and pure metaphysics – mainly because of his scientific research from the beginning of his career[12] – Descartes tries to establish a direct relationship between ontology and epistemology. In this sense, “I” is the first entity that can avoid the action of the demon that deceives us. “I”, as a thinking thing, is the entity that, using mechanisms of perception/conception, can convert one epistemological entity (“I perceive myself”) into one ontological entity (the “I” exists). Then, this epistemological argument is applied for the existence of everything, from mind and God to the body and external world. We can identify the interwoven relationship between epistemology and ontology just by analyzing their definitions. At the epistemological level, *distinct* perception stands for what is “precisely distinguished from all others”. At the ontological level, *substance* means what “it has need of no other thing in order to exist”. These definitions overlap on the expression that indicates the relationship between the thing that is identified and other things. Complete being (at the ontological level) presupposes complete knowledge (at the epistemological level) and vice-versa. The identification of one thing simultaneously implies epistemological and ontological elements. Thus we have a bidirectional relationship between epistemology and ontology.

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[11] For the second level, the role of metaphysical conceptions of substance, see Gaukroger (2002, p. 86).

[12] For Descartes’ original programme and his “rational medicine” in Wilson (2002, Part 1).

In what sense are the properties of mind and body evidently opposite? Descartes emphasizes that the mind is indivisible and the body is divisible. (Descartes, Sixth Meditation) Moreover, in the *Synopsis*, he insists on the difference between the mind and the body. (Fowler 1999, Ch. 8)

> This conclusion is confirmed in the same Meditation [the sixth] by the fact that we cannot understand a body except as being divisible, while by contrast we cannot understand a mind except as being indivisible. For we cannot conceive of half of a mind, while we can always conceive half of a body, however, small; and this leads us to recognize that the nature of mind and body are not only different, but in some way opposite. (AT VII; CSM II 9–10, in Fowler 1999, pp. 274–75)

The opposition between the nature of mind and body is reflected by their opposite properties, materiality and immateriality. (Fowler 1999, p. 276) Thus we are aware of and we understand these properties (that are at the ontological level) only through our capacity of perceiving two substances as clear, distinct and complete things. By these processes of perceiving if we identify two different sets of properties that belong to different entities, then evidently the substances that correspond to those objects exist.

1.4. One world and the relationships between all primitives (the union between mind and body, the "I" and the "world", etc.)

In this section I discuss the most important primitive, the "world", and the relationships among certain primitives. To understand the mind-body relation, we have to clarify the primitive "one world" in the Cartesian equation.

In the introduction, I mentioned a fundamental issue which needs to be noticed: Descartes' approach is grounded in a pre-existing framework (paradigm) which has dominated human thinking during the whole of history, the unicorn-world perspective. I claim that within this framework there is one key element that represents one of the most important errors: the postulation of "*one world*", one single ontological world in which everything has been placed. In fact, there are two factors (psychological and religious) that have shaped this unicorn-world. I presented in the introduction the psychological factor (the projection of a specific human transcendental characteristic onto the external space). The religious argument is for the existence of God. If we believe in his existence then, even if he has no spatiotemporal dimensions, he has to be present in the "whole universe". The power of God implies the existence of only one Cosmos or Universe. God exists everywhere, and this "everywhere" means one Universe.

In Descartes' framework, we can notice another bidirectionality between two primitives: "I" and the "world". As a thinking thing, the "I" perceives/ conceives the self as one and only one entity (being). But at the same time the "I" perceives/ conceives the external world as one world. The nature of our thinking is reflected by this bidirectionality: one being presupposes one world or unique external space.

How do we identify these two entities, the "I" and the world? In the first step we identify "I", the self. This is done by two kinds of perceptions: the mind (and/or consciousness) through introspection, etc., and by visualization, of the body within a spatio-temporal framework. Both concur during individual development. In the second step, during the same development period, we identify, within the same spatio-temporal framework, the external world. The identification of

"I" and the world are two bi-directional processes. The single "I" identifies one external world; in that single world there is only one "I". Essentially, the "I" is in that single world. Later, human beings introduce God(s) within the same world. It is, again, the same single world because God(s) entail(s) localisation; and their localisation takes place in the same single world. The localisation of Gods in Ancient Greece was Mount Olympus; in Christian doctrine, the localization of God is within the same Universe as us. Because the origins of this unicorn-world are mythical and religious, we can straightforwardly find certain religious arguments for this unicorn-world:

(a) If God exists, God is continuously in contact with each of us and he perceives our actions and judges our behavior. Thus he has to be somehow in the same world or universe as us even if he has no spatiotemporal dimensions. Multiple worlds/universes would entail limits to God's existence. If there were multiple ontological worlds, and even if God has no spatiotemporal frame, in what world would God exist? Existence assumes a certain (spatiotemporal or not) location. If God exists, then he necessarily has a location: he is somehow located in this unique world.

(b) In Ptolemy's view, which is followed by Descartes, there are different spheres encapsulated one in other. This world, of course, does not consist of only the world that we can visualise- the first sphere. It includes the part of the world that we conceive, too- i.e., other spheres (the Ptolemaic-Aristotelian model). Nevertheless, not only does Christian doctrine have this image but the majority of religious doctrines, philosophers and scientists throughout the history of human thought have been creating their doctrine/approach/theory within and for explaining one world, the unicorn-world. The main element is the unicorn-world, the unique world or unique Universe in which we have to find everything-from God, angels and "I" to body, animals and inanimate things.

Let now return to Descartes' equation. The Cartesian primitives are *one "I"*, two perceptions/conceptions, two kinds of substances, and *one world. One* human person, being in *one* world, is composed from *two* substances, mind and body. Thus, the question is how is it possible to situate within the same entity two completely different substances? Descartes' main problem is the unity of mind and body. Even if mind and body are separate substances that have opposite properties, their unification is necessary. *It is necessary because of the uniqueness of both the "I" and the world.*

Descartes was aware by the difficulty of the mind-body union. Contemporary thinkers to Descartes, like Regius, Arnaud, Gassendi, Princess Elisabeth, etc., greatly criticized his idea of the union of mind and body. They all detected that the problem has no logical answer. Descartes was trying to justify almost fanatically the union between mind and body. What are then the arguments that generate Descartes' belief? I think there are two lines of argument that support this belief: religious and philosophic arguments.

(a) The religious arguments

As I noted above, both directions (religious and common knowledge) have in common the same point: one world. Descartes was born and elaborated his approach in a period in which Christian doctrine controlled the whole society. It is improper to interpret Cartesian philosophy independently of Christian doctrine.[13] In that period practically nobody asked if

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[13] For a very detailed book on the relation between theology and philosophy in Descartes see Fowler (1999).

God existed or not. The question was only how you can prove God exists, what relation exists between God and human beings, etc. Descartes considers that if human beings have the idea of infinity then God exists. God exists in the same world as us because there is this unique world. As Fowler shows (Fowler 1999), the Christian doctrine from that time makes certain authoritative demands:

– The idea of one person as *ens per se* requires the unity between those two different substances, mind and body. Christian doctrine follows Aristotle's idea that the soul is the form of the body; thus the Platonic view in which *ens per accidens* unity between soul and body is rejected. "The substantial unity of the human soul and body has been formally secured for Catholic doctrine by a decree of the Council of Vienna (1311–1312) which had defined the rational soul as the *forma corporis*." (Fowler 1999, p. 310)[14]

– By the seventeenth century, the Catholic Church asserted that the nature of the human soul is explained by Scriptures and demonstrable by reason. Both theology (with faith) and philosophy (capacity of reason) offer explanations for the soul. (Fowler 1999, pp. 2-3) However, there is only one truth revealed by the text of the Bible and philosophers had to resonate with this theological frame. In this context and sincerely believing in God, Descartes elaborates his theory on the mind-body problem. Following Christian doctrine, Descartes rejects the Platonic view and accepts the main idea that a person is one entity *ens per se.*[15]

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[14] Or the immortality of the soul (Fifth Lateran Council in 1513) and the resurrection of the body (introduced in 1212-2 by Council). (Fowler 1999, p. 311)

[15] For the Cartesian's mind-body union and Christian Doctrine, see Chapters 9 and 10 from Fowler (1999).

(b) The philosophical arguments

How can someone figure the union between two different substances within the same person? Descartes' solution evolves during his controversies with other thinkers such as Regius, Arnauld, Gassendi, and Princess Elisabeth. This development is reflected mainly by the debate between Descartes and Regius. (Fowler 1999)

Regius was a medical student at Utrecht University and a disciple of Descartes. "The most dramatic exchanges" on the mind-body problem with theological implications in 1641–1642 were between Descartes and Regius. (Fowler 1999, p. 314) In the first step, Regius pursues Plato's view that the union between mind and body is *ens per accidens*. Accused of supporting Plato's conception, Regius moves from an "extremely Platonic dualism" to "materialist monism"; with his background in medicine, Regius claims that the mind is a mode of the body. In this way, the unity of the mind and body is assured but the immortality of the soul in a dangerous position. (Fowler 1999, p. 347)

Descartes totally critiqued Regius' position. Regius admitted mind and body as distinct substances; his problem was the union between them. However, Regius' mind-body unity as *ens per accidens* is against Christian doctrine and Descartes' philosophy. Descartes, in a letter to Regius, repeats the ideas from the *Second and Forth Meditations*:

> You agree that thought is an attribute of a substance which contains no extension, and conversely that extension is an attribute of a substance that contains no thought. So you must also agree that thinking substance is distinct from an extended substance. For the only criterion we have enabling us to know that one substance differs from another is that we understand one apart from the other. And God can surely bring about whatever we can clearly understand; the only things that are said to be impossible for God to do are those which involve a

> conceptual contradiction, that is, which are not intelligible. But we clearly understand a thinking substance that is not extended, and an extended substance that does not think, as you agree. So even if God conjoins and unites them as much as he can, he cannot thereby divest himself of his omnipotence and lay down his power of separating them; and hence they remain distinct. (AT III, 567, CSM III, 214 in Fowler 1999, p. 343)

In this paragraph we can see, again, the same ideas that I presented above about the existence of two substances, with opposite properties. We can, once more, comprehend why those substances differ: "we understand them one apart from the other" and God assures the existence of these substances because of this understanding! Furthermore, we can "clearly understand" (using Descartes' words) the shift from epistemology to ontology. The intermediary ingredient between epistemology and ontology is the presence of God. Conceptual contradiction, in which a substance has two opposite properties, is impossible even for God. The nature of our intellect is divine, and thus we are able to understand God's properties. The *epistemological argument* has the following route: we perceive first our mind and its attribute thought; then we perceive, intellectually, the body and external objects. Having the idea of the infinite, the intellect can prove the existence of God. God guarantees the existence of both mind and body and the external objects. Human intellectual logic is our guide to reality because our intellect is divine and God guarantees the reality.[16] Nonetheless, even with this track of reasoning the mind-body union remains still an unsolved problem.

In reply to the objections, Descartes introduces the distinction between a simple and a composite entity. Mind and

[16] We will see in the Chapter 6 that this argument is erroneous.

body are different substances because of their different properties, thought and extension, respectively. A person is a composite entity with two attributes "that we understand one apart from the other". Thus: "That which we regard as having at the same time both extension and thought is a composite entity, namely man." (Descartes in *Notae in Programma Quoddam* [AT VIIIB, 351, CSM I, 299] in Fowler 1999, p. 375)[17] If we perceive separately mind *or* body, then we have complete knowledge of those substances. If we perceive a person as a whole then mind *or* body are incomplete substances. (AT VII, 222; CSM II, 156–57 in Fowler, p. 381)

Christian doctrine demands the union between mind and body. Nevertheless, for everybody (theologian or philosopher) one question remains unsolved: what kind of union can exist between mind and body if both things have completely different properties? Replying to Arnauld, Descartes considers that "the mind is substantially united with the body". Thus there is a substantial union between these two substances. (AT VII, 227–28; CSM II, 160 in Fowler 1999, p. 380)[18] If the pineal gland, as a physical substance, realizes this union then how can we find within the pineal gland the immaterial property of the mind?[19]

The point that I want to highlight is that Descartes was aware of the fact that the union between mind and body is difficult to explain because two contradictory substances have to be located in one entity, the human entity. In this sense, Princess Elisabeth asks Descartes how it is possible for the soul to move the body if there are two different substances. (Elisabeth to Descartes, 6/16 May 1643 [AT, 661 in Fowler 1999, 10.4.8 D

[17] For more details on this topic see Fowler (1999), part 10.4.
[18] It seems that this idea contradicts Cottingham's thesis (see below) that the union between mind and body is an attribute and not a substance.
[19] Gassedi's objections were along this line. (Fowler 1999, pp. 383–86)

and the Princess Elisabeth, pp. 399–406) Descartes replies to Princess Elisabeth that there are three categories or notions: extension, thought, and the union of mind and brain. (Descartes' letters to Elisabeth, 21 May 1643 in Cottingham, 1986, p. 127) The union means the interactions between psychological and physical substances; certain examples of these interactions are sensations and passions. (AT VII 665, K138, Letter to Elisabeth-28 June 1643: At III 691, K 141 in Cottingham, p. 127) In Cottingham's terms, Descartes introduces this triad in order to respond to the phenomena of sensory experience. However, sensation and feeling are not primitive substances but attributes that are irreducible to mind or body. (Cottingham 1986, p. 127) Thus these three primitives are not all three ontological but only attributively categories, i.e. they refer to "a distinct aspect of a thing's nature not to a distinct type of thing." (Cottingham 1986, pp. 130–131)

As Fowler emphasizes in the conclusion of his book, Descartes, preserving a traditional relation between doctrine and philosophy, rejects Regius' alternative of the "double-truth option", i.e., of separating the truth of revelation from the truth of reason. Reaching the stage in which he was aware that the unity between mind and body couldn't be proved scientifically or philosophically, Descartes pronounced, "the union of mind and body is a reality which escapes philosophical discourse." (Descartes to Elisabeth, 21 May 1643 in Fowler, p. 385)

CHAPTER 2

Kant's anti-metaphysics, empirical knowledge and objective reality

I highlight the fact that that my perspective of "Epistemologically Different Worlds" is, somehow, an extension of Kant's transcendental idealism. Therefore, it seems necessary for me to introduce a general view abut Kant's *Critique of Pure Reason* (CPR) and *Prolegomena*. In this chapter, I present certain ideas about Kant's theory from Parvu's theoretical reconstruction of CPR (Parvu 2004) and that of other authors including Friedman, Allison, Brook, Gardner and Waxman.

Let me briefly consider the pre-Kantian period. In that period, philosophers and scientists tried to explain the foundations of nature. Two prominent persons, Newton and Leibniz, had created exciting debates by offering different answers to central questions of that time. They worked in different frameworks.

Newton developed a scientific, inductive method – starting from empirical data and principles – that reflects a skeptical empiricism. However, he believes in non-scientific notions of absolute space and time that are prior to and independent of all objects. Because objects in general are located in space and time, all objects have the properties of these elements like extension and continuity. The interactions between objects are immediate and simultaneous. There is action-at-a-distance that corresponds to gravitational attraction.

Leibniz used a deductive method – from metaphysics and mathematics to empirical data – that mirrors rationalist dogmatism. Within the Leibniz system, reality consists of non-spatial and non-temporal entities, the monads. The monads do not interact with each other, their evolution being produced by internal forces. The appearance of interaction is given by pre-established harmony among the monads, God being the creator of this pre-establish harmony. Rejecting the idea of absolute space and time, Leibniz asserts that the relations among objects create space and time.

Kant starts building his system immediately after Newton elaborated his gravitational theory and Leibniz built his Monadology. Trying to reconcile Leibniz metaphysics with Newton's natural philosophy, Kant begins constructing his transcendental idealism in his *Dissertation.* In *The Critique of Pure Reason,* Kant tries to offer the foundations of Newton's theory of gravitation and mathematics (Euclidean geometry and arithmetic). He asks three intimately interrelated questions (that appear in Prolegomena and CPR): "How is metaphysics in general possible?", "How is pure mathematics possible?" and "How is pure natural science possible?" The first question asks not if metaphysics is possible but how it is possible. However, Kant needs to change the definition of metaphysics. As a science, metaphysics needs to be strongly related to human cognition and experience (empirical knowledge). He rejects transcendent metaphysics and replaces it with "transcendental metaphysics" or more specifically with "transcendental ontology". The role of this new kind of metaphysics is to analyze our intellectual abilities and certain elements of reasoning that are a priori and contribute to the constitution of external and internal objects. As we shall see below, the synthetic a priori and necessary judgments make mathematics and physics possible as disciplines that explain the structure of reality.

Speculative or transcendent metaphysics is eliminated since judgments about nature that is beyond our experience have no objective reality. As we see below, experience is given by the interactions between the things-in-themselves and our sensorial and intellectual mechanics. You can know an object only when you access it directly by experience. Thus, metaphysics has to deal only with objects that we can know; it is about the so-called *metaphysics of experience.*[1]

Kantian transcendental idealism is of course different from other approaches like Locke's empiricism, Berkeley's idealism and Descartes' rationalism. However, Kant borrows certain elements from each important approach in constructing a new one. For explaining reality or empirical objects, Locke focuses on sensorial data, Berkeley emphasizes the content of mental states, and Descartes accentuates the role of ideas. In the pre-Kantian period, philosophers believed that we could acquire knowledge about the real nature or real external objects.

Kant generates the *Copernican revolution* in philosophy. Changing the pre-Copernican perspective, he claims that objects (internal and external) conform to our modes of cognition in our process of knowing them. This means that the subject *constitutes* the objects.[2] (See Friedman 1992; Parvu 2004) It does not mean that the external objects do not exist at all.[3]

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[1] The title of Paton's book is *Kant's Metaphysics of Experience*, in Allison (1983, p. 174) and Gardner mentions this expression in his introductory book on Kant. (Gardner 1999, p. 24)

[2] In the preface to the second edition Kant writes that the fundamental law of motions (Newtonian attraction) that holds the universe together "would remain undiscoverd if Copernicus had not dared, in a manner contradictory of the senses, but yet true, to seek the observed moments, not in the heavenly bodies, but in the spectator." He makes a parallel between this position and his view from the *Critique*. (Kant 1958, p. 25)

[3] Berkley's idealism reduces the existence of external things to our mental states.

While they exist, we cannot know them "as they are" but only "as they appear to us" and this is because of the *conditions of experience*[4] that are *a priori* in relation to the objects. The notion of "conditions of experience" is equivalent to that of "transcendental". (Parvu 2004, 51) Any knowledge presupposes certain conditions of experience. Thus, what we can know are phenomena but not noumena or things-in-themselves. The limits of our knowledge are identical to the limits of our experience: "what can be known is what can be experienced, and what cannot be experienced cannot be known." (Gardner 1999, p. 24) Thus, the traditional distinction between ontology and epistemology is again blurred.[5] (Gardner 1999, p. 39)

In order to avoid Humean scepticism, Kant offers serious arguments for the *objective reality*[6] of our knowledge. The phenomena, as constituted by the subject, have objective reality. The objects are objects of our experience, but the conditions of experience – pure intuitions of space and time and categories – offer us the objective reality of our knowledge. If we accept the noumena-phenomena distinction, then the conditions of our experience provide our knowledge with objective reality. This notion of objectivity takes for granted the human subjectivity given by our *conditions of experience*. Following Descartes on this point, Kant reduces ontology to epistemology. The world that we can perceive and with which we interact directly is our world and not the world-in-itself. The interaction between our pure forms of intuitions, categories and noumena produce phenomena or appearances.

[4] This is the title of Parvu's book about Kant.

[5] As I presented in Chapter 1, Descartes is the pioneer of this movement.

[6] The distinction between objective validity (that refers to the truth-value of judgments) and objective reality (that refers real objects) is well known. (Or Caimi's distinction between "formal objects" and "real objects". Caimi, p. 61 in Parvu 2004, p. 398)

Due to the a priori intuitions (space and time) of sensibility and to the categories of understanding, human beings cannot access noumena (things-in-themselves). These forms structure the external or internal raw material. Evidently, "objects that conform to our mode of cognition are exclusively objects of sense experience." (Gardner 1999, p. 44) Thus, the distinction between appearances and things-in-themselves corresponds to the distinction between the metaphysics of experience and transcendent metaphysics. Pure intuitions applied to things-in-themselves produce empirical intuitions. The subject interacts with the things-in-themselves. From their interaction, we have the appearances that involve the empirical synthesis in imagination that is possible due to the synthetic unity offered by pure forms of space and time. For us these are the appearances. Even if the synthetic unity of pure intuitions is necessary for our appearances, because pure intuitions are imperceptible, the appearances have no determination (Waxman 1995, p. 851) or empirical objectivity in respect of time and space. (Waxman, p. 848) If the appearances do not occupy or contain any space and time, they cannot be an object of cognition. They do not conform to the original synthetic unity, which means they cannot be accompanied by the "I think". The manifold of appearance is just a kind of associated perception in "Humean style bundle by imagination" (Waxman 1995, p. 856) but not fixed existence within space and time. The manifold of such appearance needs a coherence or necessity (affinity) (Waxman, p. 856) offered only by the schemata. For instance, we have a successive apprehension (associate perceptions) of a tree but it lacks this unity of reflection on appearances; they do not have determinations with respect to space and time (p. 851) and ordering predicated on existence. (Waxman, p. 854) We can construct only judgments of perception.

Following Friedman, the application of understanding to intuitions represents the *transcendental apperception*. (Friedman 1992) Pure intuitions and categories are *applied* to the external manifold creating the objects of experience, i.e., empirical objects. The philosophy that analyzes the conditions of experience is called "transcendental philosophy".

> I entitle transcendental all knowledge which is occupied not so much with objects as with the mode of our knowledge of objects in so far as this mode is to be possible a priori. (A11–12/B25)

However, for Brook, transcendental apperception represents "the ability to tie together 'all appearances' together into 'one experience'". (Brook 1994, p. 133) Brook quotes a passage from CPR:

> This transcendental unity of apperception forms out of all possible appearances, which can stand alongside one another in one experience, a connection of all these representations according to laws. (A108)

In fact we can find in Brook's book another passage from Kant in which transcendental apperception is related with the unity of consciousness: "This pure original unchangeable consciousness I shall name *transcendental apperception*". (A107) Thus, Brook claims that transcendental apperception represents both a unified recognition ability and the unity of consciousness. (Brook 1994, p. 137) As we see below, recognition implies synthesis of recognition in a concept. However, for all the processes we have to include the subject.[7] (See below)

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[7] I mention from the beginning one of the main ideas of Brook. He underlines the main mistake made by those who try to explain mind: they fail to include the subject in the equation. "In Fodor or Pylyshyn, for example, the mind as a whole is nothing beyond an assembly of representations; they say little or nothing about synthesis, unity, or representations of self, certainly nothing to

For my approach, there is an essential notion from Kant's CRP that I have to explain it in detail. Before presenting the table of categories, Kant defines the essential notion of *synthesis* (A77/B103) which, when associated with other elements, appears under different definitions. Synthesis is similar to the above definition of functional unity: it is the act of putting the manifold of something (intuitions or representations) together. Regarding the representation, to put together different representations in one representation means to grasp their manifold in one act of knowledge. As Brook writes, synthesis is a) the combination of different elements into a unified representation and b) the combination of representations and their objects into one item of knowledge. There are three kinds of synthesis: synthesis of apprehension (locating something in space and time), synthesis of reproduction (associating a series of representations) and synthesis of recognition in a concept (unification of different characteristics of a representation or different representations under a concept). (Brook 1994, p. 35) We have to preserve this idea that synthesis unifies the manifold of intuitions and representations; this is the first process that gives rise to knowledge. Then to what do these representations refer? They can refer to different individual objects that have to be synthesized in "one experience"; moreover, all these representations of "one experience" belong to the single common subject. Thus everything must be synthesized! "We must synthesize if we are to recognize anything as synthesized (even space and time)" (Letter of July 1, 1797, Ak. XI: 514 in Brook 1994, p. 122) Synthesis is a transcendental process that belongs to

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match the sophistication of their accounts of mental contents and functons. The leading alternatives to representational realism such as Dennett's or the Churchlands' do no better. On the mind as a whole, Kant still as things to teach us." (Brook 1994, p. 209) the subject. If knowledge has two aspects, the forms and the content, then synthesis (i.e., the process of unifying the manifold) creates the content to which the forms are applied. Kantian distinction between pure and empirical is applied to synthesis, too: it is pure when the manifold is given *a priori*. When the manifold is given empirically, we have empirical synthesis.

2.1. Transcendental deduction

In this section, even if I roughly present Kant's transcendental deduction, I emphasize certain Kantian ideas and concepts that I will apply later to the "perspective of the observer" in Chapter 3. We have to consider two things for understanding the transcendental deduction:

a) In general, each notion has two meanings, pure and empirical.
b) The main point for Kant is to determine the *conditions of possible experience.*

Again, these distinctions are transcendental ones. As I noticed above, it is without sense to check for empirical elements corresponding to these notions.

I will show below the general frame of Parvu's theoretical reconstruction of CPR, and will try to insert the ideas of other authors about Transcendental Deduction within his framework. The title of Parvu's book expresses his main Kantian topic: *the possibility of experience*. This book is not a presentation of certain Kantian ideas (from CRP and *Prolegomena*) but instead, is a theoretical reconstruction of Kant's theory in a structuralist framework. In this sense, the CPR is seen as a "theory"; the CPR is about a "theoretical form" of a "new science" proposed by Kant. (Parvu 2004, p. 6) Kant's theory is reconstructed within a framework offered by the structuralist approach (meta-theoretical approach) that has been usually applied to scientific theories (J.D. Sneed, W. Stegmueller, C.U. Moulines, W. Balzer, etc.).[8] Kant's theory from CPR (with its elements: the pure intuitions and categories, the schematism and the principles of the Analytic of Intellect) is projected onto a structuralist meta-theory. One paragraph from CPR that appears four times in Parvu's book reveals his main framework:

> We then assert that the conditions of the *possibility of experience* in general are likewise conditions of the *possibility of the objects of experience*, and that for this reason they have objective validity in a synthetic *a priori* judgment. (Kant A157/B197 in Parvu 2004, pp. 17, 153, 407, 410)

Let me introduce the general scheme of Parvu's interpretation.[9] In order to apply structuralism, Parvu needs to consider that the CPR is a kind of theory-frame. The main concept in such a frame is the "structure of the theory". Kant's theory is both a philosophical and scientific. Its structure is given by the conditions of possible experience that cannot be projected directly (either inductively or deductively) over a *determinate* experience. (Parvu, p. 48) The theory-nucleus (core) is category-theory and transcendental principles that rationally reconstruct the world and cognitive experience. The main concept is "transcendental conditions" or "conditions of possible experience" that reflect, at the same time, the possibility of cognition and possibility of experience. The transcendental methodology includes the transcendental exposition of pure forms of intuition, transcendental deduction of categories and transcendental proof of principles. (p. 49) Parvu analyzes the Kantian notion of "transcendental" that seems to be equivalent

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[8] I will not introduce this approach in detail but try to extract some ideas and notions that are useful for my approach.
[9] This general scheme is a summary from Parvu's introduction to his book.

to “conditions of possibility”. (p. 51) The supreme principle of transcendental philosophy is transcendental apperception with its synthetic function. “This represents the pure structural form of the transcendental.” (p. 55) Parvu considers that the CPR is a structural-abstract theory. It is about a structural theory of possibility, because such structure entails the conditions of possible experience. Essentially, it is the idea that the structure of a theory is not directly projected to a particular determinate experience. (Parvu 2004, p. 48) The nucleus of the Kantian program is the transcendental categorical theory that is a frame-theory of a project of rational reconstruction of both world and cognitive experience. (Parvu 2004, p. 48) The transcendental apperception with its synthetic function represents the structural pure form of the transcendental. The structures are ontologically primordial and they generate the events and entities in the world. (Weinert 1995, p. 49 in Parvu 2004, p. 57) As an abstract-structural theory, the frame-theory of CPR is just a theoretical matrix that determines a structure of possibility (a set of possible models in the structuralist approach). This theory is “a formal one in a structural sense, a science of which the object is determined immanent through structural constraints or conditions (“the form of law-likeness in general”) and because of this it contains an immanent ontological project.” (Parvu, 61)

The “conditions of possibility” notion appears at two levels, mathematical and physical:

1) Axioms of intuition and anticipations of perception are the conditions of application of mathematics to experience determining the possibility of different mathematical formalization of physical laws. (Parvu 2004, p. 67)

2) The Analogies of experience, i.e. the transcendental laws of nature, are – as a whole – the determinative matrix (i.e. the structure of possibility) for special laws. It is not only the possibility, but mainly the structure of possibility that offers us

the “transcendental laws of nature” (Kantian expression) which are the foundation of the entire Newtonian theoretical system. The principle of the Analytics of intellect or the principle of “conditions of possibility”, which appears in both “modules” of Transcendental Analytics, the theory of categories and principles, synthesizes the action of the elements of structure. The structure of possibility is actualized by special laws. (Parvu 2004, p. 63) The transcendental program means the conditions of possibility of the *constitutive* relationship between pure representations and reality.

Kant’s theory is beyond the eternal debates between empiricism and rationalism because in his theory both elements are strongly related: the conditions of possibility (abstract-theoretical) and the experience (empirical). Pushing further Heidegger’s interpretation of CPR, Parvu reconstructs one of Kant’s main ideas, that is, searching for the conditions of possibility, the theoretical structure of the CRP’s frame-theory is *ontologically loaded*. The possibility of experience becomes actual, real in interaction with noumena. Kant’s theory establishes the structure of experience, it constitutes “the form of any possible knowledge” (Pippin 1982, p. 13 in Parvu 2004, p. 264)

With this frame of Parvu’s interpretation of CRP, let us return to Kant’s transcendental deduction. In the first edition, the general framework of deduction contains three notions[10]: *intuition* that belongs to sensibility (the notion is analyzed in the *Aesthetic*), *imagination*, and *categories* that belong to apperception. Applying Kantian distinction between pure and empirical we have: pure and empirical intuitions (as we saw above), pure and empirical imagination, and pure and empirical apperceptions. All these elements are interrelated or overlapping

[10] I always use “term” or “notion” for indicating the Kantian terms; I avoid the term “concept” because it is one of the main Kantian terms.

with (pure and empirical) consciousness and (pure and empirical) understanding. At (A95), Kant prepares the framework for these three elements, "the original sources" or "the *conditions of the possibility* of all experience", sense, imagination and apperception. Each element corresponds to a particular process: the synopsis of the manifold *a priori* through sense; the synthesis of this manifold through imagination; and the unity of this synthesis through the *a priori* apperception (A115).

In the second edition[11] the main notion is "*the original synthetic unity of apperception*" (*the OSUA)* (16&17) related to self-consciousness (18). Applying Kantian distinction between pure and empirical to the apperception we have:

a) OSUA or pure (transcendental) apperception, or the *transcendental condition of experience*. More important for me is that transcendental apperception is related to the "recognition of the identity of the 'I think' that accompanies diverse representations". (Allison 1983, 274)

b) Empirical apperception or ordinary introspection (Allison 1983, p. 274) or the problematic identification with inner sense (see Allison, p. 273).

The OSUA is one of our *a priori* faculties that belong to understanding and not to sensibility. It is an act of spontaneity and not an act of receptivity (B132). What does Kant more exactly mean by OSUA? Each normal human being is always in contact with the surrounding environment and this relationship generates certain representations in our mind. In normal conditions (when we are not sleeping, etc.), we are aware of some of these representations. In this case, it means that *it has to be possible* for the representation "I think" to accompany all my representations (B132). "I think" accompanies with certainty

[11] In this presentation, I follow the second edition of the Transcendental Deduction.

those representations—for example, the representation Y—that I am conscious or aware at one moment. This means that I can think in one moment "In this moment I think that Y". My opinion is that if we change the point of view, OSUA is strong related to the unity of self-consciousness that can generate this representation "I think".

> The unity of this apperception I likewise entitle the transcendental unity of self-consciousness, in order to indicate the possibility of a priori knowledge arising from it. (B133)

All the representations are "*my*" representations because they belong to my self-consciousness and it is *possible* for "I think" to accompany them. In fact, the unity of apperception presupposes the unity of the self. Thinking requires this unity. Without this unity, we would not be able even to think. In consequence, the OSUA includes the process of unification of all my representations in one consciousness, *my* consciousness and the aptitude that represents the possibility of "I think" to accompany all "my" representations. In this case, synthesis is the process of unifying the manifold of representations.[12] However, for understanding what the "I think" means, we have to clarify the analytic unity of apperception and its logical functions. Because of the synthetic unity of pure forms of sensibility (space and time), the analytic unity of apperception is possible. The ground of analytic unity is the synthetic unity of apperception (pure intuition). (Waxman, 1995, p. 853) However, at this stage, there are only judgments of perception but not yet judgments of experience. The "I think" is the "logical act in terms of form without content" (Waxman 1995, p. 843) or it is

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[12] Allison points out that the "apperception involves the actual consciousness of an identical 'I think'", i.e., the role of this thought "I think" is to unify different representations in a single consciousness. (Allison 1983, p. 142)

"as analytic unity of apperception, (…) a concept of which synthetic unity of pure intuition is object" (p. 850) but not the concept through which the objects appear to us in experience (p. 843). The analytic unity of apperception requires pure intuitions.

> Analytic unity … is a concept of pure intuition irrespective of its particular character (space, time, and so forth). Hence any synthesis of perceptions (the real of appearances) subjected to the categories would thereby be brought into agreement with conditions for an I think; and since this is just to say that such a synthesis would produce synthetic unity of manifold, it would indeed be a proper surrogate, or exponent, for synthetic unitary pure intuition (space and time). (Waxman 1995, p. 849)

A concept is a synthesis, and therefore the "I think" functions as a rule of synthesis for the manifold. Do we have too many syntheses here, one from pure intuitions and one from the "I think"? Not at all; we have to remember that such syntheses (and others) are transcendental. Through its logical functions, the "I think" extends its own identity to the appearances. (Waxman 1995, p. 850) It expands the "scope of synthetic unity" (p. 850) or, in other words, the analytic unity of apperception "introduce[s] the missing unity into the real of appearances" (p. 852). Otherwise, "the pure intuition alone, would lack it, and so be uncognizable by me". (p. 850) In this sense, the appearances have no determination with respect to space and time, i.e. they lack determinate existence in space and time. (Waxman 1995, p. 851) They have a spatio-temporal structure but not a fixed existence within a spatio-temporal framework.

Logical functions are rules of synthesis of imagination that produce the universals but "they also subject it to conditions of that special unity characteristic of the individuality of pure intuition (space and time)". (Waxman 1995, p. 853) The "I think" accompanies all my representations. "The analytic unity of apperception is a representation of the thinker's own identity in relation to all the representation of his sensibility." (Waxman, p. 826) One's own identity in relation with all representations is self-consciousness, which is the same thing as the capacity for universal representation (concepts). This is the analytic unity of apperception that "ha[s] one and the same condition of possibility: the original *a priori* synthetic unity of the manifold in one consciousness." (Waxman, p. 827)

Applying Kantian distinction between pure and empirical once again, we have pure and empirical consciousness.[13] The former means the *possibility* to be conscious of certain representations that offer us our identity; the latter accompanies not only those representations that I am aware of but also *conjoins* them, the individual being conscious of this synthesis (B134). It represents the empirical apperception.

What then is the relationship between "I think" and "my representations"? This relationship requires the identity of apperception. (Allison 1983, pp. 138–9) For being aware of a set of discrete representations during one interval of time, the possibility of becoming conscious of its own identity is necessary for the subject.[14] (B138)

> We are conscious *a priori* of the complete identity of the self in the respect of all representations which can ever belong to our

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[13] Kant makes an analogy between the application of Kantian distinction between pure and empirical to consciouness and intuitions: "the empirical consciousness of a given manifold in a single intuition is subject to a pure self-consciousness *a priori*, just as is empirical intuition to a pure sensibile intuition, which likewise takes place *a priori*." (B144)

[14] We have here again the Cartesian "I". "So construed, the argument posits a kind of Cartesian consciousness of our numerical identity as a necessary condition of knoweldege." (Allison 1983, p. 140) We will see below more details about numerical identity and personal identity.

> knowledge, as being a necessary condition of the possibility of all representations. (A 116)

We have to take into account again that the distinction between OSUA and the identity of the subject is a transcendental one. I am aware of my identity, i.e., of "I" that thinks, only by being aware of my representations. (Again see B133 from above.) Nevertheless, at the same time, "apperception can be said to be impossible apart from the consciousness of synthesis." (Allison 1983, p. 143)

However, following Allison (1983, p. 155), we have to analyze the difference between unity of consciousness (subjective unity) and unity of self-consciousness (objective unity). The unity of self-consciousness is objective because it offers us the identity of "I think" and a thought is implied but not an "empirical knowledge through inner sense of the 'me'". (Allison 1983, p. 125) The former, the unity of consciousness, is subjective because as a determination of inner sense it is non-objective and non-representational. (Allison 1983, p. 156) The order of occurrence in inner sense is equivalent to the order of *association* that it is not necessarily and universally valid. (B140) For Brook, a representation that is located with others in one self-consciousness is equivalent to the fact that this representation is accompanied with "I think". (Brook 1994, pp. 217–8)

The OSUA is the most important principle in the Kantian system (B135; B136) because it puts together the relations between intuitions and categories within one consciousness, the self. As I said above, while there are other notions that are equivalent to this term, their definitions are different because they are given from different points of view. This principle – OSUA – is a kind of function that is the foundation of the unity of rational functions that is assumed by categories. In this sense, categories are functions that realize the synthesis of phenomenal manifold for constitution of possible experience and the possibility of objects of experience. (Parvu 2004, p. 108)

I am interested mostly in the Kantian notion of "*application*" related to *empirical knowledge* and its *objective reality, and the relationship between self and all "my representations"*.[15] Understanding is the faculty of knowledge of external or internal objects. An object corresponds to certain representations of our mind. The unity of consciousness unifies these representations. In this sense, the *objective validity* of these representations rests on the unity of consciousness, i.e., the OSUA (B137). More precisely, the OSUA is "an objective condition for all knowledge" (B138). The OSUA involves the categories and thus we can acquire *objective knowledge* only through the application of categories to the manifold of intuitions.

For Kant, one of the main epistemological questions is "How do we know an external object"? It is essential to specify again that such experience implies only empirical knowledge. The knowledge of an object requires pure intuitions and OSUA with its categories (and/or the unity of consciousness). These are the principles of our knowledge, i.e., the conditions of our experience. Even the mathematical concepts are knowledge only if we consider them as objects that conform to pure intuitions (B147).

> … with the aid of [pure] intuition, the categories do not afford us any knowledge of things; they do so only through their possible application to empirical intuition. … they serve only for the possibility of empirical knowledge; and such knowledge is what we entitle experience. (B148)

[15] There is no special section dedicated to these notions; they appear thourghout the whole chapter. I extend these notions to the "epistemologically different worlds" perspective.

Taking into account that experience means *empirical knowledge*, the relationship between intuition and concept, i.e. the interdependence between sensibility and understanding, is essential. Here is one of the most quoted paragraphs from Kant's *Critique of Pure Reason*:

> Without sensibility no object would be given to us, without understanding no object would be thought. Thoughts without content are empty, intuitions without concepts are blind. It is, therefore, just necessary to make our concepts sensible, that is, to add the object to them in intuition, as to make our intuitions intelligible, that is, to bring them under concepts. (A 51/B75)[16]

We can conclude here that the objective reality – that presupposes the unity of self-consciousness, the categories, and the application of categories to the manifold offered by intuitions – is available only for empirical knowledge (experience). However, the understanding of internal or external objects (i.e. the application of categories and intuitions to raw material) is represented by the power of judgment. Allison wrote that the experience consists not only in receiving sensorial data but also in judgments. Thus, an object of possible experience is correlated to a judgment of experience. (Allison, pp. 118–9 and Parvu, pp. 345–51) In this context, Allison discusses the cryptic passage A79/B104–105, in which Kant claims that the same function offers unity to a), some representations or logical form of concepts in one judgment and b), synthesis of manifold in one intuition.

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[16] In CPR there are numerous paragraphs in which Kant directly expreses the same idea of the application of categories to intuitions. (A few examples are A51, B75; B147; section 22 and 24; A239/B298; A240/B299; A241/B300; B306; A254/B309; A258/B314; B407)

2.2. The role of original synthetic unity of apperception for internal and external objects

In this section I want to analyze the relationship between OSUA and the knowledge of representations that correspond to external objects. Again, I strongly emphasize that Kant is interested mainly in the *conditions of experience*, i.e., the conditions of empirical knowledge. Moreover, we have to take into account that the Kantian distinction between noumena and phenomena is available for both external and internal objects even if the knowledge has *objective reality* only when the *a priori* conditions of experience are applied to external objects.

Through pure intuitions, external objects produce empirical intuitions and the OSUA is applied to this manifold of sensible intuitions. In this case, related to the OSUA is the "*figurative synthesis*"[17] (B151)) or the *"transcendental synthesis of imagination"*. This notion creates the relationship between sensibility and understanding in the following sense. On one side, being the capacity to represent an (empirical) object in its absence (B151), the imagination belongs to intuition. Through transcendental synthesis of imagination, space and time *are determined*. Through imagination we are able to represent the past, present and future time or successive parts in drawing a line in space. On the other side, this synthesis applied to the intuitions is an act of spontaneity (called by Kant "productive imagination"[18]), and thus it belongs to understanding that contains the categories. The possibility of

[17] Kant makes the distinction between this synthesis (figurative) and intellectual synthesis that is realized by understanding without any intuition. (B152)

[18] In opposition to productive imagination is reproductive imagination that has an empirical synthesis, the association.

categories *to determine* the sensibility is *a priori.*[19] According to Waxman, the appearances have to conform to the pure intuitions of space and time, but because these intuitions are imperceptible, the appearances are devoid of determinate existence in space and time. The categories insert the space and time necessary for the appearances to become objects of experience.[20] (Waxman 1995, p. 814)

These two notions are unified in one expression, "transcendental synthesis of imagination", which represents the relationship between understanding and sensible intuitions. The meaning of this notion is similar to that of transcendental apperception or figurative synthesis and thus we can say that these terms represent "an action of understanding on sensibility and the first application of the understanding (at the same time the ground of all the rest) to objects of our possible intuitions." (B151–152) Therefore, transcendental apperception entails the interdependence between pure intuitions and categories and their application to objects of experience.

However, we have to acknowledge the distinction between the synthesis of *apperception* (that is intellectual and belongs to the categories – see footnote B162) and the synthesis of *apprehension* (that is empirical and must conform to the synthesis of apperception).

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[19] The titles of section 22 and 24 reflect this idea: "The Category as no other Application in Knowledge than to Objects of Experience" (22); "The Application of the Categories of the Senses in General" (24). I emphasize an essential point of view here. The understanding determines the sensibility. However, as we see below, the understanding depends on sensibility too, and thus there is a transcendental bidirectionality of dependence (i.e. an epistemological bidirectionality of interdependence) between understanding and sensibility. This bidirectionality is just transcendental and not empirical. (See Kant's footnote from B161b)

[20] In a footnote, Waxman writes that "Kant's Copernican experiment makes the trancendental understanding itself the foundation of all order and coherence in appearance; CPR, Bxvi-xvii". (Waxman 1995, p. 814)

> … by synthesis of apprehension I understand that combination of the manifold in an empirical intuition, whereby perception, that is, empirical consciousness of the intuition (as appearance) is possible. (B160)

Empirical knowledge of external objects involves certain elements: pure intuitions and OSUA (that presupposes the categories), the external material (the manifold operated by intuitions and categories), the empirical intuitions and synthesis of apprehension, i.e., the applications of the pure elements to the noumena. Again this distinction is a transcendental one. However, objective reality is guaranteed by synthesis of apperception through the categories.

Kant has to answer one question that would immediately arise: where do the processes generated by OSUA take place? Evidently they occur within one subject. Thus Kant moves forward and establishes a kind of transcendental correspondence between OSUA and synthetic unity of self-consciousness. The last notion represents the "condition under which every intuition must stand in order *to become an object for me"*.[21] (B138) The above correspondence is given by the *synthesis* because this process unifies, at different levels, the manifold of intuition in one and the same consciousness of a subject. With this idea, we return to the relationship between OSUA, self-consciousness and all "my" representations.

> Now all unification of representations demands unity of consciousness in the synthesis of them. Consequently it is the unity of consciousness that alone constitutes the relation of representations to an object, and therefore their objective validity and the fact that they are modes of knowledge. (B137)

[21] This expression "to become an object for me" reflects again Kant's interest only in empirical knowledge, as mentioned above.

In fact, the unity of self-consciousness "is a necessary condition for the representation of an object." (Allison 1983, 146) At the same time, apperception needs the representation of objects. Thus, there is bidirectionality between these two terms (or what Allison calls the "reciprocity thesis"). (Allison 1983, p. 144)

2.3. The schematism

It is believed that the schematism is the third thing that makes possible the application of categories to the appearances. (A138/B177) However, Waxman considers that there are three "false paths" in attempting to create the relationship between understanding and sensibility: transcendental schematism, pure imagination and pure space and time. (Waxman 1995, pp. 816–25) Because the categories and the intuitions are completely different notions, in order to unify them, it is necessary for there to be a third element that has to be homogeneous with both. (I emphasize again the same idea that Kant is interested mainly in explaining what mechanisms are necessary for human beings to acquire empirical knowledge.) The schematism unifies sensibility with understanding because the "sensible conditions under which alone pure concepts of the understanding can be employed." (A136/B175) Through comparison, reflection and abstraction, the "I think" constructs the universals, the empirical concepts that constrain and control the imagination (with its synthesizing). In this way, the schemata (universal procedures of synthesis) are produced. (Waxman 1995, p. 854) These schemata exhibit and govern an empirical concept. Logical functions, as rules for synthetic operations of imagination produce the universals and, in this way, we have schemata (universal procedures of synthesis). However, these schemata cannot be directly subordinate to logical functions, but only via empirical concepts. A concept subordinates to logical functions, i.e., to analytic unity. Logical functions act as principles of synthetic unity constituting the phenomena. In this way, the heterogeneity (amphiboly) between intuitions and concepts is avoided. Schemata and all the synthesis must satisfy the conditions for synthetic unity of apperception. (Waxman 1995) Allison emphasises, that "pure concepts have 'logical use' (as logical function of judgment), but not a 'real use', that is, an application to 'real' objects." (Allison 1983, p. 174)

The transcendental determination of time is homogeneous with both empirical intuition and categories. (A139/B178) Why does time create the relationship between intuitions and categories? It is because it is present in the processes that include intuitions, categories and the self. However, both intuitions represent the formal conditions of sensibility; they are the universal conditions "under which alone the category can be applied to any object." (A140/B179) The empirical faculty of reproductive imagination generates the image of an object. The *schema*, that is the product of *a priori* imagination, makes the connection between that image and its corresponding concept. Kant makes a clear distinction between two things: "the lower cognitive power is characterized by the passivity of inner sense of sensations; the higher, by the spontaneity of apperception". (An Ak. VII: 140–1 in Brook 1994, p. 104) The schemata determine the projection of the abstract structure of categorical operators to the structure of phenomena (objects of possible experience). (Parvu, 2004, p. 152) For mathematical concepts, the scheme determines "our pure sensible concepts"; the construction of images produces these concepts. (Parvu, 150)

Transcendental cognition deals with our *mode of cognition* of objects – that has to be *a priori* – and not with the objects. As we saw above, this means that intuitions are applied to the objects of experience. I think that it is not the knowledge of those objects that is *a priori* but the intuitions, the categories and the *possibility of their applications*[22] to the objects of experience. The antecedent element to the application is the *possibility* offered by *a priori* knowledge (intuitions and concepts) to empirical knowledge. The relation between pure intuition and objects is given by the empirical intuition. Pure intuition and concepts lead to *schemata* and *transcendental apperception,* while empirical intuition and objects lead to *particular images*. Schemata are used for the proof of the universality of geometry. (Friedman 1992, p. 89)

To explain the relationship among categories, intuitions and phenomenal objects, Parvu analyzes the paragraph A245–246. He highlights the fact that this paragraph appears just before the chapter "The ground of the distinction of all objects in general into phenomena and noumena" in which the conversion of ontology into "immanent thinking" takes place. Within a structuralist framework, the role of categories is to construct the structural definition of this concept: "an object of possible experience". The categories, as "functions of thinking" (Kant, A535 in Parvu, 120)[23], structurally define the object of possible experience. Again, Parvu considers that the structural determination of an object in general is not the determination of an object through relations but "the determination of an 'object of possible experience' (= the principle of transcendental vision in general) through structural constraints that are the determinative conditions of foundation". (Parvu 2004, p. 118) Thus the categories are the conditions of possibility of (objects of) experience or they are "the formal conditions of scientific experience". (Cohen 1885, 410 in Parvu 2004, p. 336) They are

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[22] This idea follows the line given by the expression "the conditions of possible experience".

[23] Parvu quotes A247/B304, A679/B707.

the functional foundation of experience, or in other words, the foundation of "immanent ontology".

In Parvu's interpretation, categories represent the structural functions or operators that realize the synthesis of manifold of phenomena for constituting possible experience (the possibility of experiential objects), i.e., the "formal unity of an experiential object". The principles are forms of law-likeness in general that determine any particular law. (Parvu, p. 67) Kant constructs the table of categories for determining the conditions of possibility of *a priori* forms of synthetic judgments that correspond to the intellectual principles of the foundation of transcendental laws of Newton's science. (Cohen 1885, p. 410 in Parvu, p. 336)

However, the functions of categories are the result of transcendental apperception that has the function of *synthesis*.

> Apperception is itself the ground of the possibility of the categories, which on their part represent nothing but the synthesis of the manifold of intuition, in so far as the manifold has unity in apperception. (A401)

The categories have two kinds of functions: logical functions of the intellect as the capacity of judgment ("categorical operations", in Parvu's words) and ontological-immanent functions, i.e., the constraints that structurally define the object of possible experience. (Parvu 2004, p. 129) For Waxman, the concepts of metaphysics are logical functions that synthesize (p. 811) concepts to form judgments. (Waxman 1995, p. 810) The last functions structurally determine the organization of categorical operations. (Parvu, p. 130) In Waxman's terms, the categories occur when logical functions of understanding are applied to sensibility through "original acquisition". (The categories are functions or conditions, not ontological predicates. Parvu 2004, p. 135) Thus the relationship between categories and principles, from one side, and intuitions and experience, from the other side, is not a direct relationship. From the viewpoint of a theory, Kant is interested in general laws of structure but not in the nature or interactions (relations) of those entities.[24] (Parvu, p. 390) Even if the functions of categories are "principles of possible experience in general", we cannot understand in which sense the experience is determined as possible through categories. The answer to this question is the *definition of judgment* (second edition of CPR). Only through categories, an object is thought as *determined* in relation to the function of a judgment. (Kant, 475 MANW in Parvu, p. 390) Analyzing the experience as the product of intellect and sensibility, Kant is interested only in logical-structural elements: the forms of judgments (from which the categories are derived) and the pure forms of intuition. (Parvu 2004, p. 391)

To explain the relation between intuition and cognition (the schemes) more precisely, we need to see the Kantian distinction between forms of intuitions, *formal intuition* and the notion of understanding that implies the unity of apperception. (Parvu 2004, 154; Friedman 1992, the end of Ch. 2 and Ch. 4) As Parvu writes, the main role for formal intuition is to mediate between pure concepts and pure forms of intuition, space and time. These last forms are converted into determinate intuitions. The rational generalization transforms the material content of sensible intuitions in *"transcendental matter"* that can correspond to formal intuitions. "The concept of transcendental matter is the ontological-transcendental support of methodological prediction proper to the transcendental theory of

[24] Einstein recognizes Kant's influence on the idea regarding the relationship between the theoretical part of a system and reality: there is no logical way from empirical data to teh conceptual framework. (Parvu 2004, p. 386)

CPR.” (Parvu, p. 154) The schematism inserts within the categories certain mathematical elements that are necessary for the construction of fundamental laws. These laws determine not only the conditions of the possibility of objects of experience in general but also the conditions of the existence of spatial-temporal objects. Thus, the Axioms of intuition and Anticipations of perception transform the qualitative concepts of experience in metric (mathematic) concepts. The schematism – with the principles of applied mathematics to phenomena – mediates between abstract structure (categorical schema) and general laws (Analogies of experience). (Parvu 2004, p. 158)

The forms of intuition yield only the manifold of a priori intuition without any cognition. (Kant, B137–8) Friedman (1992) insists on showing us the dependence of geometrical construction on the action of *understanding* quoting the famous passage B154:

> We can think no line without *drawing* it in thought; we can think no circle without *describing* it; we can absolutely not represent the three dimensions of space without setting three lines perpendicular to one another at the same point”. (See also B137–138; A162–163/B203–204)

For explaining Kant’s approach as abstract-structural theory, the next step is a general justification of the relationship between possibility and objects. It is the step from abstract structure to a model. Parvu borrows this idea from structural-abstract theories in which the general theorem of representation assures the transportation of general structure on determinate domain (a model). In this view, Kant wants to offer the *possibility* of the relationship between abstract structure and objects of experience. The “same function” involved at both levels – intellect and sensibility – makes this structural transfer. Parvu shows that the next step is the insertion of categories−that means the application of categories to objects of experience. The categories are the conditions of possible experience. "[T]he categories are conditions of possible experience and therefore are *a priori* valid for all objects of experience." (B161) They determine the form of experience which depends upon *a priori* principles of its form, i.e., upon universal rules of the unity in the synthesis of appearances. (A157/B196 in Parvu, p. 406)

The general theorem of representation ascertains the transfer from abstract structure to its models. This transfer means not only to establish an isomorphism between certain "relational systems" but also to transfer the action of "transcendental form" through which the knowledge receives its objective validity. (Parvu, p. 407)

> We then assert that the conditions of the *possibility of experience* in general are likewise conditions of the *possibility of the objects of experience*, and that for this reason they have objective validity in a synthetic *a priori* judgment. (A158)[25]

In Parvu's framework, the insertion of categories within the frame of conditions of possible experience reflects their *constitutive* role for the form of experience (formal conditions of possible experience). (Parvu, p. 407) The categories are at the same time operations and conditions. In this context, Parvu focus on Kant's principle: "The highest principle of all synthetic judgments is therefore this: every object stands under the necessary conditions of synthetic unity of the manifold of intuition in a possible experience." (A157/B197) This principle makes structural connections that reflect the determinative structural function of the form of experience.

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[25] Or "These grounds of the recognition of the manifold, so far as they concern *solely the form of an experience in general*, are the *categories*." (A 125)

> Synthetic *a priori* judgements are thus possible when we relate the formal conditions of *a priori* intuition, the synthesis of imagination and the necessary unity of this synthesis in a transcendental apperception, to a possible empirical knowledge in general. We then assert that the conditions of the *possibility of experience* in general are likewise conditions of the *possibility of the objects of experience*, and that for this reason they have objective validity in a synthetic *a priori* judgment. (A 158/B197 in Parvu 2004, p. 410)

On the other hand, the synthesis applied to the intuitions is an act of spontaneity that belongs to understanding with its categories. Now, we have to add something from the next footnote – the same page of CPR:

> [T]he synthesis of apprehension, which is empirical, must necessarily be in conformity with the synthesis of apperception, which is intellectual and is contained in the category completely *a priori*. It is one and the same spontaneity, which in the one case, under the title of imagination, and in the other case, under the title of understanding, brings combination into the manifold of intuition. (B162b)

The synthesis of apprehension that involves the imagination needs *the same* spontaneity as the synthesis of apperception that implies the understanding. And this spontaneity brings *combination* into the manifold of intuition. But this combination of the manifold of intuition determines the unity of representations. Thus, spontaneity would determine the unity of representation that, as I said above, is given by formal intuition. To avoid this confusion, we have to understand this spontaneity as referring to imagination, not understanding. However, it is still not enough to explain formal intuition. The claim that "space and time are first *given* as intuitions, the unity of this a priori intuition belongs to space and time" is equivalent to "Space, represented as *object* (as we are required to do in geometry), contains more than a mere form of intuition; it also contains *combination* of the manifold". The combination is equivalent to the unity and both presuppose the same spontaneity that determines two kinds of synthesis. Syntheses are subject to categories that involve spontaneity and thus imagination and understanding.

> This synthetic unity can be no other than the unity of the combination of the manifold of a given *intuition in general* in an original consciousness, in accordance with the categories, in so far as the combination is applied to our *sensible intuition*. All synthesis, therefore, even that which renders perception possible, is subject to the categories; and since experience is knowledge by means of connected perceptions, the categories are conditions of the possibility of experience, and are therefore valid *a priori* for all objects of experience. (B161)

We return to two essential points:

1) The distinction between these syntheses is a transcendental one. This is the reason that all syntheses are subject to categories because the categories are the main *conditions of the possibility of experience*. Experience again means empirical knowledge. Even for space as an object, we need the unity of the combination of the manifold of a given intuition.

2) The correspondence between transcendental synthesis of imagination, OSUA, self-consciousness and their relationship with all "my" representations.

> Now all unification of representations demands unity of consciousness in the synthesis of them. Consequently it is the unity of consciousness that alone constitutes the relation of representations to an object, and therefore their objective validity and the fact that they are modes of knowledge… (B137)

In this case, we have space represented as an object and thus we have the representation of space. The unification of this representation requires not only the unity of consciousness and its synthesis but also the categories. The fact that space is *given* as intuition, the unity of this *a priori* intuition belongs to space. Therefore, there are different *transcendental levels of synthesis*: the synthesis (i.e., the unity) of intuition (formal intuition), the synthesis of imagination, and then the synthesis of understanding.

> Consequently, all possible perception, and therefore everything that can come to empirical consciousness, that is all the appearances of nature, must, so far as their connection is concerned, be subject to the categories. (B165)

The axioms and anticipations are the mathematical aspect of the relations among objects established by the analogies of experience. The analogies of experience are, in fact, the transcendental laws of nature. They determine, transcendentally, the formal Nature. (Parvu 2004, p. 163) In A216/B236, Kant indicates that the analogies represent the unity of nature in relation to all phenomena, that is, time in relation to the unity of apperception. They constitute the objective structure of possible experience, i.e., the determination of conditions for the existence of objects. The form of possible experience or form of objective experience in general – in Kant A220/B267 and A225/B272 that is understood as "formal experience" – corresponds to the coherence of experiential phenomena under the universal laws. (Parvu, p. 176) In this way, Kant's theory is ontologically loaded. (Parvu, 170) The rules of syntactic unity of apperception determine the formal unity of possible experience and realize the regimentation of empirical extension of theory. The structure of theory constitutes the form of experience or the structure of experience in general (formal possibility of experience, A250) involved in any empirical extension. (Parvu 2004, p. 214) The analogies (the "principles of objects") realize the "transcendentalisation" of ontology in "immanent thinking"! Kant's theory is about the "immanent metaphysics" (Paton), the results of dependence between the phenomenal world and *a priori* forms of cognition. The transcendental laws are the foundation of nature, in general. The principles of intellect are the conditions of the possibility of physical laws. However, the experience in general follows the supreme principle of transcendental apperception. Therefore, the *common point* for OSUA, synthesis of apprehension, and experience or empirical knowledge is the subject. *Now we can understand why all such correspondences are only transcendental: because they belong to the same subject.* Waxman considers that due to transcendental idealism, the synthesis "cannot come to us via the senses (and, *a fortiori*, via the object existing in itself) but must always be generated through "an act of the self-activity of the subject". Synthesizing action (spontaneity) of imagination and understanding synthesizes the sensation in consciousness. (Footnote 135, p. 851, CPR B130) Therefore, the spontaneity (synthesizing action of imagination and understanding) unifies the sensations in consciousness. I mention that the relationship between "spontaneity", "synthesizing", "understanding", "judging" and "apperception" is quite complex in CRP. They are more or less synonyms. (Pippin 1997, p. 30) Commenting B158, for Pippin, the spontaneity seems to be the "determination of my existence". (Pippin 1997, p. 34) However, I quoted the last sentence from B158: "But it is owing to this spontaneity that I entitle myself as intelligence." (See also A546–7/B574–5 in Pippin, p. 34)

Consciousness – because of its unity – produces the unity of sensation. Otherwise, someone can

> have as many-colored and diverse a self as I have representations of which I am conscious" and "a multitude of perception, indeed even an

> entire sensibility… would be found in my mind, but separately, and without belonging to a consciousness of myself;. (CPR 134 and A122 in Waxman 1995, p. 851)

The subject's actions are essential for mathematical postulates (construction of figures) and for transcendental philosophy (the action of power of knowledge that is realized in empirical reason). (Parvu 2004, p. 174)

Brook strongly emphasizes the role of the subject in the Kantian system in all the processes of the mind, i.e. its role in explaining the mind in general. I agree completely with this idea. It has no sense to try to explain how the representations are computed in the mind without taking into account the subject to which the mind belongs, with its computations and representations. Against Hume, Kant claims that the "associations of representations" is the empirical unity of consciousness. (Brook 1994, p. 91) However, as we saw above, Kant emphasizes the role of transcendental unity of consciousness, i.e., the transcendental apperception. The apperception of self, that is the common subject for all the representations, has nothing empirical.

> This representation [of the self as common subject of all of its representations] is an act of *spontaneity* … it cannot be regarded as belonging to sensibility." (B132 in Brook 1994, p. 91)

As we can see in A108, only the transcendental unity of apperception, i.e. *the unity of the subject*, offers the synthesis of all possible appearances in *one* experience or *one nature*. In Kant's words:

> The original and necessary consciousness of identity on the side of the self is thus at the same time a consciousness of an equally necessary unity of the synthesis of appearances according to the concepts, that is, according to rules. (A108 in Brook 1993, p. 146)

Brook points up that when the "I" is aware of myself as subject "I" must appear to myself to be one and not multiple. (Brook 1993, p. 159) Then the question is how do I *appear* to myself? What are the properties I have access when I appear to myself? "I", as a whole, must be represented without any properties or qualities. If all the representations are accompanied by "I think" then "I", that is included in this expression, has to be somehow represented to the subject! But this representation of "I" has no qualities because it accompanies all other representations that represent different qualities[26]. Kant used a few times (A342= B400, B155, B157, and B161 in Brooks 1993, 82) the expression "bare consciousness" to illustrate consciousness without qualities. "Through the "I", as simple representation [or 'bare consciousness' (A346 = B404 and B158)], nothing manifold is given." (B135 in Brook 1993, p. 88) Why are there no qualities to this representation? Because the sensibility is not involved in its construction, we do not have sensibility involved in such "empty representation".[27] Moreover, the absolute unity of the subject is necessary "only because otherwise we could not say, 'I think' (the manifold in one representation)" (A353 in Brook 1993, p. 168) For Brook, "I think" is both an act and a representation. "As an act, it is spontaneous pure apperception and does not belong to sensibility. Thus, having 'a necessary relation' to 'I think' is having a relation to an act of transcendental apperception, an act that also yields a representation of self, 'I think'." (Brook 1994, p. 222)[28]

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[26] As we will see in Chapter 3, the representation about self involves implicit knowledge.

[27] Implicit knowledge does not involve sensibility at all. (See Chaper 3)

[28] More details from Brook: "In his words, the use of 'I' to refer to oneself as subject designates 'only transcendentally...without knowing anything of [the subject].' (A355). It 'denotes' but does not 'represent.' (A382)" (Brook 1994, p. 73)

All the syntheses and representations of internal or external objects require the intuition of time and thus the subject is strongly related to the notion of *time*. Analyzing in details the B159 above, I wrote that the understanding makes the combination of the manifold in the condition imposed by inner sense. The combination is made *intuitable*, i.e., the combination is made following the form of inner sense, as temporal. This process represents the *inward* affection that implies self-consciousness. The understanding, i.e., its categories, determines sensibility when we are inwardly affected. "For we intuit ourselves only as we are inwardly affected…" (B153), which means the affection of our inner sense by ourselves (B156).

> Now it is imagination that connects the manifold of sensible intuition; and imagination is dependent for the unity of its intellectual synthesis upon the understanding, and for the manifold of its apprehension upon sensibility. All possible perception is thus dependent upon synthesis of apprehension, and this empirical synthesis in turn upon transcendental synthesis, and therefore upon the categories.… [A]ll appearances of nature, must, so far as their connection is concerned, be subject to the categories. (B165)

In this paragraph, we see clearly the relationship between apperception, apprehension categories, and empirical knowledge. (We return again to the main Kantian interest: empirical knowledge.) Because the subject is the common point of all these elements, Kant needs to generalize the notion of experience.

> When we speak of different experiences, we can refer only to the various perceptions, all of which, as such, belong to one and the same general experience. …it is nothing else than the synthetic unity of appearances in accordance with concepts. (A111)

Kant specifies (A113) that all representations belong to the totality of a possible self-consciousness that is a transcendental representation and the *numerical identity* is inseparable from this representation. The combination of all representations is only as the result of a unified act of transcendental apperception in which it is possible for me to become aware of my identity. The unity of consciousness "precedes all data of intuitions… This pure and original unchangeable consciousness I shall name *transcendental apperception*." (A107) In fact, the mind can think *a priori* "its identity in the manifold of its representations" only because all syntheses of apprehension are subordinate to the transcendental unity. (A108) Again, I emphasize the essential role played by "I", the "common subject". To analyze together some Kantian concepts, I quote an important passage from CPR:

> The identity of the consciousness of myself at different times is … only a formal condition of my thoughts and their coherence, and in no way proves the numerical identity of my subject. Despite the logical identity of the "I", such a change may have occurred in it as does not allow of the retention of its identity, and yet we may ascribe to it the same-sounding "I", which in every different state, even in one involving change of the subject, may still retain the thought of the preceding subject and so hand it over to the subsequent subject. (A363)

Brook believes that by using the same word "I", we grasp the "logical identity of the 'I'" which means that "I" refers to the same being when I refer to the earlier and actual subject, myself. (Brook 1994, 192) However, even if the memory is involved here it does not require the identity of the self. Thus, the "numerical identity" is not provided by identity of the consciousness. Brook stresses that Kant only supplements Hume's idea about mind adding the unity of consciousness[29]. Only *fait* not knowledge

[29] This point is so important that I will return to it in my perspective of the observer.

guarantees personal identity! (Brook 1994, p. 195)[30] The belief of the existence of "I", with all its characteristics intuitions, categories, and ideas guarantees (to the same "I") the existence of a Newtonian and Euclidian external world. I believe that "I" exist because "I" appear *to* myself.[31] As we saw above, the "I" is represented *to* the "I" without any qualities, i.e., as a *bare consciousness*. "I" *appear* to myself without any of my qualities; in such a situation, we have only that "*me includes my transcendental aspect*." (Brook 1993, p. 92) Thus, if we extend Brook's idea, we can say that formal intuition is my transcendental aspect. Can we say that the *existence* of "I" and the world is my *transcendental* aspect? How then we can explain these notions of "the existence" and "my" that appear in the same statement? This transcendental aspect guarantees the existence of both "I" and the world. It is what makes the foundation of Kant's attack on rational psychology. It is the application of the categories to the intuitions and external or internal raw material. It is, in the end, the distinction between transcendental versus empirical apperception. Empirical apperception involves the empirical consciousness that is "the result of 'empirical laws, the laws, namely, of association'. (B152)" (Brook 1994, p. 243) Transcendental apperception involves the application of the categories to the intuitions and the raw material.

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[30] Regarding personal identity, Brook makes an essential observation: Kant rejects Descartes' and Leibniz's ideas but not Hume's idea (as Strawson suggests) showing that it was Hume who missed the unity of consciousness, but his treatment of personal identity was right. (Brook 1994, p. 193; regarding personal identity in CPR─see Chapter 8, Brook 1994)

[31] Again, Brook stresses the role of the subject as a whole in explaining the functioning of the mind, its processes (computation) and its entities (representations), writing that "we are talking about representations representing *to* themselves, not being of themselves or their subject." (Brook 1994, p. 210)

2.4. Apperception and existence

For the perspective of the observer, one of the most important topics from CPR is the relationship between apperception, categories, and existence. As I presented at the beginning of the section on Transcendental Deduction, Parvu emphasizes two steps of rational generalization between abstract-possible and empirical entities. The second step represents the "transcendental matter" that corresponds to transcendental ontology (Buchdal 1992 in Parvu 2004, p. 270) or ontology of possibility. More exactly, what is the relationship between the conditions of possibility and existence? For the first term of this relation, specifying that "the conditions of possibility" do not refer to propositional presupposition or the subjacent conceptual frame of one theoretical construction, but to the determinative structure of one set of operations and thus (returning to paragraph A157/B197, our note), Parvu claims that

> (T)he "dependence" between the conditions of the possibility of experience and the conditions of the possibility of the objects of experience is not a propositional implication. It indicates the "formal identity" (in a specific meaning given by the transcendental of "formal"), the "transposition of a structure" or the possibility for abstract structure as having a model, an "instantiation" of one abstract structure within organized system. (Parvu, p. 271)[32]

The second term, the experience, is under a transcendental umbrella. Within this framework, the transcendental experience – in collaboration with certain constraints that are proper to the power of judgment (the form of sensibility, and the categorical

[32] In other words, the form of law-likeness in general constitutes the possible condition of objects of nature as objects of experience. (Parvu 2004, p. 290) (All paragraphs from Parvu, 2004, are my translation.)

matrix the object of real possibility) – is the result of the synthesis of perceptions.

> The idea of synthesis indicates to us the fundamental meaning of these “conditions of possibility”; they are nothing more than the determinative structure of the acts of synthesis that offers them objective intentionality. (Parvu, p. 271)

Moreover, the unity of apperception implies the unity of nature. The unity of nature represents the possibility of some particular laws. (Parvu, p. 204) From a *regulative* point of view (not *constitutive*), this determinative matrix is founded by the principles of reason, the transcendental ideas. (A680/B708 in Parvu, p. 230) However, the reason entails the “absolute unity of thinking subject”. (A335/B392) The relationship between thinking and ontology is not similar to Berkley’s idealism simply because the structure that is a formal one reflects formal nature not empirical nature. The expression “The ontology is immanent thinking” means that the experience of empirical objects is possible only if any such object can be thought *a priori* as a measure and similar to all the other categories. (Kant in a letter to J. Beck (20.01.1792), Parvu, p. 247) Thus, the form of intellect in relation with space and time constructs the “transcendental invariant” of objectivity in Kant’s theory. It is the foundation of ontology as “immanent thinking”. (Parvu, p. 261) However, the analogies reflect the unity of nature, all phenomena (the determination of objects and the processes) must lie in *one nature*[33]:

[33] Parvu shows that in section 38 from *Prolegomena* Kant points out the internal form of his general theorem from CPR: the constitution of nature as “object of possible experience” in accordance with the form of law-likeness in general of nature. (Parvu 2004, p. 294)

> Our analogies therefore really portray the unity of nature in the connection of all appearances under certain exponents which express nothing save the relation of time (in so far as time comprehends all existence) to the unity of apperception -- such unity being possible only in synthesis according to rules. Taken together, the analogies thus declare that all appearances lie, and must lie, in *one* nature, because without this *a priori* unity no unity of experience, and therefore no determination of objects in it, would be possible. (A216/B263)

For my perspective, there is an important relationship between this notion, "one nature", and the "global object". In this sense, Parvu discusses the role of categories from *Prolegomena*. (Parvu, p. 401) The deduction of categories is not *in abstractio* but inside of the internal model of Kant's theory. It is the transformation of general concepts (arguments and theorems) from the deduction of categories into proper concepts of this model that has – as structural theory – a *global object*, "nature as object of experience".

> Thus the concept of "object of possible experience" would become, within this model, "nature as object of experience" (IV: 297), and "the possibility of experience" would be transformed in "the universal law-likeness of nature" or "form of law-likeness in general", or "general laws of nature that exist a priori" (296); "formal experience" or "formal conditions of experience in general" would be projected in this model-theory through "nature in formal meaning". (Parvu 2004, p. 401)

Parvu introduces two Kantian ideas: the conditions *a priori* of possible experience are at the same time the sources from which all universal laws of nature must be derived (IV: 297); and the object "constructed by *a priori* conditions of possibility of experience will be this time nature as integral object of possible experience". (Idem) (Parvu, p. 401) In this context, the insertion of categories in determination of the general structure of experience is related to the distinction between judgments of perception and experience. In *Prolegomena*, the problem of objective validity of categories is transformed into a problem of possibility of universal law-likeness of nature that is related to the possibility of pure physics. Thus, the question is "how is it possible to use the abstract structure of formal nature for the determination of this integral object, nature as object of scientific experience, or as Kant asks in #36, "How is nature possible?" (Parvu, p. 402) Parvu considers that the final step is the justification of a set of categories that determine the general principles of a pure science of nature.

Apperception (as spontaneity of thought) involves the awareness of existence. Against Descartes, the last concept is not equal with the knowledge of oneself as thinking being. (Allison, p. 278) Allison quotes two paragraphs:

> [I]n the transcendental synthesis…, and therefore in the synthetic unity of apperception, I am conscious of myself, not as I appear to myself, not as I am in myself, but only that I am. (B157)[34]

> The 'I think' expresses the act of my existence. Existence is already given thereby, but the mode in which I am to determine this existence, that is, the manifold belonging to it, is not thereby given. (B158n)

The second paragraph (B422n) is too large to include here but I present Allison's interpretation for these two paragraphs. Following Spinoza and Leibniz, Allison indicates that the first idea is that Descartes' *cogito ergo sum* is a tautology. The second idea is that "I think" as a thought is an empirical proposition. This idea is a direct attack on the Kantian distinction between

[34] The same idea occurs in A355: "In attaching 'I' to our thoughts [in using 'I' to refer to myself as me, as the subject of my thoughts] we designate the subject...only transcendentally, without noting in it any quality whatsoever, in fact without knowing anything of it either by direct awareness or by reasoning." (Brook 1994, p. 72)

empirical and transcendental apperception. (Allison, p. 280) The cogito needs sensibility and thus "the apprehension of some sensible content (as modification of inner sense) is a necessary condition of the awareness of existence that is presumed to be presumably inseparable from the consciousness of thinking". (Allison, p. 280) However, this sensation is not an empirical one. Thus, the thinking thing can be represented only as something "purely intellectual" as an empty thought. (B157) In this case, there is only an "indeterminately given object" ("indeterminate perception" or a "bare consciousness" (A 346/B404)) that is incorporated in that act of thought and we cannot apply the categories. We cannot claim the existence of a subject that has this thought, "I think", from only the act of thinking. Along the same lines is a third idea, the critique of "rational psychology". Rational psychology deals only with a transcendental subject.[35] The existence of *something* requires the process of *individuation* for the subject (or, as we see in Chapters 3, 4 and 6, for other entities). Something exists only if it has some limits. Brook writes that Kant says "strangely little about individuation, at least by name." (Brook 1994, p. 244) For Brook, in Kant's approach the individuation is related to the process of recognition. Recognition means the application of the categories and intuitions to the raw material; it presupposes transcendental apperception. Thus, we have to relate transcendental apperception to individuation and existence. Above, I asked whether we could claim that the *existence* of "I" and the world is "*my*" transcendental aspect. Brook asserts that the subject using the categories processes the

[35] Against this idea, Kant introduces his Paralogisms. In general, in Cognitive Science and even in Philosophy of Mind, the authors try to explain the mind/brain without taking into account the role of the subject. Brook emphasizes Kant's idea in whole his book: it means that I can be aware of myself, as myself, as an "empty representation" without any quality. (Brook 1994, pp. 73–6 and see above)

recognition, and the categories and thus the recognition "are not optional; that is one reason why Kant called them transcendental." (Brook 1994, p. 244) Indifferent what categories do we have and use in recognition and in all mental processes, it seems that after the critical period of development their application is not optional. Through this idea, as we see in Chapter 3, we can reject Hume's scepticism and its application to the existence of "I" and the external world. Brook claims "Our synthetic activities must individuate particular representations and unify them as global representations… my representations must be located in time and combined with others in a global representation." (Brook 1994, p. 244)[36] He highlights that the distinction between empirical and transcendental apperception reflects the mixture of freedom and constraint. (Brook 1994, p. 245) Synthetic a priori knowledge is based on this mixture and this knowledge produces Euclidian geometry and Newtonian physics. The objective reality of the external and internal objects and of "I" rests on the conditions of experience[37]. Returning to Descartes' framework, Kant asserts that even if "I" is a composite entity "I" exists as indivisible. (Brook 1994, p. 168)[38]

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[36] Brook introduces certain notions. This notion, global representation, is essentail in explaining CPR. It means "a representation that has a number of particular representations and/or their objects or contents as its *single global object*". (Brook 1994, p. 133)

[37] We will discuss this kind of objective reality in Chapter 3. If the intuitions of space, time and the categories are the results of the species' evolution and individual development in contact with a "standard environment", then we can believe in the external and internal objects as we believe the existence of 'I', i.e. of ourselves.

[38] Being one of the main ideas for him, Brook insists on it writing that "appearing to myself to be a single subject is a requisite of thinking of myself at all; it is a 'form of apperception which belongs to ....every experience.' (A354) And this is all. I 'have no right to transform [this] merely subjective condition ... into a concept of a thinking being in general' (A354)". (Brook 1994, p. 172)

> Although the whole of [a] thought could be divided and distributed among many subjects, the subjective "I" [the "I" pictured from its own point of view] can never be thus divided and distributed.[39]
> (A 354 in Brook 1994, p. 168)

Waxman considers that the role of categories is, through our reflection on appearances, to conceptualize them. The phenomena "are the result of conceptualizing appearances in accordance with the categories". (See CRP, A249 in Waxman 1995, p. 843, footnote 114) They are objects in the sense specified in the Transcendental Deduction: that in the concept of which the synthesis of a given manifold is united (see CRP, A108 and B137); and such concepts count as cognitions (see A103–10)." (Waxman 1995, p. 843, footnote 114) The categories are constitutive of objects (the synthesis of a given manifold is united) and they institute the laws of objects. (p. 845) We have seen that without the categories, the objects lack reality and have no spatial or temporal dimensions in relation to me. As exponents of synthetic unity, the categories "act as a surrogate for space and time in the field of appearances by bringing sensation-reality of appearances to synthetic unity, and thereby endow space and time with objective validity." (Waxman 1995, p. 848) In this way, data apprehended perceptions "become something for me". (p. 853) Categories are in and of themselves just logical functions of judgment. However, these judgments are determinative not only of the analytic unity of judgment but also of the synthesis of imagination. (Waxman 1995, p. 852)

> The same function which gives unity to distinct representations in a judgment also gives unity to the bare synthesis of distinct representations in an intuition; and this unity, expressed universally,

[39] This idea is essential for the perspective of the observer. We will extend it from human beings (that are indivisible even if composite entities) to all entities.

> we entitle the pure concept of understanding. (Kant, CRP A79/B105 in Waxman 1995, p. 853)

Categories are the logical functions and therefore the appearances are accompanied by me. (Waxman 1995, p. 854)

The intuitions of space and time have two exigencies: they are imperceptible and inconceivable. (p. 846) It is for this reason that the appearances have no spatio-temporal reality or determinations with respect to space and time. It means they do not occupy or contain pure space and time and therefore "they necessarily lack all determinations and ordering predicated on existence in space and time". (Waxman 1995, p. 846) If space and time are inconceivable then the intellect cannot grasp an object under a concept, can "have nothing predicated of it in a judgment, and so cannot even be so much as thought, much less cognized as an object." (pp. 846–7) Through its categories that refer to logical functions and unity of apperception, understanding (Waxman 1995, p. 847) offers these determinations, i.e., the synthetic unity that solved those two exigencies.

For Kant, "the categories acquire objective validity and are constitutive principles of nature" (Waxman 1995, p. 849) and the categories "overcome the obstacles posed by the imperceptibility and inconceivability of space and time. (p. 849)

> … by subjecting the synthesis of perceptions in reproductive imagination to the logical functions, as a priori rules determining all association of perceptions in fixed relations of space and time, the understanding is able to embrace this real, and thereby expand the universal scope of its I think to a whole new class of representations-objects of possible experience. Thus are humans uniquely cognizing beings. (Waxman 1995, p. 852)

Categories fulfill this unity through the unity of consciousness. Categories are constitutive of objects in the sense that "constitutive" means to conceive an object of pure intuitions. Conceivability presupposes the formation of a concept of composite that is an act of synthesis of the manifold in conformity with pure intuitions. (Waxman 1995, p. 848)

Synthetic unity of apperception, the supreme function of understanding, reunifies pure intuitions, categories as logical functions of analytic unity of apperception schemata and consciousness. Schemata conform to synthetic unity of apperception through the transcendental schemata. Transcendental schemata are pure synthesis or pure consciousness that produces particular schemata as synthetic unity of all manifolds in one consciousness. (Waxman 1995, p. 857) Otherwise, particular schemata would be nothing for me. It is the principle through which understanding determines sensibility and the judgments of perceptions are transformed into judgments of experience. The categories produce the synthetic unity of the manifold or of perceptions within the conditions of the "I think". Therefore, this synthesis would be a surrogate or *exponent* (A126/B263) for synthetic unitary pure intuition (space and time). (Waxman, p. 849) The order of nature itself is given by the categories.

> [O]nly through the subordination of the synthesis of perceptions in imagination to the categories, as exponents of synthetic unity, can data apprehended in perception become something for me (that is, be accompanied by an identical I think), and, at the same time, acquire a determinate reality of their own, as existent events or enduring things (phenomena), distinct from and independent of their appearance in immediate intuition. (Waxman 1995, 854)

and

> The categories "contain nothing further than the unity of reflection on appearances insofar as they belong necessarily to a possible empirical consciousness"; (A310/B366-7) they serve merely to "spell out appearances according to synthetic unity." A314/B370 (Waxman 1995, p. 856)

For Waxman, the role of understanding in representing the world for Kant is this one:

> Thus do the categories become effectively the template of the sensible universe. More strikingly still: the understanding, in implementing this *Bauplan* by means of imagination, and thereby extending the scope of consciousness (that is, of that which is something for me), is actually doing nothing more than furnishing the I-concept with an expanded instantiation. The outcome of Kant's theory of understanding could therefore be expressed as follows: *the* world is not simply *my* world, as with other subjective idealist philosophers; the world, for Kant, actually *is* the self. (Waxman, 1995, p. 857)

The empirical laws depend on a transcendental principle, the systematic unity of nature, from Critique of Power of Judgment (Buchdal, Guyer, Allison, etc. in Parvu, p. 198) This principle is the result of reflexive judgment and mediates between formal structures (formal intuitions and categories) and particular empirical laws. Thus the determination of empirical laws is given by a reflexive judgment that is a component of the "I". We can say that the "I", even if it cannot be proven to exist, reflects the unity of nature.

2.5. Apperception and the noumenal self

Allison presents two versions of this topic. The first one is official and incoherent: the "I that thinks" is a "transcendental object of inner sense". (Allison 1983, p. 287) More interesting for me is the second alternative: the apperception is a consciousness of the activity of thinking in which the objects of the inner sense are contents of the mind. Thus, inner sense is the consciousness of the objects of the mind ("subjective objects") and apperception is the consciousness of the activity of thinking. (Allison, p. 290) This view is compatible with Kant's critique of rational psychology. Again, just knowing that something thinks it is not enough to prove its existence. In order to prove the existence of “I” of the “real” self we need certain empirical constituents. “I”, continues Allison, as an “existence that is determined in time” is the subject with the body, memory, and history. Moreover, this “I” is different from the rational psychological “I”. The “I that thinks” is just a “bare consciousness” that cannot completely prove its existence. We saw above that the “I think” is related to the analytic unity of apperception. The last notion is devoid of any content being “a wholly indeterminate consciousness of one’s identity in respect of all the manifold of an intuition in general.” (Waxman 1995, p. 838) As we saw above, the analytic unity of apperception which produces the universal, depends on the synthetic unity of all manifold – that is the individuality of pure intuition – in one consciousness. Therefore,

> *[T]he I is nothing more than the universal (analytic) expression of the same original unity of which pure space and time are the individual (synthetic) expression.* Hence, even if it is impossible to conceive pure space and time in their own right, the unity they create of all representations in one consciousness (that is, one sensibility, synthetic unity of apperception) finds its complete and adequate intellectual expression via consciousness of our own identity in respect of all the manifold (it is in this sense, I believe, that Kant spoke of a “pre-established harmony” between sensibility and understanding). (Waxman 1995, p. 839; his italics)

Regarding the same topic, Allison introduces Wittgenstein’s position from the *Tractatus*. Because later I will need Wittgenstein’s view, I continue presenting the details from Allison’s chapter. There are few sentences quoted by Allison from the *Tractatus*:

> There is no such thing as the subject that thinks or entertains ideas. (5.631, 117)

> The subject does not belong to the world; rather, it is a limit of the world. (5.632, 117)
> The philosophical self is not the human being, not the human body or the human soul, with which psychology deals, but rather the metaphysical subject, the limit of the world – not a part of it. (5632, 117)

Even if Wittgenstein was interested in solipsism, Allison regards his "philosophical self" or "metaphysical subject" as equivalent to Kant's transcendental subject. In this sense, the transcendental subject (that is an object of inner sense) is not an object of the world and thus it cannot be identified with the noumenal self. To justify this alternative, Allison quotes three passages from Kant:

> [C]onsciousness in itself is not a representation distinguishing a particular object, but a form of representation in general, that is, of representations in so far as it is to be entitled knowledge; for it is only of knowledge that I can say I am thereby thinking something. (A346/B404)

> Self-consciousness in general is therefore the representation of that which is the condition of all unity, and itself is unconditioned. We can thus say of the thinking "I" (the soul) which regards itself as substance, as simple, as numerically identical at all times, and as the correlate of all existence, from which all other existence must be inferred, that it does *not* know *itself through the categories*, but knows the categories, and through them all objects, in the absolute unity of apperception, and *through itself*. … I cannot know as an object that which I must presuppose in order to know any object, and that the determining self (the thought) is distinguished from the self that is to be determined (the thinking subject) in the same way as knowledge is distinguished from its object. (A 402)

> The subject to the categories cannot by thinking the categories acquire a concept of itself as an object of the categories. For in order to think them, its pure self-consciousness, which is what was to be explained, must itself be presupposed. (B422)

Allison points out that the general conclusion of all these passages is that we cannot think or know the "I" of apperception because it cannot be a sensorial object to which we can apply the categories. Kant – like Hume – considers that the self is not an object of perception. (Waxman 1995, p. 827)

> The I is indeed in all thoughts; but there is not the least intuition combined in this representation which would distinguish it from other objects. (A350) The representation *I* is completely simple and, in and of itself, devoid of content. … This consciousness is not so much a representation which distinguishes a particular object, but a form of representation in general. (A346/B404) This I is as little intuition as concept of any object, but the mere form of consciousness which accompanies both sorts of representation, and is capable of raising them to cognitions insofar as something else is given in intuition which furnishes material for a representation of an object. (A382) (Waxman 1995, p. 827)

For Allison, the "I" is just an "object in general", i.e., an intellectual object but not a sensorial one. The categories cannot be applied to the object because they belong to this object. Allison stresses that it is not only a case in which there is no intuition to which the categories are applied but also there is no concept for the subject of apperception! (p. 292) And this critique is available for Descartes' *cogito*. The subject of apperception (consciousness) cannot seize itself as an object because it would negate "its character as subject" and that "through which alone there can be objects (whether of mere thought or of experience), it must be thought as already on the scene, doing conceptualising".[40] (Allison, p. 292) Thus, the subject of apperception cannot think itself either an object or a noumenal object. (Allison 1983, p. 293) The problem then will

[40] Allison makes an analogy with Wittgenstein's idea of the eye and its visual field.

be the relationship between two pairs of concepts: inner sense-apperception and phenomenal-noumenal. How, then, is the object of inner sense phenomenal (that is not identical with the appearance of the soul) and the subject of apperception is intelligible, but is not the noumenal self?[41]

2.6. Against Kant's perspective

In this section, I will only sketch some lines of attacking Kant's philosophy. It has been shown that Kant's perspective is wrong from a theoretical point of view (by the mathematical construction of the non-Euclidian geometries) and empirically (through Einstein's general theory of relativity). Non-Euclidian geometries and Einstein's physics do not involve human perception. After polyadic logic and non-Euclidian geometries appeared, the perception and cognition of human thinking used in geometry and physics have been separated. In fact, the human perceptual field is not Euclidian space. If a human being observes two parallel lines that are long enough that person perceives those two lines in two different ways: a) when the two lines are close to the observer, they are parallel lines, but b) if the distance from the observer increase enough the lines become progressively closer and closer unifying at the horizon. Einstein's theory was proved by the fact that solar light follows the curved space that exists near planets, i.e., they are geodesic lines.

Friedman mentioned Hopkins who invokes "visual" or "phenomenal" geometry to explain Kant's preference for Euclid. (Friedman 1992, p. 103) Against Kantian pure intuition of

[41] Using the perspective of the observer, I reinterpret Kant's approach and thus I manage to deal with some of Kant's problems emphasized by different authors.

space, he asks how, through pure intuition, is it possible to distinguish between the sum of the angels of two triangles, one being 180º and the other being 180.000001º? Thus, in the post-Kantian period we have completely rejected both a) the necessity and the universality of certain principles (basic principles of geometry and mechanics) and b) the necessary relationship between the intuitions and concepts that are applied in exact science and the their apriority.

Many philosophers, from Carnap to Friedman, have tried to save certain elements from Kant giving up on the necessity and universality of these principles. With Einstein's theory, it becomes clear that, in physics, a scientific theory is true even if it does not directly involve any spatio-temporal framework. Moreover, within quantum mechanics the existence of micro-entities are proved, indirectly, through empirical results or through pure theoretical elements offered by mathematics. Thus, since Wittgenstein, philosophers have discussed linguistic frameworks or scientific theories and not physical entities or the real external world. For logical positivism, language is a pre-condition for any science. (Romanos 1983, p. 23) For instance, Carnap tries to save the distinction between analytic and synthetic judgments by introducing the concept of a "linguistic framework" – against the necessity and universality of principles in science. Moreover, along the same lines, Kuhn brings in the concept of a "paradigm", while Goodman introduces "worldviews", and so on.

From another point of view, evolutionary epistemology (Lorenz, Popper, Campbell, Wuketits, etc.) contradicts the Kantian notion of the "thing-in-itself". For instance, Lorenz considers that the evolution of our species has taken place in direct contact with external reality and thus that our cognitive abilities and our knowledge are generated by the interaction between the body and the environment. (Lorenz 1941)

> We are convinced that the “a priori” is based on central nervous apparatuses which are just as real as our hand or our foot, just as real as the things of the external world existing in itself, whose form of appearance they determine for us. This central nervous apparatus in no way prescribes laws to nature, any more than the hoof of the horse prescribes form to the ground. Like the horse's hoof, this central nervous apparatus stumbles over unforeseen changes in the task posed to the organ. But just as the horse's hoof is adapted to the ground of the steppes with which it interacts, so our central nervous world-depicting apparatus is adapted to the varied real world with which human beings interact, and like any organ, it has reached its form, geared to preserving the species, during an evolutionary development lasting for aeons, by means of this interaction of the real with the real. (Lorenz 1941, p. 8)

We will see in the next chapters how we can extend and what we have to reject from Kant’s perspective when we turn to the perspective of the observer (the epistemologically different worlds).

CHAPTER 3

The epistemologically different worlds perspective

As we saw in the previous chapters, since Descartes (i.e., in the last 350 years!) nobody has offered a plausible solution to the mind-body problem and other problems from philosophy of mind. In this chapter, I will show that the mind-body problem and many other problems from philosophy of mind are in fact a pseudo-problem. For doing this, I need to change the framework of the mind-body problem. This framework does not involve only the relationship between mind and brain (body), but also all the problems that flow from the singular conception of the world, the universe, or reality. As I showed in the introduction, the world or the unicorn-world is a wrong concept. In this chapter, I will construct something that has to replace the unicorn-world: the epistemologically different worlds (EDWs).

3.1 Epistemologically different worlds[1]

As I presented in the introduction, the framework in which Descartes elaborated his dualism is wrong. Rejecting the

[1] The EDWs perspective with the first five principles can be found in Vacariu (2005). However, the framework is different in this thesis. In that article, I showed that the mind-body (brain) problem is a pseudo-problem that is a consequence of adherence to the unicorn-world.

unicorn-world view, we can see that the mind-body problem is a pseudo-problem. The unicorn-world has to be replaced with something that rejects the main characteristic of the world or universe – its unicity. This is the main reason I replace the unicorn-world with epistemologically different worlds (EDWs). The principles of the "epistemologically different worlds" perspective are constructed on an epistemological dimension (our *knowledge* of ED entities and their interactions) and then extended to an ontological dimension (the *existence* of ED entities and their interactions). This smooth extension excludes the strong distinction between epistemology and ontology that implies, among other things, the realism-antirealism or the Kantian noumena-phenomena distinctions. In fact, the EDWs perspective represents an extension of the Kantian transcendental notion in the sense that we humans are not the only "observers" that observe (or interact with[2]) other objects/entities, but there are other classes of entities in which the components of each class interact only among themselves.

There are three elements within the EDWs perspective that need to be taken, into account, epistemologically: the subject, as an observer of both the external world and an internal world; the conditions of observation or conditions of "having something" that include certain external and internal tools of observation; and the observed object or entity. These elements constitute a framework that is not new. However, let me consider the mistake that has been made in some cases in the past regarding the continuity of partition among these elements. As we will see below, in certain cases, the new condition of observation involves a new entity that cannot exist in the same world as a different entity/substance that necessitates a different condition

[2] As we will see in this section, the notions of observation and interaction are equivalent.

of observation. It means that changing the conditions of observation involves the change of the "world". Preserving this continuity of the partition of elements, the rejection of the unicorn-world, i.e. of its unicity is inevitable.

Let me point out something about "conditions of observation": where Descartes emphasizes the role of perception in identifying two different substances, the mental and the physical, in the EDWs perspective, I replace the notion of perception with "conditions of observation" for external entities and "conditions of having" for internal entities. In this case regarding the relationship between the subject and the object (external or internal), these notions are equivalent. Usually, when the notion of "perception" is used, we think, immediately, of the sensorial system. However, within the EDWs perspective, the term "conditions of observation for human beings" stands for conceptual and/or sensorial mechanisms. From one side, with different conditions of observation (that involve different tools of observation), a human being can observe external entities with different structures. The external tools of observation are those instruments or devices that enhance or expand our perceptual mechanisms and help us to perceive external objects. For instance, through perceptual mechanisms, it is possible to observe different parts of a dissected brain. Moreover, expanding these perceptual mechanisms through different devices such as PET or fMRI, certain aspects of neural activation patterns can be observed. From the other side, each human "has" certain internal entities like mental representations and processes.[3] Certain

[3] As we saw in Chapter 1, Descartes considers that we perceive external and internal entities. However, regarding internal entities, I replace "observing" with "having" in order to avoid the "notorious homunculus". "What these doctrines have in common is the mistake of assuming that we apprehend our mental states rather than just have them. It is clear why such an implicit conception leads to positing a representational format-sentences or pictures –

internal tools enable us to be aware of certain mental states involving our own consciousness or inner experience. Internal tools are the means we have to channel our inner world, such as introspection or the mechanisms of accessing memory. Even if the distinction between internal and external tools of observation is apparently unproblematic, working within the unicorn-world, Descartes failed to grasp its significance. The fatal consequence for Descartes was that he allocated the mind and body (two ontologically different substances) to the same entity, a human subject or a person.[4] As can be seen below, it is not possible to locate two epistemologically different ontological substances within the same world. In this case, the partition of elements must be preserved: new conditions of observation require new entities within the new worlds.

The idea of partition is also available in some cases for the pairing of external conditions of observation with external entities. The subject can use different tools of observation for external entities. For instance, from one side, using her eyes, a subject can observe a table. On the other side, with the help of an electron microscope, she can observe the micro-particles that "compose" or are "identical" with the table at another

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which is paradigmatically the sort of thing requiring an external, intelligent observer – the notorious homunculus (see Slezak 2002a)." (Slezak 2002b, p. 210) I would like to thank very much to Peter Slezack for the discussion that I had about this topic. However, in section 3, I will replace "has" with "is": "The 'I' *has* mental states" will be "Mental states *are* the 'I'".

[4] As we saw in Chapter 1, Fowler emphasizes that Descartes, preserving a traditional relation between doctrine and philosophy, rejects Regius' alternative of the "double-truth option", i.e., of separating the truth of revelation from the truth of reason. Reaching the stage in which he was aware that the unity between mind and body couldn't be proved scientifically or philosophically, Descartes pronounced, "… the union of mind and body is a reality which escapes philosophical discourse." (Descartes to Elisabeth, 21 May 1643 in Fowler 1999, p. 385)

ontological "level". The question is, what does "compose" or "identical" or "levels" mean? What really exists, the table or the microparticles? Do both a planet and the process of gravity produced by it really exist? The notions of "composition" or "identical" or "levels" do not preserve the continuity of the partition. In order to avoid the realism-antirealism debate, the notion of the "world" and its principal characteristic, unicity, need to be changed. The microparticles and macroparticles and their corresponding forces (that differ from each other) really exist, but not in the same unique world. They belong to different worlds and the problem is that there is only one spatio-temporal framework (with different metrics). Therefore it can be said that the micro- and macro-particles belong to epistemologically different worlds. From an epistemological viewpoint, we can introduce the first principle, the principle of epistemologically different worlds (EDWs):

> **Under different conditions of observation, the human subject observes epistemologically different worlds.**

If this principle is adopted, it can be assumed that mind and brain or micro- and macro-particles belong to epistemologically different worlds. For instance, using different tools of observation (the eyes, fMRI and PET vs. introspection and memory), we can either observe external entities like parts of the brain, patterns of neurons, and neurons or we have internal mental representations and processes. These internal and external entities belong to EDWs. We can now easily understand Descartes' error. He thought that using different conditions of observation we can observe various substances like mind and body that belong to the unicorn-world. Moreover, if this principle is correct, we can claim that some of the errors within the heterogeneous domain of cognitive science are due to the confusion of these epistemologically different worlds. More precisely, the confusion consists either in mixing different concepts that belong to epistemologically different worlds or in considering that different terms represent the same phenomena. For example, "pain" is a concept that belongs to the psychological world that is identified with some kind of neuronal pattern. As we will see below, we can avoid such errors by taking into account Kant's notion of *"conceptual containment"* as Kaiser (1993) interprets it. To put it here briefly, each epistemological world possesses a class of entities (primitives) that have the same structure, properties, relations, processes, and so on.

At this point I would like to bring the ontological dimension into the discussion. "Conditions of observation" have an epistemological dimension, but the idea needs to be extended to the ontological dimension. In order to address the ontological dimension, we replace "conditions of observation" with "conditions of interaction". These notions are equivalent in the sense that every epistemological entity (micro or macro, neural pattern or mental representation, human being or cell) "observes" or interacts with other entities that belong to the same EW.[5] In this sense, it is important to emphasize that the replacement of the "world" with EDWs entails that we humans are not the only "observers". However, there is an essential difference between observation and interaction. If using different tools of observation, we can observe macro and micro particles, one can ask: do the tables and the microparticles, with their conditions of interaction/observation, "observe" us? Physically, a table (and its macro parts which we will call

[5] For supporting the extension of "conditions of observation" to "conditions of interaction", I introduce Putnam's words: "Measurements are a subclass of physical interactions – no more or less than that." (Putnam 2005, p. 618)

"organizationally different parts") can interact with/observe a human being. Using an electron microscope, a human subject can observe an electron but the electron does not interact with/observe that person. The electron interacts with other microparticles that correspond to a table but not with the table itself just because the table and "its" microparticles exist in EDWs. Therefore, the persons' observation is a unidirectional process (one element observes another element but not vice-versa), while interaction is a bi-directional process (both elements interact). Someone can introduce an objection to the EDWs perspective. If, using an electronic microscope, the subject interacts with an electron then the subject, the tool of observation, and the electron are in the same world. From an EDW perspective, this is not a real objection. The electron does not interact with the subject but it interacts with an amalgam of microparticles that *corresponds* to the electronic microscope. The subject cannot observe at the same time the microscope (as macro-object) and the electron (as micro-object). According to the principle of conceptual containment, we have to include the microscope in the definition of the electron even if the electron really exists without our observation. Our essential mistake was that we consider ourselves to be the only "observers" (entities that interact with other elements) in the "world" and this was a reason for us to believe in the unicorn-word. We are not the only observers of our corresponding "world" and therefore there is not a unique world. Various macro particles and micro particles are epistemologically different entities with epistemologically different interactions that belong to EDWs. We can declare that the existences of epistemologically different entities *determine* epistemologically different interactions or epistemologically different interactions are *constitutive* (in Kantian sense) in creating epistemologically different entities.

Each epistemological world (EW) has its own epistemological entities with its own properties and its own epistemologically different interactions (or epistemologically different laws). However, with the exception of human beings, there are no other entities that can observe/interact with epistemologically different entities from other epistemologically different worlds. Each member of an epistemologically world exists only for those entities that belong to that EW alone. Form an ontological viewpoint, we can now introduce the principle of objective reality:

> **The determining epistemologically different entities and their corresponding constitutive epistemologically different interactions represent the epistemologically different worlds. Each epistemologically different world has the same objective reality.**

Kant wrote that the *possibility of experience* is the condition of the *possibility of the objects of experience*. (A157/B197) In our case, the conditions of the *possibility of epistemologically different interactions* are the conditions of the *possibility of epistemologically different objects*. The epistemologically different interactions are constitutive in *synthesizing*, in the Kantian sense, the corresponding epistemologically different entities. Indeed, even the space of each EW is synthesized by the corresponding epistemologically different interactions. For Kant, the "space, represented as object …, contains more than a mere form of intuition; it also contains *combination* of the manifold". For me, space is given, in the Leibnizian sense, by the relationships among epistemologically different entities. These relationships are in fact the epistemologically different interactions among the corresponding epistemologically different entities. These interactions combine the manifolds, i.e., the epistemologically different entities. However, in the case of mental entities, "space" or their *combination* (that is equivalent to their unity and presupposes the spontaneity) determines the synthesis – is the "I". (See 2.3) Mental representation and neural patterns of activation are not the same entity described at different "levels" of description. They are epistemologically different entities that belong to EDWs.[6]

Regarding the external entities, in some cases such as mind-brain or macroparticles-quantum microparticles, we have to apply the partition: different conditions of observation show us epistemologically different entities. To clarify the cases where we do need to apply the partition, I introduce the distinction between *organizational* threshold and *epistemological-ontological* threshold. This distinction is available only for us as observers of external entities. Organizational thresholds help us to differentiate between entities from the same EW and their corresponding organizationally different parts. An epistemological-ontological threshold means that changing the observational conditions or passing the epistemological threshold, the subject moves from observing one EW to another. An essential difference is that the organizationally different parts follow the same epistemological interactions (epistemological laws), while epistemologically different entities follow epistemologically different interactions (epistemologically

[6] The EDWs perspective is beyond any kind of relativism. The distinction between the epistemological and ontological dimensions offers me the possibility of avoiding the classic dilemma of relativism. This distinction shows that the EDWs perspective is not based on a circular argument. Epistemologically, the human subject observes and defines the EDWs and its entities in terms of observation but, ontologically, they exist without these processes of observation.

different laws). If we do not make the distinction between these two thresholds, then we work under the umbrella of the unicorn-world. In general, different concepts refer to entities that belong to either EDWs or organizationally different parts of the same EW. If they refer only to levels of analysis or levels of description[7] what do these concepts mean? Within the unicorn-world, in some cases these notions refer to organizationally different parts (or different "aspects" of reality of the same world). In other cases, such as "the mind is the brain" or "a table is a collection of microparticles" or "mind and brain (microparticles and macroparticles) exist at different levels" one notion (mind or brain, microparticles or macroparticles) can be considered to be an "empty concept".[8] However, from the EDWs perspective, in the first cases the continuity of partition is not necessary, whereas in the latter cases it is necessary, but it is not followed. I emphasize here that the notion of "levels" is completely different then "EDWs". Both "ontological levels" and "epistemological"/"description"/"analysis levels" are erroneous concepts when applied to mind and brain or microparticles and macroparticles! In the first case we have dualism, in the second there are empty concepts.

Outlined below is an example of the difference between "organizational threshold" and "epistemological-ontological

[7] The notion of "levels of description" is similar to Carnap's "linguistic frameworks" or actual "conceptual frameworks". (See Chapter 6)

[8] Eliminative materialism considers all notions of folk psychology "empty concepts". From an EWs perspective, because of the unicorn-world, they were right to eliminate one set of notions that refers to an EW. What really exists, table or microparticles, is a topic of debate between realist-antirealist approaches. The EDWs perspective is beyond the eternal realism-antirealism debate. (I used the Kantian expression "empty concepts". As we saw in Chapter 2, Kant criticized the dogmatism for using empty concepts!)

threshold" and their relation to the continuity of partition. A table, as a macro-object, exists in the macro-epistemological world. A subject observes the table with her eyes. If we split the table into its legs and its top, we conclude that all the parts are in the same macro-EW.[9] The subject still uses her eyes to observe the parts of the table. If we divide the table into 100 parts (or even if we think about macro-macromolecules), we believe that these 100 parts (or macro-macromolecules) are in the same world. The subject uses a standard microscope for observing the macro-macromolecules. The difference between the table and its macro-macromolecules is just an organizational threshold and therefore both kinds of entities belong to the same EW. In such cases, we do not apply the continuity of partition because there is not an epistemological-ontological threshold between the table and its macro-macromolecules. The issue here is that the theoreticians have gone too far regarding this continuity of divisibility (see the Ancient's turtle game, Kant's infinite divisibility, Newton and Leibniz's infinitesimal calculus, and the paradoxes created by the notion of infinite[10]), considering that a table and the elements that "composed" it (the microparticles) are in the same world. In order to observe the electrons and protons that correspond to a table, the subject has to use an electron microscope. There is an epistemological-ontological threshold between our eyes and a standard microscope on one side, and an electron microscope on the other. Thus we can say that in such cases, through different tools of observation, we observe EDWs. I emphasize that it would be completely wrong to apply the notion of organizationally different parts or different aspects or reality to the mind-brain or table-

[9] I emphasize here that it is meaningless to ask if one leg "observe"/interact with its table! (See 5.9 and 6.10)
[10] A scientific example against this division is Planck's constant.

microparticles "relationships". This alternative was possible only within the unicorn-world framework.

Now I can introduce a new concept, the hyperworld or hyperverse. Epistemologically, the hyperworld would be all the EDWs "observed" simultaneously by a human being. The hyperverse, an abstract notion, represents the hypervisualisation of one hyperbeing, that is, the combination of all EDWs in one image. Ontologically, the hyperverse represents the epistemologically different entities and epistemologically different interactions that take place in the same time. The number of EDWs that human beings can observe is not fixed but it is given by the subject's ability to develop new tools of observation, which can reveal to us new EDWs. However, it is difficult to say how many different observational conditions there are. The *existence* of EDWs does not depend on our conditions of observation but on the existence of epistemologically different entities and their interactions. In general, within an epistemological world, epistemological entities and their organizational different parts follow the same epistemologically different interactions. If, using new tools of observation, we pass an epistemological threshold, we *discover* a new external EW and its entities but we do not "shape" the phenomena, as Kant and Bohr thought. I strongly emphasize that in answering the question, "How many EDWs exist?", we can only use heuristic and scientific methods. Therefore, the identification of EDWs is a scientific and not a philosophical problem.

Under a single set of observational conditions, a subject can observe the constituents of only one EW. Following Bohr, and considering that a subject cannot use two or more tools of observation at the same time, we can postulate the next principle – the principle of complementarity:

As human attention is a serial process, the human subject cannot simultaneously observe EDWs.

Moreover, an observer cannot pay attention simultaneously to an entity and its organizationally different parts. Avoiding the unicorn-world, a researcher, as an observer, can try to see only the *correspondences* between the entities that belong to EDWs described by different concepts.[11] For instance, we can find only the rough correspondences between mental states/processes and neural patterns of activation that belong to EDWs. In the next section, from an epistemological viewpoint, we have to emphasize the role of the conditions of observation in *defining* all epistemologically different entities.

3.2. The role of the conditions of observation in the defining of physical and mental phenomena

It is generally accepted that the conditions of observation play a major role in explaining an external phenomenon. One of the best ways to make this idea more explicit is to look at Kant's philosophy and Bohr's physics. Both of them consider that through the conditions of observation (pure intuition of space and time for Kant and measurement apparatus for Bohr) we have access only to phenomena and not to noumena (or "closed systems of objects" for Bohr). As part of the problem of grasping the relation between the subject (human being) and "reality" (the unicorn-world), the following approaches need to be discussed.

[11] I change "Bohr's view that quantum mechanics and classical physics are complementray aspects of nature" (Dyson 2004, p. 76) into quantum mechanics and classical physics are descriptions of EDWs!

3.2.1. The influence of Kant on Bohr's approach

Kaiser analyzes the strong influence of Kant's approach on Bohr's way of thinking. (Kaiser, 1992)[12] He emphasizes how the Kantian notion of *"conceptual containment"*[13] can be identified in Kant's theory[14]. For Kant conceptual containment means: a judgment is objective with respect to empirical knowledge "if we add to the concept of the subject of a judgment the limitation under which the judgment is made". (Kant 1929, p. 72 A27/B43 in Kaiser 1993, pp. 218-219) For Kaiser, conceptual containment is the inclusion of the conditions and the limitations within the concept of a judgment. (Kaiser 1992, p. 219) For empirical judgments such conditions and limitations are given by the sensible intuition, i.e., by empirical intuitions of space and time.[15] These empirical intuitions refer to phenomena; they result from the interaction between pure intuitions of space and time and the noumena (or thing-in-itself). Thus, the pure intuitions of space and time are conditions of possible experience. Human beings can come to know only phenomena; noumena are unknown forever. Kaiser quotes another passage about conceptual containment from the *Critique of Pure Reason*:

> [N]o object is determined through a pure category in which abstraction is made of every condition of sensible intuition… the employment of a concept involves a function of judgment whereby an object is subsumed under the concept, and so involves at least the formal condition under which something can be given in intuition. If this condition of judgment… is lacking, all subsumption becomes

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[12] Bohr accepts, as does Heisenberg, the Kantian noumen-phenomen distinction that implies the unicorn-world.

[13] "Conceptual containment" is Kaiser's expression. (Kaiser 1992, p. 219)

[14] I am highy indepted to Ilie Parvu for recommending me Kaiser's article.

[15] For the relation between intuitions and concepts in forming judgments in Kant's approach see, for instance, Friedman (1992).

> impossible. For in that case nothing is given that could be subsumed under the concept. (Kant 1929, A 247-B304, in Kaiser 1992, pp. 219–220)

According to Kaiser, "one must include the conditions under which an object is perceived in order for judgments regarding the object to remain meaningful." (Kaiser 1992, p. 220) The judgments that relate "uncontained concepts" (i.e., those concepts that ignore the conditions and limitations of sensible intuitions) produce no empirical knowledge; this knowledge is beyond our possible experience.

Bohr applies the same distinction between noumena and phenomena to the quantum level. He introduces the idea of complementarity for quantum phenomena: because of the conditions of the measurement apparatus the position and the momentum of a particle cannot be observed simultaneously; or the properties of light (wave and corpuscular) cannot be grasped simultaneously. "The wave-particle duality of light... invokes mutually exclusive concepts relating to either wave behavior or particle behavior." (Kaiser 1992, pp. 220–221) Conceptual containment is for Bohr a requirement which says that we have to include the conditions of the observation (i.e. the measurement apparatus) in the definitions of quantum phenomena. Without such a rule, our judgments relate uncontained concepts and thus these judgments have no objective reality.

> [I]t is therefore only proper for practical reasons as well as epistemological reasons to include the observations themselves in the definition of the phenomena. Above all, we obtain by such definition a description that involves no reference to the observing object. Indeed, in account of the experiments, we need not say that we have prepared of measured something, but only that under certain conditions certain measurable effects open to observation and reproduction by anybody have been obtained. (Bohr 1957 in Kaiser 2003, p. 230)

Finally I introduce Bohr’s reply to Einstein's ontological realism: “… I advocated the application of the word *phenomenon* exclusively to refer to the observation obtained under specified circumstances, including an account of the whole experimental arrangement.” (Bohr 1949)

3.2.2. The principle of conceptual containment

Let us now apply the notion of “conceptual containment” to the perspective of the observer. It follows that a specific set of observational conditions offers us a particular epistemological world. Specific judgments describe the phenomena of each epistemological world. These judgments must follow the rule of conceptual containment. As we saw above, for Kant conceptual containment means the inclusion of the conditions and limitations within the concept of the judgments. These conditions and limitations are given by the empirical intuitions. I introduced the internal and external tools of observation (observational conditions) that offer us EDWs. The conditions of observation represent, in a Kantian sense, the conditions of possible experience. Due to the evolution of species, and the development and experience of each individual in a “standard” or normal environment, human beings have certain empirical intuitions that correspond to external tools of observation, but also certain mechanisms of internal observation. Thus, we can also extend the rule of conceptual containment to the internal tools of observation.

In my view, the process of “perceiving an object/entity” means to perceive internal or external objects. Internal and external tools of observation play the same role for perceiving internal or external phenomenal objects. Thus, the judgments of internal knowledge must follow the conceptual containment rule given by the properties of internal tools of observation that involve mental states (representations). For empirical (external) knowledge the conceptual containment is given by empirical intuitions; for internal knowledge this rule is governed by the properties of mechanisms that observe internal mental states. In both cases, we deal with a process of observation of internal or external objects. Using different conditions of the observations we can observe either mental states or neural patterns of activation.

Up to this point, the aim of this entire argument has been to allow us to introduce the principle of conceptual containment specific for our analysis:

> **The set of judgments that describe the phenomena of each epistemological world must follow the rule of conceptual containment that is given by the conditions and limitations within the concepts of the judgments. These conditions and limitations are governed by the properties of (internal or external) tools of observation.**

Different properties of the tools of observation lead us to different epistemological worlds. Not only do internal and external tools of observation offer us EDWs but also different external tools of observation can grasp EDWs. The external tools of observation are different because they have different properties; in consequence, they present us with EDWs. For instance, fMRI and PET grasp certain neural patterns of activation. Epistemologically, in Kantian terms, the conditions of observation are the “transcendental conditions” or “conditions of possible experience” that reflect, at the same time, the possibility of mental states and possibility of experience of external entities.

We can say that constructing judgments that presuppose genuine, direct relationships between psychological items and neuronal items (or between microparticles and macroparticles) is a mistake, because such judgments that relate uncontained concepts do not follow the conceptual containment rule and therefore do not have objective reality. Working under the unicorn-world's umbrella, researchers in philosophy of mind (or even in science) construct Ptolemaic epicycles for proving or denying the existence of, ontologically or at least epistemologically, two different substances. In their constructions, the researchers have used either empty concepts within the unicorn-world, or they eliminate concepts that are valid within the EDWs perspective. The similarity between Descartes and the proponents of identity theory (and all other approaches) is that they all work under the unicorn-world's umbrella. The difference is that dualism has notions like "mind" and "brain" that represent two different substances within the unicorn-world, while the identity theory has empty concepts like "mind" and "brain" within the same unicorn-world. For Descartes, two kinds of perception represent the constitutive conceptual-intuitive conditions of observation of mind and brain. Without using constitutive elements (that are, for Kant, the intuitions and the categories), the identity theory has not only one erroneous concept, the "unicorn-world", but also at least one empty concept, "mind" or "brain". In this framework, mind and brain belong to different *conceptual schemes/frameworks* (that is a completely different notion than Kant's possibility of conditions of existence). Within such conceptual frameworks there are, in Kantian terms, no constitutive elements. If for constructing such elements as mind and brain, someone were using constitutive elements within the same unicorn-world, then there would be a contradiction.[16] For

[16] This line is common to the "conceivability" argument that infers the *metaphysical possibility* of the existence of entities. (Chalmers 2003, p. 5) It seems to show us the impotence of attempting to prove the existence of both mind and brain within the unicorn-world.

avoiding such contradictions but preserving the unicorn-world, philosophers (following Wittgenstein and Carnap – see Chapter 6) and scientists have introduced different linguistic frameworks that explain the same reality. I emphasize here that the same argument is available for the distinction between two essential notions in philosophy, ontology and epistemology.

What we can do instead to avoid these errors is to try to see only the *correspondences* between the concepts that describe different phenomena that belong to EDWs. A particular concept describes a specific object/phenomenon that belongs to one epistemological world. A different concept describes an object/phenomenon that belongs to a different epistemological world. These two concepts under discussion do not refer to the same object/phenomenon because each object/phenomenon described by them belongs to the epistemologically different worlds. Therefore, in the best case, we can try to find a correspondence between objects/phenomena described by those different concepts that belong to EDWs. At this point, it is useful to clarify the notion of correspondence between objects/phenomena described by mind and for brain (body) terms within different EDWs.

3.2.3. The physical human subject or the "I"

The point here is to see how a phenomenon from one epistemological world corresponds to a phenomenon from a different epistemological world. For example, we may ask what neural or physical processes correspond to human subjectivity as it is understood by Searle or human experience from Chalmers' perspective. (Searle 1992; Chalmers 2003 and 1995) In my terms, human experience or subjectivity are equivalent notions for the "I".

We saw above that we can become aware by human subjectivity only through internal tools of observation. Evidently there is a difference between the notion of "awareness" and that of "knowing". The "I" can have clear, distinct, and complete internal or external perceptions for internal or external entities. Until the end of 19th Century, within the Cartesian method, thinkers had identified external entities through clear, distinct and complete perceptions. From the beginning of last century until our day, this method has not been possible to be applied – especially in modern physics. In modern physics, explaining certain entities and processes requires not only empirical data but also theoretical knowledge. We can "identify" certain entities without having clear, distinct, and complete perception. In these cases, the theoretical part or "conceptual scheme" becomes essential for defining the existence of such entities. However, I think that the framework of conceptual schemes offers us the possibility of using "empty" concepts in different theories that explain various entities and processes. In this sense, these theories have an epistemological character but not an ontological one.

The internal entities are more difficult to identify. For describing the mental states and processes, we have to include in their definitions the "conditions of observation" or "conditions of having" them. From the first person-ontological viewpoint, this means finding the relationship between the mental representations/feelings (pain, etc.) and the subjectivity/self. I want to briefly emphasize the relationship between syntax and semantics regarding the existence of internal entities. Carnap (in philosophy) and Turing (in science) followed by Chomsky and his disciple, Fodor, found the existence of internal entities only on syntax but not semantics. As we will see in Chapter 6, later in his life, Carnap renounced the authority of syntax. Against Fodor's computationalism, Searle's Chinese Room replies to the authority of syntax. I think that Fodor and other people from philosophy have applied almost the same method as for external entities: that depends upon location. In this case, it seems to me that the researchers have made a kind of unconscious analogy between external and internal entities. The consequence of this analogy is that syntax was considered the process of localization of mental entities in our mind. For internal entities it is not the spatio-temporal framework that we can use for their location. However, the temporal dimension is still used.[17] Fodor (and previously Carnap) and his proponents have used syntax for the location of mental states. The problem is that the "I" cannot "localize" the meaning of its internal entities. As we will see in below, in the attempt to explain the meaning of internal mental representations, the "I" needs to use different pairs-processes of the mind like explicit-implicit, conscious-unconscious, and declarative-procedural.

From my perspective, the distinction between "conditions of observation" and "conditions of having" reflects the dispute over the explanatory gap between mental and neuronal levels. The observational conditions created by the external tools, such as fMRI and PET, do not allow us to "observe" mental states but only firing neural patterns that correspond to those mental states. McGinn stresses that the common characteristics ascribed to mental states and processes are unobservable, asymmetrically accessible, subjective, non-spatial, and subject dependent. (McGinn 2001, p. 258)[18] In spite of that, it is believed that we

[17] Regarding Fodor's approach on mental characteristics of compositionality, systematicity and productivity, see Chapter 5. All three characteristics entail temporality.

[18] McGinn mentions "the role of perception in shaping our understanding of the brain – the way that our perception of the brain constraints the concepts we can apply to it" and goes on to say that "The property of consciousness itself (or specific conscious states) is not an observable or perceptible property of the brain." (McGinn 1989, p. 105) By way of comparison, we could equally say that "rain is, an object of perception, laid out in space, containing spatially distributed processes; but consciousness defies explanation in such terms". (p. 106)

can observe the *correspondence* between the "I" (human subjectivity) and certain physical phenomena. There is a difference between being aware (or self-aware) of human subjectivity (through internal tools of observation) and describing it with the help of some external tools (fMRI, for example). The description – in physical terms using different concepts – is something that corresponds, with very rough approximation, to what we are aware of. The tools of observation used by the subject provide this difference. The difference between "conditions of observation" and "conditions of having" (or between internal and external conditions of observation) and the observed/having objects is their relation to the subject as an observer.

(1) The problem of subjectivity in neural terms

In order to describe human subjectivity using physical terms, three aspects have to be taken into account. Firstly, I will analyze the subject from an external viewpoint or third-person identity taking as an example a subject observing a red object. Using various tools of observation like fMRI and PET, I consider the following parts of the subject (who observes a red object) are activated:

(a) The firing neural pattern at one moment produced by one external stimulus.

Some authors claim that the most activated neural pattern is to be taken as representing a certain conscious mental state. Kanwisher mentions "the strength hypothesis": the more active a given neural representation, the stronger its representation in awareness.[19] However, against this hypothesis, Kanwisher

[19] This neural pattern is changeable depending on the past experience of each individual.

adopts Baars' position: "awareness of a particular element of perceptual information must entail not just a strong enough neural representation of that information, but also access to that information by most of the rest of the mind/brain." (Kanwisher 2001, p. 105)[20] Baars proposes what he calls "the global workspace" paradigm for consciousness: the brain as a whole, or at least a large part of it, is engaged in consciousness at one moment. (Baars 1988) This leads to the second aspect:

(b) A certain part of the nervous system that consists of a considerable number of other firing neural patterns; the set of these patterns can be viewed as forming a pyramid of neuronal patterns of activation.

The correspondence between one mental state that reaches the level of consciousness and neural patterns of activation is not an isomorphic one. Many theoreticians consider that consciousness involves the most activated pattern and other large parts of the brain (with a lesser degree of activation). For instance, Kanwisher takes up an idea introduced by Green and Swets according to which perceptual awareness is not "an all-or-none affair, but a graded phenomenon which admits many shades of grey". (Kanwisher 2001, p. 103) Treisman goes further and claims that attention, i.e. the feed-back projections from high levels to low level of vision, is involved even for binding processes.[21] (Treisman 1998a; 1998b) Damasio and

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[20] Moreover, Kanwisher raises the studies made by Luck et al. (1996) and Rees et al. (2000) which show that neural signals can be as strongly activated in conscious states as in unconscious states.

[21] The binding problem would correspond – from one viewpoint – to the Kantian notion of synthesis. From EDWs perspective, it is meaningless to search for the binding problem of neural patterns of activation or what the self means from a neural or third-view point. Again, it is like an electron interacts with the table that composed it, i.e. a mixture between EDWs.

Damasio believe that recollections or perceptions of the human face that imply consciousness require the activation not only of early visual cortices, lateral geniculate, and superior colliculus but also of other cortical structures and processes. (Damasio and Damasio 1996, p. 21) Damasio has introduced the notion "convergence zones" to deal with the association or synchronization among different patterns of neurons that correspond to one mental state. (Damasio 1989)

For Edelman and Tononi, consciousness is a process that involves groups that are widely distributed in the brain. (Edelman and Tononi 2000) Consciousness presupposes mainly the re-entrant interactions among these groups which are the most important feature of the brain: "reentry leads to the synchronization of the activity of neural groups in different brain maps, binding them into circuits capable of temporally coherent output". (p. 85) Thus, through their book they present strong arguments for the idea that consciousness engages large populations of neurons that are widely distributed across the brain. However, even if only a small subset of the neuronal groups contributes directly to conscious experience (p. 143), every consciousness state "requires the activation and deactivation of many regions of the brain". (Edelman and Tononi 2000, p. 140)

From a similar perspective, Crick and Koch argue that the neural correlates of consciousness at one time engage one part of the cells but their firing influences other neurones, the so-called "penumbra", which makes a contribution to the process of understanding. (Crick and Koch 2003) In their turn, Llinas and Parre indicate that the "fact that all frequencies are not equally probable determines that certain resonant frequencies will be observed preferentially". (Llinas and Parre 1996) The cognitive task of focusing attention on a certain single item seems to engage a considerable number of implicit links among the nodes of the most activated pattern and the nodes of other less activated patterns, which form a sort of pyramidal pattern of activity. "The selective property of attention is presumed to be expressed by a positive difference between the activity levels in columns that code for the target and the activity levels in neighbouring columns that code for other (distracting) objects." (LaBerge 2002)

Not surprisingly, other scientists like Merzenich and deCharms tried to find a correspondence between the pyramid of neuronal patterns of activation and a mental state from the conceptual level. According to them, in neural terms there is a *representational perceptual constancy*. However, at the neural level, the pattern of activity of the ensemble of neurons−from which the perceptual representations emerge−is permanently changing and moving. "[R]epresentational relations among a group of neural elements can be isomorphic across changing patterns of activity in effective connectivity, and thereby can accomplish representational constancy." (Merzenich and deCharms 1996, p. 66) Merzenich and deCharms take the relations between neurons to be more important than the neurons themselves. Vacariu et al. (2001) continue this idea claiming that we can speak of a conceptual constancy at the conceptual level even if the ensemble of neurons that correspond to that conceptual representation is changing continuously. The correspondence between one mental state and certain patterns of neurons is called the "interval of similarity" in which the structures, the states and the processes from the psychological world appear to be identical, even though the patterns of activity of the neurons that correspond to them are continuously changing. (Vacariu et. al 2001 and see Chapter 5)

A parallel between the already classical approaches in cognitive science, computationalism and connectionism, can bring us to the same conclusion: at the conceptual level, the primitives are the *symbolic representations*, which are static and discrete entities. At the neural level, the corresponding elements of symbolic representations are the neurons' patterns of activation. However, there is no univocal correspondence between primitives from the conceptual level and those from the neural one. "[T]he structures of 'higher levels' of system are rarely isomorphic, or even similar, to the structures of 'lower levels' of a system." (Fodor and Pylyshyn 1988, p. 63)

Some findings in neuroscience indicate a direct correlation of the certain firing neural patterns and a certain mental state. For instance, Rolls points out that "if we know the average firing rate of each cell in a population to each stimulus, then on any single trial we can guess the stimulus that was present by taking into account the response of all the cells". (Rolls 2001, p. 157) Georgopolous shows that we can predict the direction of a monkey's arm movement just before grasping an object through observing the neural patterns that are activated in that moment. Each neuron "votes" for certain direction and the resultant vector of the neuronal population determines the direction of the arm's movement. (Georgopolous 1988) However, for humans even perceptual awareness is a complex process that implies feed-forward and feedback projections between early visual processing and higher-level neurons. Trying to explain a mental state through certain neural patterns that are the most activated provides only a loose approximation to reality.

Finally, we come to the last aspect that we need to take into account:

(c) The counterpart (or the rest of the brain and body) that is not activated (or at least it is not to be seen as activated under the observational conditions provided by PET and fMRI).

Since sensory systems can be regarded as extended parts of the nervous system, the whole body can be viewed as part of the just mentioned counterpart. Llinas and Pare offer one prop for the subsistence of the counterpart: perception at a given moment is

> represented by a small percentage of coherently oscillating cellular elements over the whole thalamocortical system. The rest of the thalamocortical system, being silent to such coherence, may in fact represent the necessary counterpart to the temporal pattern of neuronal activity that we recognise individually as cognition. (Llinas and Pare 1996)

Moreover, the internal tools of observation belong to this counterpart. If such a counterpart is necessary for explaining perception at a particular moment, then it seems obvious that the counterpart has to be engaged for explaining human subjectivity.

Now, where do all these considerations lead us? We can say that all these elements are part of the epistemological world that we call brain or body. As we have already seen, it would be almost impossible to identify exactly what entities from the other epistemological world – the mind – correspond to these elements. It follows that a particular part – the activated pyramidal patterns of neurons – has a counterpart that is the rest of the brain and body. From this perspective, a particular understanding of human subjectivity or human experience is given by the part-counterpart principle:

> **In physical terms, the part-counterpart relation corresponds to the "I" or human subjectivity or experience.**

We can explain the "I" or the human subjectivity or experience in physical terms (or "What is it like to see a red object") only through the part-counterpart relation. Using external tools it is practically impossible to grasp human subjectivity as a whole. Human subjectivity is a universal property of the human species, that is, every human has the feeling of her self, as an individual, due to the internal tools. However, we cannot perceive this property using external tools.

Damasio and Damasio define the self in neural terms: "We see the self as the neural structure and neurobiological states that help us know, without the help of inferences based on language, that the images we perceive are ours rather then somebody else's.") (Damasio and Damasio 1996, p. 22) The subjective state of perceiving an object presupposes different neural structures that represent the image of that object, the image of the self, and the connection between the self and the image of that object, i.e., the convergence zone. (p. 25) The "self" means "a collection of images about the most invariant aspects of our organism and its interactions". (p. 23)

Offering various experiments from cognitive neuroscience, Macrae et al. try to explain self-knowledge from a neuroscientific viewpoint. They suggest that the medial prefrontal cortex seems to be essential in self-referential and mentalizing processing and social-cognitive functioning (simulation of other minds, the use and representation of social knowledge, and moral reasoning). (Macrae 2004, p. 1073) Klein mentions various papers written by different authors that support the idea that "self-descriptiveness produced activation of cortical area associated with semantic memory retrieval (left frontal regions) but not those associated with episodic memory retrieval (right frontal regions)". (Klein 2004, p. 1080) However, he has a footnote in which he mentions that, even if there are various studies that support the conclusion that the self can be located in the left cerebral hemisphere (that presupposes the doctrine of modularity embraced by cognitive science), neurologically, declarative knowledge is distributed widely across the cortex. (p. 1086) This footnote cautions against the location of the self or even self-knowledge in an isolated neural area.

I think we cannot reduce the self only to the brain. The activations of neural patterns are due to external or internal (bodily) stimuli and thus the self or subjectivity means the unified brain-body.[22] Crucial here is the difference between the local and the global. Using external tools we can grasp only local areas of the brain; internal tools, like introspection, presuppose not only that mental state but also the part and counterpart, i.e., the subject as an individual entity. For supporting this principle, I introduce two examples from neuroscience. In a very recent paper, studying the behavior of real and simulated robots, Lungarella and Sporns analyze their sensory and motor data in contact with the environment. (Lungarella and Sporns 2006) Within an embodied cognition framework (that is quite close to a dynamical system approach, see Chapter 5), they emphasize the essential "effects of embodied interactions on (internal) neural information processing". (Lungarella and Sporns 2006, p. 1301) Sensorimotor interactions (sensory inputs) and body morphology have a precise role in inducing information in the neural system followed by motor outputs. (p. 1307) This view is against the classical paradigm (computational approach, see Chapter 5) in which cognition is related to the brain but the body is completely excluded from the equation. The researchers were able to measure the information flow from the environment to their robots and vice-versa. These measurements convinced Lungarella and Sporns that the embodied cognition paradigm is the only framework in which we can understand the human mind and construct artificial intelligently devices. Their conclusion is that there is a continuous interaction between brain, body and environment that produces intelligent behavior and cognitive processes. (p. 1309) Sporns declared that

> Really, this study has opened my eyes. I'm a neuroscientist so much of my work is primarily concerned with how the brain works. But brain and body are never really separate, and clearly they have evolved

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[22] As we saw in Chapter 1, even for Descartes the process of thinking includes perception, imagining, etc.

> together. The brain and the body should not be looked at as separate things when one talks about information processing, learning and cognition -- they form a unit. This holds a lot of meaning to me biologically. (Sporns 2006)

The proponents of the dynamical system approach and embodied cognition claim that in order to understand human cognition we need to introduce into the equation not only the brain but also the body and the interactions with the environment. From an EDWs perspective, I can specify a positive and negative point regarding Sporns and Lungarella's ideas. The positive point refers to the essential continuous interactions between brain, body and environment. Obviously, rejecting the computational approach but embracing the embodied cognition perspective, we cannot analyze the brain in complete isolation from the body. The negative point is again the unicorn-world: mind and brain are not in the same "world". This vital union between brain and body corresponds to the "I" or to the mind-EW. We cannot analyze mind in interaction with the environment because mind has no place in any environment but is just an EW. Because brain, body and environment are in a continuous reciprocal interaction, the neural states and processes are in a continuous change. But the "I" that corresponds to the brain and body (and their interaction with the environment) is quite stable (see the "interval of similarity" from Chapter 5, the processes of change for various neural states need to pass a threshold to change the corresponding mental states that belong to the "I").

In a short paper, Raichle hints at a special topic in neuroscience: the dark energy of the brain. The question is what does the brain need so much energy for? "The brain apparently uses most of its energy for functions unaccounted for – dark energy, in astronomical terms." (Raichle 2006, p. 1249) In modern times, using PET and fMRI researchers realized that the energy necessary for the brain to manage the demands of the environment is less then 1%. The brain's metabolism and its circulation requires only a little of the energy consumed by the brain. In this context, the logical answer seems to be that the energy is necessary for the intrinsic activity of the brain. But what does "intrinsic activity" mean? Raichle analyzes some possible answers to this question:

a) Spontaneous cognition – our daydreams or the stimulus of independent thoughts. However, his reply to this alternative is that the brain responds with a small amount of energy for controlled stimuli so the energy cannot be larger for the stimulus of independent thoughts.

b) Intrinsic functional activity facilitates responses to stimuli. Receiving continuously excitatory and inhibitory inputs, the neurons (patterns of neurons and large parts of the cortex) pass through various "balances" that determine their responses.

c) Interpreting, responding to and predicting environmental demands. Finally, Raichle suggests that further research is needed to clarify the spontaneous activity of neurons. (Raichle 2006, p.1250)

From an EDWs perspective, I maintain that the dark energy represents the relationship of the large parts of the brain and the body. As we will see below, the dark energy of brain (that includes Crick and Koch's penumbra) and the rest of it and the body represents the part-counterpart relation and corresponds to the "I". I maintain that the dark energy represents the relationships of the large parts of the brain, the body and the environment. We have to take into account that after a period of training, neural patterns reduce their activation for achieving a task.

(2) The problem of subjectivity in psychological terms

As a reaction to Hume's doubts on the self, Kant believes that the "I" exists but we cannot prove its existence. In several places (B157, A355, A342, 350, 346/404, A363, B400, B155, B157, B161, etc.), he uses the expression "bare consciousness" or "simple representation" or "indeterminate perception" to illustrate consciousness without qualities. "Through the "I", as simple representation nothing manifold is given." (B135) (See Chapter 2)

In our days the notion of subjectivity is very problematic. However, the question "Does the 'I' exist?" still has no definitive answer. In order to explain human subjectivity in psychological terms from an EDWs perspective, I need to introduce some psychological dichotomies concerning the notion of representation elaborated by Mandler (1998 – see also Chapter 5). She synthesizes these dichotomies in pair-notions: declarative-procedural, accessible-inaccessible, conscious-unconscious, conceptual-sensorimotor, symbolic-subsymbolic, and explicit-implicit. (Mandler 1998, p. 265) These dichotomies are interconnected and partially overlap without being identical. (Mandler 1998, p. 265) The declarative-procedural distinction is based on whether or not the knowledge in question is accessible or inaccessible to consciousness. Procedural knowledge remains inaccessible to consciousness, since we have access only to the effects of procedures, not to procedures themselves. The fact that we use declarative knowledge for gaining procedural knowledge does not entail our having accessibility to procedural knowledge. We are never aware of the details of procedural knowledge by means of which our habituation can increase the performance of our body for some actions. Mandler maintains that we cannot conceptualize and think explicitly about sensoriomotory information.[23] "Sensorimotor

[23] In philosophy and psychology, there are of course various definitions of Mandler's pairs of knowledge, but I think her definitions are quite close to those of others. For instance, mentioning Tulving, Cohen and Eichenbaum, Parkin, and Schater, Klein talks about the procedural memory (acquisition and retention of motor perceptual and cognitive skills) and declarative memory (facts and beliefs about the world). (Klein 2004, p. 1078) He emphasizes that this pair reflects Ryles' classic distinction (1949) between knowing how and knowing that. However, he mentions Tulving's

schemas are structures controlling perception and action, not meanings to be used to interpret words". (Mandler p. 293) This, of course, does not mean that a person is not aware of sensations (qualia) involved in perceptual and motor learning. "You see that a tree is green, you experience greenness, but this is not the same as thinking". (Mandler 1998, p. 266) This shows the difference between the conceptual and sensoriomotor. According to Mandler, while the declarative-procedural distinction is a processing distinction, the implicit-explicit distinction has to do with the

> presence or absence of attention and elaboration: Verbal material that is consciously attended to and semantically analyzed, is called explicit, whereas verbal material that is unattended or at any rate not consciously elaborated (Dorfman and Mandler 1994; Schater 1992) is called implicit. (Mandler 1998, p. 267)

From the EDWs perspective, how can we explain human subjectivity in psychological terms? The "I" "perceives" (or according to Slezack, "has") certain internal representations or has various feelings like fear, pain, etc. The processes of having mental representations or various feelings involve the "I" that, according to the part-counterpart principle, corresponds to whole brain-body interactions. If we define the existence of all other epistemologically different entities with the help of their interactions, we can say that the "I" does not interact with anything else. The "I" cannot "observe" itself as a complete entity (in Cartesian terms). Moreover, an "I" cannot observe another "I". Does this means that the "I" does not exist? In order to define the existence of human subjectivity, I have to once again change the notion of the existence. Through the interaction of the brain and the body with the environment, certain patterns

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classification of declarative memory: semantic memory (generic, free-context knowledge) and episodic memory (the records experienced by the self at a particular point in space and time. (Klein 2004, p. 1078) of neurons are activated. These brain-body-environment reciprocal causal interactions *correspond* to the "I" or to the mind-EW. However, the mind has no place in the "world"; the mind is just an internal EW or the "I".[24] Because brain, body and environment are in a continuous reciprocal interaction, the neural states and processes are undergoing continuous change. But the "I" and its mental states that correspond to the brain (neural patterns of (dis)activation) and the body (and their interaction with the environment) is an EDW. The processes of change for various neural states need to pass a threshold for changing their corresponding mental states and processes that are the "I". Slezack considers that the subject has mental states but does not see or perceive them. (Slezak 2002a, p. 210) For me such mental states and processes represent implicit and explicit knowledge and the other pairs of knowledge. Nevertheless, even this movement presupposes two elements that cannot be explained: the "I" and the knowledge. Therefore I need to push this "have" further: these mental states and processes *are* the "I". This time changing the notion of existence means to pass from explicit knowledge to implicit knowledge: there exist *not only entities for which we have explicit knowledge (external epistemologically different entities – electrons and planets – or*

[24] We have to remember Wittgenstein's analogy between eyes-visual field and self-world. (5.633) Within the unicorn-world, he needed to introduce a border between the self and the "world". Trying somehow to follow Kant, he considers that "The world is *my* world" (5.62), and therefore the self has no place in the world: "The subject does not belong to the world: rather, it is a limit of the world." (5.632) However, according to Parvu (personal communication), Wittgenstein does not refer to the "limit of the world" (in German "schranke" means "limit") but to the "margin of the world" (in German. "grenze" means "margin" or "border"). The concept of margin is not negative-limitative (in the mathematical sense) but positive-affirmative. Wittgenstein borrows this notion from Kant. However, from an EDWs perspective, there is no margin between the self (as an EW) and the macro-EW. We can find only the correspondences between entities that belong to these EDWs.

internal entities – mental representations) but also entities that are implicit knowledge, i.e., the "I".

I mention that implicit knowledge is the result of the development and learning processes through the life of each individual. This knowledge corresponds to biological mechanisms that are the results of the evolution of our species and the development of each organism in the continuous reciprocal interactions between brain, body and environment. Due to the evolution of species and development of each individual the "I" is feelings, desires, etc. I consider the feelings and desires to be knowledge as well. The mental representations and processes (that only *correspond* to parts of the brain and body) *are* the "I".[25] Now we can introduce the last principle. Human subjectivity or the self in psychological terms is given by the principle of knowledge:

The "I" is knowledge.

I emphasize that in this case the content of knowledge has at least four elements that overlap:

(1) Any kind of knowledge (declarative and procedural, accessible and inaccessible, conscious and unconscious, conceptual and sensorimotor, symbolic and subsymbolic, and explicit and implicit knowledge).

(2) All kinds of memory.

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[25] Following Wittgenstein, Merleau-Ponty maintains the "unobservability" or "non-representable" of the body. (O'Brian 1996) Because of the unicorn-world, both Wittgenstein and Merleau-Ponty were forced to eliminate the subject or the body from the "world". More exactly, without replacing the unicorn-world with EDWs, Wittgenstein introduces the border between the subject and the "world", while Merleau-Ponty eliminates the body from the "world". From an EDWs perspective, the "I" is unobservable or non-representable (Merleau-Ponty). From an EDWs perspective, the "I" corresponds to part-counterpart. The "I" is not only eliminated from macro-EW but is an EDW.

(3) Descartes' functions. For him, the "I", as a thinking thing, has different functions (or properties) such as doubting, understanding, denying, willing, sensing and imagining. (Descartes 1994, p. 82)[26]

(4) Self-knowledge[27] and the capacity (possibility) of knowledge for manipulating itself. This capacity involves, among other features, Fodor's characteristics of the mind: compositionality, systematicity and productivity. (Fodor and Pylyshyn 1988) This knowledge corresponds to the biological elements of a human subject. For Kant, the "I think" is to unify different representations in a single consciousness. (Allison 1983, p. 142) But thinking requires the unity of the self and synthesis is the process of unifying the manifold of representations. There is a

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[26] Essential for the EDWs perspective are the following from Descartes' philosophy. "By the term *thought*, I understand everything which we are aware of us happening within us, in so far as we have awareness of it. Hence, thinking is to be identified not merely with understanding, willing and imagining, but also with sensory awareness." (Principles, I, p. 9) For Descartes, there is no clear distinction between "what the mind perceives and what it conceives". (Wahl 1998, pp. 190–191) Cottingham translates the term "thought" as "something which I am immediately aware". (Cottingham 1986, p. 34) (See Chapter 1)

[27] Regarding self-knowledge from a cognitive neuroscience viewpoint, see recent papers of Klein (2004) and Macrae et. al (2004). Klein considers that the "unified self is composed of several functionally and neurally isolable components. These include episodic memories of one's own life, representations of one's own personality traits, facts about one's personal history (semantic personal knowledge), the experience of personal agency and continuity through time, and the ability to reflect on one's own thoughts and experience. (Klein, 2001)" (Klein 2004) Klein's main attempt is to show that self-knowledge is a "functionally isolable subsystem of semantic memory" that is different to episodic memory. (p. 1084) To support his approach, he introduces information from psychological and neuropsychological cases of people with impaired cognitive functions. From an EDWs perspective, self-knowledge, semantic and episodic memory are all included in the definition of the "I". We can talk about "isolable subsystems" only by physically analyzing a human subject that belongs to the macro-EW. In that EW, the "I" does not exist as an entity.

correspondence between original synthetic unit of apperception and synthetic unity of self-consciousness (that is "the condition under which every intuition must stand in order to become an object for me". (B138 – See 2.1) From an EDWs perspective, the "I" is this synthesis or the unity of self-consciousness that is "a necessary condition for the representation of an object". (Allison 1983, p. 146) This is Allison's bidirectionality between the unity of the "I" and the unity of an object. (See 2.3) According to Kant, the apperception of self is an "act of *spontaneity*…. it cannot be regarded as belonging to sensibility". (B139) Spontaneity, as subject to categories, determines the unity of a particular representation (B132) and syntheses the action of imagination and understanding. (See 2.3) As an explicit knowledge, this spontaneity corresponds to the interactions in the brain. However, according to the principle of conceptual containment, we have to include the whole "I" in defining this spontaneity. Thus, spontaneity (explicit knowledge) is possible because of the potentiality of implicit knowledge. Kant maintains that the transcendental unity of apperception, that is the unity of the "I", offers the synthesis of all possible appearances in one experience or one nature. (A108 or B165, see 2.3) Apperception (as spontaneity of thought) involves the awareness of existence. Kant asserts that even if the "I" is a composite entity, the "I" exists as indivisible. (Brooks 1994, p. 168) We can say that only the unity of the "I" offers the unity of mental representations. Even if the "I" is composed of mental representations and processes (that are parts of knowledge), the "I" is indivisible because of the process of overlapping of the knowledge. The unity of mental representations entails the "absolute unity of thinking subject" (A335/B392). The transcendental "I", as the possibility of knowledge, is an EW as an "integral object of possible experience". (*Prolegomena* IV: 297 in Parvu, p. 401, see 2.3) From an epistemological viewpoint, without the unity of the "I", it is meaningless to talk about the unity of mental representations that represent the unity of epistemologically different entities that belong to EDWs. (See A363 in 2.3) From an ontological viewpoint, the unity of an EW entails the unity of its epistemological entities. It is useless to check for the corresponding physical elements for the representation of the self because the self or the "I", according to principle part-counterpart, corresponds to the part-counterpart.

Descartes' principle of "I think therefore I exist" is transformed into "The 'I' is thinking but, more generally, the "I" is knowledge." Thinking presupposes the existence of mental representations and processes of computation. However, the "I" is not only thinking but also feeling, sensing, etc. But these processes do not represent the stability of the self. Therefore, in more exact terms, the "I" is knowledge, including *implicit* knowledge offers the necessary stability. The "feeling that I am" (the self-knowledge) is the implicit knowledge. In fact, the traditional "I" – as a simple representation where "nothing manifold is given" (Kant, B135) or "bare consciousness" – would be all knowledge and the possibility of manipulating knowledge. In Kantian terms, we can say that the "bare consciousness" is the synthesis of implicit knowledge.[28] The synthesis of the implicit and explicit knowledge is the unity of the "I". In Kantian terms, the principle of knowledge becomes: "The 'I' is synthesized knowledge". Being such synthesized knowledge, the "I" can access in parallel various parts of "its" knowledge even if it can be conscious of this knowledge only in serial. Kant wrote that original synthetic unity of apperception belongs to understanding not to sensibility. (See 2.1) For Kant, thinking is synonymous

[28] The "I" appears to myself without any qualities and we have that "me includes my trancendental aspect". (Brooks 1994, p. 92) The transcendental aspect is the implicit knowledge that is the "transcendental" element in relation to explicit knowledge!

with "spontaneity", that is always "self-causing" activity. (Pippin 1997, pp. 30–1) Even "representing or 'act of spontaneity' that 'cannot be regarded as belonging to sensibility', he calls 'pure apperception'." (Pippin, p. 39) The concepts are "based on the spontaneity of thought". (A68/B93 in Pippin p. 33)

From an EDWs perspective, the implicit knowledge belongs to the "understanding" and only corresponds to the brain activity. Kant's spontaneity of thought corresponds to the interactions between certain neural patterns of activation. Kant considers that the spontaneity is a "determination of my existence". (Kant B158 in Pippin 1997, p. 34) This idea reminds us of Descartes' expression "I think therefore I exist." From an EDWs perspective, the possibility of spontaneity is the implicit knowledge and the spontaneity of thoughts is the explicit knowledge. In Kantian words, "… the spontaneity of knowledge, should be called the understanding." (A51/B75 in Pippin, p. 33) The cause of the spontaneity of our thoughts that presupposes Fodor's compositionality, systematicity, and productivity is the implicit knowledge that produces these properties that correspond to the brain activations. Even the sensibility belongs to the mind and there is only a correspondence between the sensibility and the interactions between the brain and the environment. Implicit knowledge is formed in a similar but not exactly the same process to that which occurs in connectionist networks. For each self, the elements of knowledge superimpose during the process of development and the adult period to create and change the "I". The superposition of knowledge on the corresponding neural networks would represent the so-call "unity of the self". The self, the unity of the self, the elements of knowledge and the elements of self are the same thing.[29] Obviously, the training experience in

[29] For Kant, the transcendental unity of apperception presupposes the unity of the self. Thinking requires this unity. The original synthetic unity of apperception includes the process of unification of all my representations in

daily life means the acquisition of new knowledge that refines the "I". The "I" cannot recognize the very minor changes in it which take place each day because of the huge difference between the old knowledge (superimposition of an enormous quantity of implicit knowledge over a period of years – that would correspond to Raichle's dark energy that involves the possibility of "spontaneous cognition" or Kant's spontaneity) and the new knowledge (acquired in one day or in one hour). Being an *a priori* knowledge in relation to the new knowledge, this old knowledge would represent the transcendental "I" that is quite stable because of the superposition of implicit knowledge. Mental representations are relatively stable, too.[30] However, I emphasize again that the "I" does not exist as an entity separate or somehow isolated from knowledge.[31] The "I" has no spatial dimension (this is the reason the superposition of mental representations and processes is possible), but only a temporal dimension (that is related to the serial status of consciousness). I recall some of Kant's ideas: numerical identity is inseparable from the transcendental representation of self-consciousness that incorporates all representations belonging to the totality of a possible self-consciousness. (A113 and A111 or A107) The

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one consciousness, *my* consciousness and the aptitude that represents the possibility of "I think" to accompany all "my" representations. This difference between the "I" (or, for Kant, the "bare consciousness" or the "I" as a whole represented without any properites or qualitites – see 2.3) and mental representations is another major mistake (the unicorn-world is the first mistake) regarding the "I" in human thinking since Ancient times. (See Chapter 2)

[30] Related to this idea is the notion of the "interval of similarity" for a mental representation (see 5.6).

[31] With superposition and implicit-explicit knowledge, we can much more easily explain the parallel-serial and holism-atomism processes of knowledge. Implicit knowledge takes place in parallel and it is correlated to holistic knowledge (the "I"), while explicit knowledge occurs in serial and it is correlated to the atomistic knowledge of the "I".

combination of all representations is the result of a unified act of transcendental apperception that is the unity of or *unchangeable* consciousness. (A 107) According to the principle of knowledge, the "I" is both implicit (unconscious) and explicit (conscious) knowledge. The Kantian "unchangeable consciousness" is the implicit knowledge and all representations belong to, or better, are, the "I". Numerical identity is not *inseparable* from the representation of self-consciousness but *is* always the overlapping of knowledge during its life. It is meaningless to talk about the "representation" of self-consciousness. As I mentioned above, we have again to change the notion of existence but this time we have to accept that such overlapping of knowledge forms the unity of the "I". According to Kant the numerical identity is not provided by identity of consciousness. From my viewpoint, the numerical identity is the result of the overlapped knowledge.[32] However, "me includes my transcendental aspect" (Brooks 1993, p. 92 – see 2.3) because the "I" includes the implicit knowledge that is this Kantian transcendental aspect. According to Heidegger until Paton and Parvu's interpretations, Kant's notion of the "possible" was *ontologically loaded*. From an EDWs perspective, this assertion is *epistemologically* available for all epistemologically different entities (except the "I"). In these cases, "possible" means "conditions of possible experience" that are, for us, the conditions of possible epistemologically different interactions. These conditions are only epistemologically "ontological loaded". However, for the "I", "possible" means implicit knowledge that is an existential part of the "I". The implicit knowledge is only the *possibility* of explicit knowledge (of Kant or Reichel's "spontaneity" or Fodor's "compositionality",

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[32] For Kant, the unity of apperception is the trancendental unity of self-consciousness. (B133) Or "We are conscious *a priori* of the complete identity of the self in the respect of all representations … as being a necessary conditions of the possibility of all representations." (A116)

"systematicity" and "productivity") and both types of knowledge constitute the "I". Only in this case, the possibility is an existential characteristic, i.e., the possible is actual and the objective reality is extended from explicit knowledge to implicit knowledge!

As I mentioned above, knowledge implies, among other kinds, self-knowledge. This self-knowledge is similar to the Kantian transcendental reflection that, according to Pippin, avoids solipsism or vicious circularity (that is attributed by Patricia Kitcher to Kant's philosophy) because it "could arrive at a knowledge of the structure of all thought and knowledge, if such reflection had to make use of such a structure". (Pippin 1997, p. 37) The highest principle of knowledge, the transcendental unity of apperception, is reflexive because "[i]t must be possible for the 'I think' to accompany all my representations. (B139n)" (Pippin, p. 39) There is a difference between the apperception or the spontaneity and the inner sense in Kant's transcendental idealism. (Pippin, pp. 44–5) The Kantian spontaneity refers to the spontaneity of our thoughts. The content of inner sense is larger than the content of our thoughts. From an EDWs perspective, the inner sense corresponds to the implicit knowledge that presupposes all kinds of knowledge, while the spontaneity/ apperception would refer only to the declarative or verbal knowledge. I recall that, according to the principle of knowledge, the "I" is knowledge and there is no distinction between the "I" and "its" representations and processes. "I think" accompanies all "its" representations but "I think" or the processes of thinking and all the representations are the "I".

It is quite difficult to explain scientifically the relationship between the implicit and the explicit knowledge or the "emergence" of spontaneous thoughts. There are various ways of grasping the spontaneity of thoughts. For instance, in connectionism, the researchers try to predict the sequence of the words in a sentence. The pioneer of this work was Elman (1991, 1993) who developed the recurrent networks with context units. Maye et al. (2007) analyze a fly to understand its spontaneous behavior. They discovered a fractal order "in the temporal structure of spontaneous flight maneuvers in tethered *Drosophila* fruit flies". (Maye et al. 2007) Mainly, the intrinsic or the endogenous nonlinear processing (or Raichle's dark energy of the brain – see above) determine these fractal behavioral patterns and not the environmental feedback. Thus, "[e]ven fly brains are more than just input/output systems". Evidently, this trend can be considered as a support for Searle's Chinese Room against the computationalism approach. From an EDWs perspective, the implicit knowledge produces these spontaneous thoughts. I emphasize here that it is easier for us to understand the neural processes that correspond to the implicit knowledge and not the implicit knowledge itself.

I offer an example from cognitive neuroscience which illustrates the principle of knowledge: Ramachandran's famous example of phantom limbs. (Ramachandran and Blakeslee 1998) I think that this example is an argument for supporting the existence of the "I" and the corresponding part-counterpart in the EDWs. The doctor analyzes a patient with one amputated arm. When the doctor touches parts of a patient's face, the patient has the "feeling" that the doctor is touching parts of his missing left arm. For instance, Ramachandran touches the left cheek (and later the lip) of the patient's face. At that moment (and later) the patient says that the doctor is touching his missing left thumb (and later his phantom index finger). In Ramachandran's words:

> There was a complete map, a systematic map of the missing phantom hand on his face, draped on his face. … The entire skin surface, touch signals, all the skin surface on the left side of the brain is mapped on to the right cerebral hemisphere on a vertical strip of cortical tissue

> called the post-central gyrus. … Actually there are several maps but I'll simplify them and pretend there's only one map called the post-central gyrus. Now this is a faithful representation of the entire body surface. It's almost as though you have a little person draped on the surface of the brain. It's called the Penfield homunculus...

According to Ramachandran, “the part of the cortex of the brain corresponding to the hand is not receiving any signals”. That part of the cortex is “hungry for sensory inputs”. The sensory inputs from the skin of the face occupy the parts of the cortex that correspond to the missing arm, this process being a cross-wiring in the brain of the patient. These sensory inputs are “misinterpreted by higher centres in the brain”. Therefore, the subject has the feeling that someone is touching his phantom hand. The treatment Dr. Ramachandran proposed for the patient was as follows: the patient had to move his right arm in front of a mirror for few weeks or months. Repeating this process many times in each day, the patient had the impression of moving his left phantom arm. After a few weeks, the patient was free from the pain from the left phantom arm.

Let us see how the phantom limbs fit with the EDWs perspective. As he declared, Ramachandran’s framework is the identity theory. For him, the brain and the mind are the same thing. However, the brain is different to the body. Parts of the brain correspond to parts of the organism. From an EDWs perspective, the “I” corresponds to the part-counterpart, i.e., the brain and the body. The union between the brain and the body – this union corresponds to the “I” – is the result of species evolution and the development of each subject that presupposes the past and the present states. During evolution our species constructed certain biological mechanisms. From the post-natal period, being in contact with the environment, every organism receives internal and external inputs. These inputs change its states and processes. Each “I” corresponds to the states and processes of these biological mechanisms. The phantom limbs belong to the "I" but it has no correspondence in the part-counterpart. The implicit/unconscious/procedural/ sensorimotor knowledge still contains a virtual arm even if the corresponding physical part is missing. Therefore the "I", but not the physical subject, has the phantom limb. Training himself with the mirror, the subject got rid of the phantom limb. In our view, this means that the "arm" from the mirror produces a representation in the patient's mind that represents an explicit knowledge for the "I". After training, this explicit knowledge became implicit knowledge of the "I" and its pain was changed.

Making different experiments with his patients, Ramachandran's asserts that the visual inputs influence our subjective experience. (Ramachandran and Blakeslee 1998, pp. 55-6) He emphasizes the Freudian role of unconsciousness for the self. (pp. 152-6) According to the last principle, the "I" is knowledge. The mind and the brain belong to EDWs but we cannot claim that the mind influences the brain or vice-versa. Ramachandran uses classical but flawed notions like "higher centres in the brain". The pain involves the "I", not higher centres in the brain. The Penfield homunculus reflects the union between brain and body that corresponds to the "I".

According to the principle of conceptual containment, in the definition of any entity we have to include our conditions of observation or its conditions of interaction. For instance, in the definition of any mental state or mental representation, we have to include not only internal tools such as introspection and memory but also the possibility of manipulating such knowledge. In fact, we have to include the whole "I". The "I" is not the border of the "world" (as Wittgenstein claimed in the *Tractatus*, 5.632) but it is a particular EW. It has to be clear that any direct relationship/interactions between elements from EDWs is meaningless; judgments about these relationships/interactions would employ "uncontained concepts". However, through the correspondences between the brain-body and the mind, the "I" "is" the knowledge about the other EDWs. We have to apply here a revision of Bohr's correspondence principle: the mind-EW (that is the "I") corresponds to all EDWs. In other words, all the external EDWs – including the macro-EW – are represented by representations and processes within the mind-EW. If all external ED entities are represented by mental representations, does it mean that the EDWs perspective can be accused of Berkeley's idealism? The EDWs perspective is not an instance of Berkeley's idealism, but an extended transcendental idealism where the "I" is "extended" or "expanded" (see Waxman's paragraph below) to epistemologically different entities that belong to EDWs. For Kant, idealism refers to the form of our representation and not, as Berkley's idealism does, to the existence of external objects.[33]

> Thus do the categories become effectively the template of the sensible universe. More strikingly still: the understanding, in implementing this *Bauplan* by means of imagination, and thereby extending the scope of consciousness (that is, of that which is something for me), is actually doing nothing more than furnishing the I-concept with an expanded instantiation. The outcome of Kant's theory of understanding could

[33] The relationship between thinking and ontology is not similar to Berkley's idealism simply because the formal structure reflects formal nature, not empirical nature. For Kant, the expression "ontology is immanent thinking" means that the experience of empirical objects is possible only if any such object can be thought *a priori* as a measure and similar to all the other categories. (Kant in a letter to J. Beck, 20.01.1792 – Parvu, p. 247) Thus, the form of intellect in relation to space and time constructs the "transcendental invariant" of objectivity in Kant's theory. It is the foundation of ontology as "immanent thinking". (Parvu, p. 261) (See Chapter 2) From an EDWs, epistemologically, according to the extended version of Bohr's principle of correspondence, we can say that the EDWs are the "I" as "immanent thinking". Ontologically, (in fact, hyperontologically – see 3.4) the epistemologically different interactions are constitutive for their corresponding entities.

> therefore be expressed as follows: *the* world is not simply *my* world, as with other subjective idealist philosophers; the world, for Kant, actually *is* the self. (Waxman 1995, p. 857 – see Chapter 2)

Pushing Kant's transcendental idealism further, I can say that *epistemologically* the EDWs are not "my" world but are the knowledge about them that are parts of the "I". *Hyperontologically*, this knowledge corresponds to real EDWs.[34]

The anti-reductionists maintain that *qualia* cannot be explained at the neural level. According to them, we cannot explain how electro-chemical events produce the feeling of pain. Kalin provides a hypothesis regarding the feeling of fear: when a young monkey is separated from her mother, an opiate-releasing process takes place and neurons become inhibited because they are sensitive to the opiate. (Kalin 1993) Warner asks how such inhibitions produce the feeling of a yearning for the mother and he continues by saying: "What we know is the inhibition correlates with the feeling". (Warner 1993, p. 14) Typically, the pain is correlated with the firing of C fibres (even if it has been discovered that there are other kinds of cells that are activated during these process, the "firing of C fibres" remains a generic name for the physical correlates of such mental events).

The real issue here is to find the correspondence between the mental and the physical element. It is not enough to focus our attention only on the firing neural patterns for providing an explanation of mental states in physical terms. The feeling of

[34] All representations/processes that refer to entities and phenomena that belong to external EDWs are the "I". These mental entities and processes *correspond* to the continuous reciprocal interactions between brain, body and external environment that are the result of the evolution of our species in a "standard" environment. Evolutionary epistemology (Lorenz, Popper, Campbell, Wuketits – see 2.11) provides a basis for this conception of interaction. With the notion of correspondence, the EDWs perspective is beyond noumena-phenomena or internalism-externalism debates.

fear engages not only the most activated pattern but also other parts of the brain and the body itself. Edelman and Tononi strongly emphasize that consciousness is not a thing or a property but a process that involves large groups of the neurons in the brain. (Edelman and Tononi 2000, p. 143) Following William James, their perspective is against atomistic or modular approaches (that identify each conscious mental state or *quale* or "elementary sensation" with a group of neurons). From my perspective they are right only if we try to describe a *quale* in neural terms. As I said above, certain groups of neurons vary within an "interval of similarity" (Vacariu et. al 2001) that corresponds in fact to perceptual or conceptual constancy, i.e., to a *quale*. In the neuronal world those pattern are continuously changing. In the psychological world the *quale* is a static and discrete entity. It seems clear that a complete understanding of the part-counterpart relation can bring us to an understanding of human subjectivity.

It is clear that the relationships between mental states/processes and brain states/processes are not identity relationships because these elements belong to EDWs. We can find only rough correspondences between elements that belong to the mind-EW and the brain-EW. It is almost impossible to identify the exact correspondence between a specific mental property or process and the corresponding brain states and process.

In order to grasp the relationship between neural and psychological processes and states, I will briefly analyze, from my perspective, Milner and Goodale's famous but controversial supposition about "two visual systems", vision for action versus vision for perception. (Milner and Goodale 1995) In Clark's words, Milner and Goodale consider that there are two different visual systems, one being for on-line visuomotor action (the dorsal stream) and one for off-line visual reasoning and visually based categorization and verbal reports (the ventral stream).[35] (Clark 2001, p. 136) Clark's suggestion that it is difficult to draw a line between the neural mechanisms that implement off-line and on-line processes is important for my approach. As we saw in 3.2.3, even the binding problem – i.e. what neural processes correspond to elementary mental states, for instance, the perception of a "cup of coffee" – cannot be solved as yet! We already know that there are various patterns of neural cells that are responsible for various colors, shapes, etc. The question is where does the *unification* of all these characteristics that "corresponds" to the formation of a unitary mental representation for the "I" take place? I recall Damasio's "convergence zone" (1988) that would be one alternative for solving such problems. But we must ask for whom is the "convergence zone" convergent? The answer is for the "I", of course. We have to be aware that the correspondences of the binding processes (and all other such correspondences) are "observed" by the "I" because they are parts of it. According to the principle of conceptual containment, we have to include the conditions of observation, i.e. the "I", in defining a mental state. According to the part-counterpart principle, the "I" corresponds to the union between brain and body. Following this principle, to explain the unification of neural processes (from the brain-body-EW) that *corresponds* to a mental state (from the mind-EW), we need to include the whole brain and body! As we saw in 3.2.3, the "dark energy" represents the relationship of the brain and the body. This "dark energy" represents the required unification of neural areas that corresponds to various mental states. Within the framework of EDWs, it is meaningless to

[35] Related to this topic are Weiskrantz's famous "blindsight" and Block's distinctionn between access-consciousness and phenomenal-consciouness. (Clark 2001, pp. 172–3)

search for such unifications in a *particular neural area.* The term “convergence zone” and all other alternatives for this and other problems (as we saw in this section, the efforts of research from cognitive neuroscience to find what neural patterns correspond to the self) suggest to me that in today people are still searching along Cartesian lines for various “pineal glands” that represent different relationships between mental and neural processes/states!

If the unity of the “I” offers the possibility of “observing” a mental state, then, we need to discover similar conditions of “observation” in order to understand how the brain and body contribute to binding processes that correspond a mental representation. I can suggest an analogy to a hyperspace with 10 or 11 dimensions or dark energy/matter. Attempting to grasp the neural processes that correspond to a mental representation is almost like having to introduce new dimensions or dark energy/matter. In reality, we deal with the correspondences between elements/processes that belong to the EDWs. Nevertheless, it is almost impossible to identify what processes/elements from the brain-EW correspond to mental states and processes from the mind-EW.

3.3. The hyperworld and its EDWs – the antimetaphysical foundation of the EDWs perspective

An alternative to the mind-body problem needs unavoidably a(n) (anti)metaphysical framework, such an alternative having some consequences for other philosophical and scientific problems. As we saw in section 3.1, pushing further on from Kant and Bohr, I considered that the notion of existence could be defined from a viewpoint of each class of entities that have different structure. Questions like "What is the ontological status of each epistemological world?" or "Which entities or primitives from which epistemological world really exist?" involve the notion of existence. Nevertheless, this notion can be defined with explicit or implicit knowledge that presuppose constitutive epistemologically different interactions. Human beings, as physical entities, belong to a class of entities, the macro-entities (explicit knowledge). Human subjectivity is knowledge (implicit knowledge). The subject, using one set of observational conditions observes one EW. According to the principle of conceptual containment, each set of observational conditions is *constitutive* in "observing" its corresponding EW.[36] Due to the conditions of observation, each epistemological world has its own entities, structures, processes, laws, etc. According to the principle of complementarity we cannot simultaneously observe two EDWs. The entities and laws from two epistemological worlds are different; we can establish only the *correspondences* between entities and laws of two epistemological worlds.[37] It would be completely wrong to understand EDWs as either ontological levels of existence or levels of analysis. It is not about levels but about epistemologically different worlds! An entity exists only if it has certain limits of interaction with other entities;[38] an entity cannot interact with the entities that have different structure and belong

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[36] As we saw in Chapter 2, for Kant the "conditions of possible experience" reflect the transcendental ontology. Different conditions of possible experience/observation are "ontologically loaded" and they reflect the transcendental hyperontology, i.e., the epistemologically different interactions that constitute epistemologically different entities.

[37] For example, we can try to find only the approximate correspondences between the entities and laws of the quantum and macroscopic worlds.

[38] This idea partially reflects the first two Kantian antinomies regarding the time and space (divisibility) of the physical world.

to an epistemologically different world. To exist means to have certain limits. The conditions of interactions have certain parameters that reflect the limits of that entity. In our case, these limits border the limits of our knowledge. Explicitly, any non-living entities (for instance, a table or a planet) exist only as a result of its external constitutive interactions. A table does not exist as being constituted from “its” components (either its organisational parts or “its” epistemologically different entities). In this sense, from a particular viewpoint, it is meaningless to ask about the relationships between the organisationally different parts/epistemologically different non-living entities and which that “compose” that entity.

The “I” is knowledge that implies its internal elements (mental representations) and internal processes (thinking, feeling, etc.). For the other entities (a planet, a table or a cell), we have to transform implicit knowledge into implicit organizational different parts or into corresponding epistemologically different entities. The “I” is implicitly transformed in the “it”. However, a planet or a table exists only in terms of its external constitutive interactions and in this sense its organizationally different parts are implicit.

We can apply this notion of existence to neural networks. In neural terms, the neural patterns of activation have a specific structure different from that of a single neuron and also from the neural network as a whole. In order to simplify this example I will limit the analysis to connectionism. The patterns of activity interact, i.e. they obey the laws of vectorial addition and product. The activation value of a certain node contributes to the degree of activation of the corresponding pattern, which in its turn contributes to the state of the whole network at a particular moment and thus to the final stable state of that network. An activation pattern can be regarded as an “observer” only in relation to other patterns. Generally speaking, an entity exists because of its relation to other entities that have the same structure. But that entity does not exist in relation to other entities that have other structures and obey different laws. Only the observer is able to shift from one set of observational conditions to another.[39]

Each entity observes (constitutively interacts with) the class of entities within the same EW. A "thing-in-itself" would be an entity that has no limits of interaction and this is not possible. All entities that populate the EDWs (human beings, planets, black holes, desks, stones, electrons, protons, quarks, etc.) – are limited entities. Why do we need to postulate the existence of such entities that belong to EDWs? The "I", as an entity from one EW, has continuously tried to identify entities in all EDWs. In our case, the Quinean slogan "No entity without identity" is secured by different conditions of observation/ interaction that represent the existential preconditions (in Kantian terms) of various sets of entities that belong to EDWs. Epistemologically, the subject can fulfill the process of an entity's individualization only with the help of certain observational conditions. Ontologically, this process is fulfilled by constitutive external interactions.

The EDWs perspective (or the perspective of the observer) is fundamentally an anti-metaphysical view. My approach can be regarded as an extrapolated transcendental idealism: not only human beings but also each entity interacts with entities from the same EW. Moreover, I transcend "multiple worlds" in an ontological sense, even if I extend the perspective of the observer to all entities (from an extended transcendentalist view). However, I go beyond Kant's approach, as I reject the noumena-phenomena distinction (to talk of noumena assumes the unicorn-world). The

[39] For the perspective of the observer applied to neural networks and cellular automata, see Terhesiu and Vacariu (2002). However, as we will see in 5.2, the unity of the "I" is absent to any kind of neural network.

trio of "entity-condition of the observation-epistemological" world is crucial and all the components have to be taken into consideration together. I emphasize that the extended perspective of the observer to all entities (that exist in EDWs) goes beyond transcendental idealism or different philosophical approaches such as relativism, materialism and idealism.[40] The meaning of "epistemologically different worlds" is crucial for the entire approach. As I have adopted the specified anti-metaphysical point of view, I have somehow to bring together both epistemology and ontology in the same expression, or even to transcend them by proposing (see 3.1) the concept of the "hyperworld" or hyperverse.

To get rid of reason the powerful distinction between epistemology and ontology which leads us to accept the unicorn-world framework (element (b) from the introduction), we need to re-define the notion of ontology: it is about an epistemological ontology and this is the reason for the expression "epistemologically different worlds". Exactly because of our limits, we have to admit the existence of EDWs. Thus, terms like "appearance", "phenomena", "noumena", "reality", "real world", etc., are improper.[41] Some philosophers and scientists claim that macro-objects are "appearances". Human beings are macro-objects. Thus, not only are tables, chairs, and planets (and gravities caused by them) appearances but human beings are appearances too![42] The Cartesian "I", that is the part-counterpart

[40] For instance, in Berkeley's idealism, God guarantees the existence of different objects. In my approach I replaced God's assurance with the interactions among the entities that exist in one EW.

[41] With the perspective of the observer we go beyond the eternal realism-antirealism debate.

[42] It is amazing that the antirealism proponents have not paid attention to Descartes' method: the ability to have doubts about the existence of external things (and teh body) assures us of the existence of "I" as the "thinking thing"! In this sense, Descartes called the "I" the Archimede point that is "certain and indubitable". (Descartes 1994, p. 78, Meditation II – see Chapter 1)

relationship, exists for us in one epistemological world; in the micro-epistemological world, the "I" corresponds to a network of micro-particles, their functions, and the relationships among them. Because of our limits, the "I" as an entity has no identity in such an EW.[43] *The existence of the "I", with its limits and with the possibility of changing the observational conditions, implies the existence of epistemologically different interactions and entities (EDWs) and vice-versa.*

Reinterpreting Descartes' notion of complete knowledge/being, we can assert that the tools of observation offer us complete knowledge about the entities from each EW. Thus, these entities are complete beings, i.e., they exist in their corresponding EDWs.[44] As I presented in 1.1, for Descartes, mind and brain are different substances because of their different properties: mind, as a non-corporeal thing, is wholly indivisible; body, with its main property the extension, is divisible in thought. These ideas are correct, but Descartes makes an essential error by avoiding the introduction of the observational conditions in the definitions of epistemologically different properties of mind and body. Even if the role of perceiving clearly and distinctly is essential because it makes "a connection between thinking and existing" (Wahl 1998, p. 185), it is not enough for avoiding the unicorn-world's paradigm. Only if we take into account the role of observational condition or the constitutive epistemologically different interactions, can we reject the main error of Cartesian dualism (and all the other

[43] Again Descartes: "Now it is plain I am not the assemblage of members called the human body; I am not a thin and penetrating air diffused through all the memebers, or wind, or flame, or vapour, or breath, or any of all the things that I can imagine; ... I still feel assured of my existence." (Descartes 1994, p. 82)

[44] Even if, for defining mental representations we need to include the "I" because they are the"I", we can consider that they are complete knowledge.

approaches of mind-body problem): locating mind and body in the same world. Even if from the perspective of the observer the Cartesian bidirectional relationship between epistemology and ontology is not wrong, this connection is not enough. However, we notice again that it is the powerful distinction between epistemology and ontology that misleads us into creating the unicorn-world! In this context, I can ask what is right and what is wrong in Descartes' theory regarding his relation between two pairs: simple-composite entities and complete-incomplete knowledge. As I wrote in section 1.4, for Descartes there is a complete knowledge only when someone perceives the mind or the body separately. However, he considers that a person is a composite entity with two substances. To perceive one individual as a whole means to perceive the unity of mind and body. Obviously, the Cartesian error is that the mind and the body belong to the same world, the unicorn-world.

Part II
Applications

CHAPTER 4

Applications to some notions from philosophy of mind

In this chapter, I analyze from an EDWs perspective different notions from philosophy of mind produced by the most powerful and dominant old paradigm in the history of human thinking, the "unicorn-world". In the philosophy of mind, because of the unicorn-world paradigm, the major problems are in fact pseudo-problems. Since Descartes, within the unicorn-world paradigm, some pseudo-problems and anomalies such as the interaction between mind and brain, levels, the explanatory gap, emergence, mental causation, supervenience, and reduction, have dominated philosophy of mind. Being used in the construction of Ptolemaic epicycles, these notions generated pseudo-problems. Consequently, philosophers needed to invent other Ptolemaic epicycles, and thus philosophy of mind has become, over recent decades, a whirlpool of pseudo-concepts and pseudo-approaches for pseudo-problems. As we said above, because the philosophers in general deal with non-empirical problems, there were some who constructed complicated Ptolemaic epicycles. Normally, they strongly defended their approaches.

As we already know, the general problem of this book is the mind-body problem.[1] Some interrelated issues produced by the

[1] "Schopenhauer famously called the mind-body problem a '*Weltknoten*', or 'world-knot', and he was surely right. The problem, however, is not a single problem; it is a cluster of connected problems about the relationship between

mind-body problem – the explanatory gap between neural and psychological explanations, levels of existence ("ontological levels") vs. levels of analysis or description ("epistemological levels"), emergence and reduction, the problem of mental causation, supervenience, the problem of representation, and the "hard problem" of consciousness or human subjectivity or what is it like to be a bat – all have been the subject of many debates. As was said above, the *domino effect* seems to join all these problems together. If one of them falls then all the other problems collapse too. From the EDWs perspective, I analyze "levels" and "reduction vs. emergence" (4.1), "qualia" and again Kant and the "I" (4.2), and "mental causation" and "supervenience" (4.3).

4.1. Levels and reduction vs. emergence

These notions involve many other notions introduced by various approaches in philosophy of mind. The history of emergence[2] is quite complicated because it has many interpretations.[3] Emergence involves certain vertical relationships between low-level and high-level properties. Talk about emergence became a complicated notion by the fact that a particular pseudo-problem (ontological emergence) has been

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mind and matter. What these problems are depends on a broader framework of philosophical and scientific assumptions and presumptions within which the questions are posed and possible answers formulated. For the contemporary physicalist, there are two problems that truly make the mind-body problem a Weltknoten, an intractable and perhaps ultimately insoluble puzzle. They concern mental causation and consciousness." (Kim 2005, p. 7)

[2] Kim wrote "Since around 1990, the idea of emergence has been making a big comeback, from decades of general neglect and disdain on the part of mainstream analytic philosophy." (Kim 2006, p. 547) Within the unicorn-world we can understand this comeback. For a criticism of analytic philosophy from an EDWs perspective, see Vacariu (2007).

[3] Kim again: "'Emergence' is very much a term of philosophical trade; it can pretty much mean whatever you want to mean…" (Kim 2006, p. 548)

mixed up with a real problem (epistemological emergence with strong and weak emergence). Therefore, "emergence" produced more complicated Ptolemaic epicycles.

When we talk about reduction or emergence, we need to specify what is reduced to what or what emerges from what. We can reduce one property or level to another or one property or one level can emerge from another. So, we have another complicated notion: "levels". In order to explain all these notions as a reaction to Cartesian dualism, various approaches have appeared in the last century in the philosophy of mind. I will try to relate some notions with some approaches but at the same time to analyze them from an EDWs perspective. (See Chalmers 2003 and van Gulick 2003 for similar classifications.)

(1) On the one side, we can relate reduction and epistemological levels/properties and epistemological emergence to identity theory and even to eliminative materialism. The pioneers of identity theory, U. T. Place and Herbert Feigl consider that mental processes or events such as sensations are just physical phenomena: mental processes are nothing but brain processes. Mental processes are, for instance, the experience of pain or of seeing something or of having a mental image of it. Place restricts the identity theory to sensations and mental images. Intentionality, which is a major property of mental states, cannot be constructed as a property of brain structure. (Place 1988, p. 209) Defining "is" in the sense of strict identity, Smart maintains that sensations are brain-processes. "Sensations are nothing over and above brain processes." (Smart 1962/1959, p. 56) So identity theory reduces mental level to neural one. It seems that identity theory presupposes a kind of epistemological emergence. Therefore, from an EDWs perspective it is interesting to analyze Place's distinction between two expressions: the "is" of definition (as in

"A square is an equilateral rectangle.") and the "is" of composition (for example "A cloud is a mass of droplets or other particles in suspension." (Place 1956, p. 34) He argues that the argument from logical independence of expression to ontological independence of entities breaks down when we compare brain and consciousness. In fact "Place spoke of constitution rather than of identity". (Smart 2004, p. 2) Making an analogy with the mind-brain relationship, Place introduces two examples: "This table is an old packing case" and "Lighting is an electric discharge". Being directly interested in such analogies, I introduce more details relating to Smart's comments on these analogies. For the objection that "sensation" does not mean the same as "brain process", Place indicates that "this table" (or lighting, in the second case) does not mean the same as "this old packing case" (or "motion of electric charges", in the second case). In different ways, we can distinguish that something is a table (lighting) or an old packing case (motion of electric charges). However, these "different ways" do not "prevent the table being identical to the old packing case". (Smart 2004, p. 2) "Sensation" and "brain processes" differ in meaning but they have the same reference. (Smart 2004, p. 2) Place, Feigl and Smart claim that even if "sensation" and "brain process" differ in meaning, they have the same reference.[4] (Smart 2004) Defining "is" in the sense of strict identity, Smart maintains that sensations are brain-processes. "Sensations are nothing over and above brain processes." (Smart 1962/1959, p. 56) According to Heil, this strict identity is applied to processes, events and properties. (Heil 2004, p.79)

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[4] Another pioneer of this trend was Armstrong (1968). His main idea is that mental states, in general, and propositional attitudes (believes, desires, etc.), in particular, are identical with brain processes and structures. (Place 1988; Smart 2004) Smart agrees with this idea, while Place rejects it. (Smart 2004, p. 5)

Avoiding for a moment the EDWs perspective, I can ask what it means for two terms – for instance, a sensation and its corresponding neural pattern – to refer to the same thing. For a proponent of the identity theory there are, evidently, different *conditions of observation* for sensation and neural pattern, but these notions refer to the same thing. What does "the same thing" mean? Is this thing a sensation or a neural pattern of activation? The problem is that if the real thing is only a neural pattern then, according to eliminative materialism, we have to reject the second notion, that of "sensation". If there is a more fundamental level, then we can have a regression *ad infinitum*. The same problem has occurred in physics and the philosophy of physics: at what level do the entities really exist? Wittgenstein and all philosophers after him consider that this question has no meaning. We can only ask about the conceptual framework in which we have to include a notion. On this line of thinking, we can ask: Is the mind-body problem a conceptual or linguistic problem? Do we need to see only how we can conceptually or linguistically define the mind (and its components) and the brain (and its components)? Then, following Wittgenstein and then Carnap (with his linguistic frameworks- see 6.2), it seems that, for the proponents of identity theory, the difference between mental and physical is just a conceptual difference. There are only "conceptual levels" or "levels of analysis". In fact, we can notice that the theory of identity provides no ontological solution, but only a conceptual/linguistic solution to the inquiry regarding the existence of physical and mental states. In the Kantian sense, it would mean that one notion, sensation or belief and neural pattern of activation, is empty. Which one? Is Rorty right in eliminating the notion of sensation? Are the Churchlands correct in eliminating the notions of folk psychology? Within the "conceptual frameworks" perspective, those who follow Carnap think that we cannot ask about reality, but only about which language/conceptual framework is correct.

In order to avoid the transformation of mind-body problem into a linguistic one, we have to answer another question: what would Descartes' internal and external perceptions mean? In a Kantian framework, the space and time intuitions and the categories are the transcendental conditions for our phenomenal experience. In our case, we can ask if the observational conditions for sensations/beliefs and neural patterns of activation are the transcendental conditions for phenomenal experience such as sensations and neural patterns? We return again to the main question: which of these "phenomenal" things, sensations or neural patterns, really exists? Both cannot really exist in the same world. Otherwise, there would be a contradiction: we cannot observe (or perceive, in Cartesian terms) two different things in the same place within the same world at the same time. If we accept that these perceptions observe the same thing, only one condition of observation (internal or external tool) can offer us the real thing. Which of these perceptions or observational conditions plays this role: the internal perception (that would determine the mind) or the external perception (that would determine the brain)?

From an EDWs perspective, Places' "different ways" involve either organizationally different parts (the same EW) or epistemologically different entities (EDWs). Ignoring the distinction between organizational threshold and epistemological-ontological threshold, he continues working within the unicorn-world. "Sensation" and "brain processes" differ not only in meaning but also in reference (there are epistemologically different entities) and this is the reason we cannot reduce mental states to neural patterns.[5] However, a table is either composed of organizationally different parts or corresponds to epistemologically different entities. I emphasize again that the notion of “composed of organizationally different parts” is just a theoretical notion introduced by us as observers. The table exists only as a whole thing in interacting with other macro-objects. The table exists only at the “surface” as a whole.

Regarding my approach, I need to introduce a comment made by Smart (2004, p. 5) on Armstrong’s distinction between perception and bodily sensation. Armstrong defines perception as “coming to believe by means of senses”. Bodily sensations are perception of states of our body. (Smart 2004, p. 5) Smart clarifies this distinction in the following sense. He introduces the notion “visual sensations” that are not perception but something that occurs in perception. “So in *this* sense of ‘sensation’ there should be bodily sensation sensations.” (Smart 2004, p. 5) Bodily sensation would be perceptions which entail “introspectible ‘sensings’”.[6] This notion is very similar to Rachamandran’s phantom limb! From

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[5] On the same line but within the unicorn-world has been the objection against this idea (that belong to identity theory)- *Distinct Property Argument*: “Max Black (reported in Smart, 1962): terms with different *meanings* can *denote* the same state only expressing different properties or “modes of presentation” of that state. → If terms like ‘pain’, ‘thought’ and ‘desire’ are not equivalent in meaning to any physicalistic descriptions, they can denote physical states only by expressing *irreducibly mental properties* of them. Thus, even if ‘pain’ and ‘C-fiber stimulation’ pick out a single type of neural state, this state must have two types of *properties*, physical and mental, by means of which the identification can be made.” (Levin 2004)

[6] “These bodily sensations are perceptions and there can be misperceptions as when a person with his foot amputated can think that he has a pain in the foot. He has a sensing ‘having a pain in the foot’ but the world does not contain a pain in the foot, just as it does not contain sense data or images but does contain having of sense data and of images.” (Smart 2004, p. 5)

my perspective, such “introspectible ‘sensing’” represents a kind of knowledge, and according to the principle of knowledge, it is the “I”.

Even if the position of the eliminative materialists is somewhat different, their perspective can be regarded as an offshoot of materialism. The main idea of eliminative materialism is that folk or common sense psychology is completely wrong. Notions from folk psychology such as belief, sensation, pain, desire, etc., or propositional attitudes and mental causation do not exist. Within the unicorn-world, eliminative materialism has been correct to embrace the Kantian framework of “empty concepts”. The Churchlands introduce eliminative materialism from a viewpoint given by the relationship between folk psychology/psychology and neuroscience. We can point out that, officially, they are not reductionists but eliminativists. If the concepts of folk psychology are wrong then the statements that employ such concepts are false. The Churchlands eliminate both the mental states and the “I” from the scientific discourse.

The Churchlands dedicate an article to intertheoretic reductionism. For them, the reduction takes place from experiential properties of common objects to microphysical properties. (Paul and Patricia Churchland 1990, p. 69) They judge that the reduction is a good thing because the old theory is vindicated and corrected by the new one. Moreover, the new theory is more simple in explaining nature, it has a “much deeper insight” and thus “more effective control over” and “inherits all the evidence” of older theory. In fact, in the article they offer examples from chemistry and physics to show that (1) the reduction can be “domain specific” and (2) the reduction of psychology to neuroscience is possible. (P.M. & P.S. Churchland 1990) McGinn points out that Paul Churchland shows that his anti-reductionist opponents[7] confuse ontological issues with epistemological ones. From an *ontological* point of view, mental states may be identical with brain states and their properties, while from an *epistemological* point of view, folk psychology and cognitive neuroscience are "two distinct forms of knowledge (knowledge-by-acquaintance vs. knowledge-by-description)" that use two distinct vocabularies (Paul Churchland 1998, p. 156). Due to the continuous progress of science, in future we will be able to give up the mentalistic description provided by folk psychology. However, according to McCauley, the Churchlands conflate *intralevel* reductions with *interlevel* ones. (McCauley 1996 in Rockwell 2003) Intralevel reduction, which is, in fact, kind of eliminativism, refers to successive theories at the same level of analysis; interlevel thesis refers to the reduction of two theories from different levels of analysis. If intralevel reduction is quite common in science (because one theory can be wrong and replaced by a new one), interlevel reduction (the reduction of psychology to neuroscience) is quite a difficult process. (McCauley 1996, p. 31 in Rockwell 2003)

From my perspective, eliminative materialism seems to be partially an inaccurate alternative because it presupposes the elimination of an epistemological world, the mind-EW that has the same objective reality as the brain-body-EW. Thus, the debate between folk psychology and neuroscience is a pseudo-debate. If true, a similar argument could be used for the dichotomy of neuroscience vs. the quantum world. Within the realism-antirealism debate, neuroscience notions can describe entities that do not exist. The point here is that within these disciplines (psychology, neuroscience, and quantum physics) there are different observational tools through which we observe constitutive epistemologically different entities produced by the

[7] This point is stressed in McGinn (2001).

relationships among them that belong to the EDWs. In science, objectivity is thought of as being related to spatiotemporal frameworks. In cognitive science it is, of course, unambiguous to study an epistemological world with the external tool of neurology. However, the classical spatiotemporal framework has been made problematic by Einstein's theory of relativity and it has been completely rejected by quantum theory. Interlevel reduction means the reduction of one EW (mind-EW) to another EW (brain-EW) and this is false. Even if the mind-EW with its internal entities (mental states) and mental processes has no spatial framework (but only the temporal dimension), this does not mean that it does not have any objective reality. Even if currently the only way to scientifically explain mental structures and functions is to use neural terms, we have to specify that in this case the external tools offer us only a loose approximation of correspondences to psychological reality. Using modern technologies, and perhaps by inventing new apparatus in the future, we can come closer and closer to identifying those local firing neural patterns that roughly correspond to mental states and subjectivity, but *practically* we will not be able, I believe, to scientifically explain the global relation between that part and counterpart of the body.

Let me analyze the framework in which Paul Churchland eliminates qualia from scientific vocabulary. Using methods from neuroscience and connectionism, he shows how different senses, (including the internal sense of that [in]famous qualia), can be pictured by the sensory coding vector. For instance, each human taste has its own vector code. If the brain uses such vectors for coding sensory inputs "then it must somewhere be performing computations so that the inputs are in some way *guiding* or *producing* the outputs". This means that there are certain *transformations* of input vectors to output vectors. (Churchland 1988, p. 151) In fact Churchland applies knowledge taken from connectionism to the brain. The Churchlands assert that the problem of subjective sensory qualia is the easiest problem to solve. (Paul and Patricia Churchland 1997) Notions such as subjective colour qualia have to be replaced with the code of three types of visual opponent cells. The opponent-cell coding has a vector space. Such vector spaces would represent subjective colour qualia. (pp. 166–72) Such vectors occur at all levels of the nervous system. From a neural networks viewpoint, they declare that the notion of consciousness can be, in this way, eliminated. To support their idea, they introduce Elman's recurrent networks that can incorporate information from different sensory modalities, noticing that such a brain area is actually Damasio's "convergent zone". (Damasio 1988, pp. 172–6) As we will see in section 5.3, connectionism cannot explain some properties of the mind. But even if Churchland applies connectionism to the brain, we saw in 3.2.3 that there are enormous problems in explaining the "binding problem" or the "convergence zone" from a neural viewpoint. So, it is completely mistaken to consider that we can explain the subjective colour qualia through the code of three types of visually opponent cells. In fact, the processes of the binding problem or the convergence zone are large processes of the brain that correspond to certain mental states that are the "I". These large processes of the brain imply the counterpart of the brain and body. According to one principle, the part-counterpart corresponds to the "I". We can talk about the stability of mental representations only because of the unity of the "I". (See Chapter 5)

Both Patricia and Paul Churchland consider that we will end up eliminating so-called folk-psychology in favour of neuroscience. However, Patricia Churchland maintains that, in the context that some of a neural network's properties are given by the interactions among neurons and certain rhythmic properties, the notion of "emergence" has a meaning. Because neural behavior is highly non-linear, the properties of neural networks are complicated functions of properties of parts and not a simple sum of parts. In this context, high-level properties really exist and we need high-level descriptions to explain them. (Churchland 1996, p. 285) Thus, eliminative materialism asserts that materialism is "probably true" and all other alternatives are inadequate to explain human behavior. "The possibility of nontrivial revision and even replacement of existing high-level descriptions by neurobiologically harmonious high-level categories is the crux of what makes eliminative materialism eliminative". (Churchland 1996, p. 286) In fact Patricia Churchland recognizes a kind of weak or diachronic emergence, but not a synchronic or strong emergence.[8] If at the beginning they were completely eliminativists, I think that in recent articles the Churchlands, especially Patricia, have become quite moderate eliminativists. From an EDWs perspective, this emergence accepted by Patricia Churchland involves organizationally different parts and not epistemologically different entities. I emphasize again that a specific neural pattern of activation interacts only with patterns with the same properties. The neurons that compose a pattern do not exist for that pattern. Thus, a pattern exists only at the "surface".

At the end of this section I introduce few remarks about other kinds of reductionism, the neutral monism and dual-aspect theory. At the end of the 19th Century and the beginning of the 20th Century, neutral monism was one of the first major trends that appeared as a reaction against Cartesian dualism. Thus neutral monism provides a solution to the mind-body problem,

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[8] About these kinds of emergence, see point (2).

but also[9] has serious consequences regarding the nature of "reality". Trying to go beyond Descartes' problem regarding the interaction between mind and body through the pineal gland, Spinoza considers these two substances to be dual aspects of a third substance, Nature or God. Neutral monism and dual-aspect theory bring neutral entities or properties into discussion. The mental and the physical are reduced to the third level of basic neutral entities. Spinoza and almost all other philosophers after him tried to avoid Descartes' problem: the existence of two different ontological substances within the unicorn-world and the very problematic union between mind and body within the same person. In recent decades there are certain philosophers who argued for different versions of neutral monism: David Chalmers with his protophenomenal properties or information and Daniel Stoljar with his o-physical properties (both authors preserving the so-called "unknown entities") and others that are quite close to physicalism such as Grover Maxwell, Feigl, Michael Lockwood, and Galen Strawson. Diaz includes Russell and Lockwood in dual-aspect theory as well. (Diaz 2000, p. 394) Different kinds of entities exist in the "world" (in Kantian terms they all have the same objective reality) but entities like the mental and the physical are reducible to the basic neutral entities.

I will briefly introduce certain details about Gordon Globus' approach (1973) to the mind-body problem, because his approach is quite close to the EDWs perspective. There are two essential points to notice. One is methodological and the other is ontological. Regarding the methodological point, Globus borrows his "bi-perspective" notion from Brody and

[9] The mind-body problem is "deeply intertwined" with the "world". (Chalmers 2003) This relationship is the main reason that has transformed the mind-body problem into an unsolved one.

Oppenheim. Consciousness is an event realized in the brain but available for the subject only from the first-person perspective. The same event observed from the third-person perspective is just neural processes. The first- and third-person perspectives are simple “methodologically equivalent” observations. (Diaz 2000, p. 395) Globus considers that there is no fundamental level/reality beyond mental or physical. However, from an EDWs perspective, both mental and physical are located within the unicorn-world, and this is the reason Globus confines the problem to a methodological one.

From my perspective, these basic neutral entities would constitute the unicorn-world. We can see here a version of the Cartesian epistemological argument that implies a relationship between existence and reduction. In Chalmers’ view, type-F monism is an approach that explains consciousness as constituted by the intrinsic properties of fundamental physical entities. The phenomenal or proto-phenomenal properties represent this fundamental level of physical reality. (Chalmers 2003, p. 35) If this is true then we can ask what “something it is like to be an electron” means? (Chalmers 2003, p. 38) To avoid this question, Chalmers introduces his alternative: the protophenomenal properties that underlie phenomenal properties.

It seems quite normal that people embraced a kind of Spinozism as an alternative to dualism. To this Spinozism we can add a kind of Kantianism in which the mental and the physical are the phenomenal properties of neutral entities that would correspond to noumena. However, even if we have different properties such as mental and physical, there is only the one frame of the unicorn-world. I believe that the beginning of the 20th Century provided a proper environment for the appearance of neutral monism. At that time we had Einstein’s theory of relativity, but quantum mechanics theory did not yet exist. Moreover, the alternative of “different linguistic/

conceptual frameworks" appeared only later, in the 1930s, with Carnap. (See Chapter 6)

In one world (the unicorn-world), something has to go beyond the relationship between two substances, mind and matter. And these are the neutral entities. Why are these neutral entities necessary? Because the one world (the unicorn-world) requires one set of basic entities to which mental and physical have to be reduced. Even if all three kinds of entities exist (mental, physical and neutral), we still have a kind of pluralism - the mental and physical have to be reduced to the basic entities. Similar to Descartes, the mental and physical states are "mutually exclusive terms" (Cottingham 1986, p. 116) but they are reduced to the unique world. This idea of reductionism is of course necessary if we are to avoid Cartesian dualism. Within neutral monism, we can consider the existence of the mental and the physical as a kind of "epistemological existence" quite close to Descartes. (See 1.3) However, I think that neutral monism is actually quite close to certain Kantian ideas. We have information about the mental and physical properties/entities but neutral entities are unknown. If the neutral entities are unknown entities, then these entities represent the Kantian noumena or thing-in-itself.

From an EDWs perspective, the Kantian noumena-phenomena distinction is a pseudo-alternative, being an ontological, epistemological or methodological alternative. Such notions as "noumena" or "protophenomenal properties" are somehow analogous to the "ether" from the 19th Century. We do not need such things to explain epistemologically different entities constituted by epistemologically different interactions.

(2) On the other side, we can relate strong emergence and ontological levels to Cartesian dualism and weak emergence and epistemological levels to neutral monism, dual aspect theory and non-reductionist materialism.

As we saw in Chapter 1, believing that mind and brain (body) are two different ontological substances, Descartes was aware of an anomaly that was, for him, the interaction or the union between these substances. This anomaly could not be solved within the unicorn-world. In order to avoid Cartesian dualism but at the same time to preserve the existence of the mental and the neural within the unicorn-world, some philosophers constructed "levels" (a Ptolemaic epicycle that replaced the Cartesian notion of substances) and ontological emergence (that is, properties or entities that belong to a higher-level emergence from a lower-level). The problem is that if we accept ontologically different levels and radical[10] or strong[11] emergence, then we arrive at Cartesian dualism, which is rejected by the majority of philosophers. Nevertheless, to save the phenomena some philosophers (mainly followers of non-reductive materialism)[12] knew that if we reject Cartesian

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[10] Radical kind emergence: "The whole has features that are both 1) Different in kind from those had by its parts and 2) Of kind whose nature and existence is not necessitated by the features of its parts, their mode of combination and the law-like regularities governing the features of its parts." (van Gulick 2001, p. 17)

[11] For Chalmers, a strong emergent property is one in which "the high-level phenomenon arises from a low-level domain, but truths concerning that phenomenon are not deducible even in principle from truths in the low-level domain." (Chalmers 2006) If the strong emergent phenomena cannot be deducible from the laws of physics, for instance, then we need new laws of nature for explaining such phenomena. The only known phenomenon that cannot be explained by physical laws is consciousness. The examples for supporting this idea are those of the colorblind scientist and zombies. However, consciousness is correlated with or supervenes on physical, neural states. "We can think of strongly emergent phenomena as being systematically determined by low-level facts without being deducible from those facts." (Chalmers 2006)

[12] To avoid the identity theory, some philosophers embraced the already classical distinction between type and token identity. With functionalism and multiple realization, they are already under the umbrella of pragmatism.

dualism then some anomalies appear. Therefore, some of them consider human beings as limited entities that can only ever have limited knowledge (McGinn), some take refuge in the ontology-epistemology distinction (with levels of analysis and the corresponding epistemic emergence, weak and strong) and others introduce the notion of "organizational levels" that is related to a layered view of nature.

Within the non-reductive physicalist approach, philosophers such as Davidson, Fodor, Jackson, McGinn, Nagel, Putnam, Searle, Chalmers, and Van Gulick have argued in different ways for the epistemological irreducibility of mental qualitative phenomena or consciousness to physical states. In the context of non-reductive physicalism, one problematic notion is qualia or subjective phenomena. Even if the mind and consciousness are the result of a series of neural phenomena, an explanation of mental phenomena – or at least of some aspects of them like their *qualia* (qualitative content) or consciousness – cannot be given in neural terms. Describing the mental qualitative states in causal terms leaves out the special problem of *qualia* and in general consciousness. The core idea of irreducibility is that *qualia* and consciousness are subjective phenomena. Nagel insists that the methods of objective physical understanding "can be used on the body, including its central nervous system" but for the explanation of qualitative phenomena, a "different form of understanding" should be considered (Nagel 1993, p. 66). In Chalmers' interpretation, the phenomenal properties (or qualia) grasp what it is like for a person or organism to be in a phenomenal state and these properties are properties of the individual and not simply of the mental states themselves. (Chalmers 2003, p.3)

For me, it is not clear at all what non-reductive physicalism means. We cannot explain qualia or consciousness in physical terms, but only from the first-person ontology. But does it mean that qualia and consciousness are still physical elements? Does it mean that they belong to another physical level? Is this non-reductive physicalism an epistemological position about a kind of ontological noumena? (We have to remember that Chalmers adopts a kind of Spinozist monism.) Then, if we use two epistemological notions to describe one ontological element, one notion is empty (in the Kantian sense). Two notions that describe the same entity do not have the same value. What does the value of such notions offer us? Non-reductive materialism differs essentially from the EDWs perspective. From its name, we can understand that non-reductive materialism refers only to an epistemological non-reduction. For me, there is a hyperontological non-reduction, i.e., the mental states exist as much as the physical states, but in EDWs. However, the main difference is that the mental states are the "I", that is, from this viewpoint, an EW. But because of its unity, the "I" is, at the same time, an indivisible entity. (For discussion of qualia and the "I" from my perspective, see next section.)

According to van Gulick, emergence is "'Xs are more than just Ys' and that 'Xs are something over and above Ys.'" He distinguishes as classes of emergence between properties and causal powers or forces.[13] (van Gulick 2001) The emergent features go beyond the features of parts from which they emerge (p. 16) and it can be categorized as "metaphysical emergence" (it refers to the relation between real things) or "epistemic emergence" (cognitive explanatory relations about real world items). What does "over and above" or "emergent features go beyond the features of parts" mean? Earlier than van Gulick, there were other people insisting upon the difference between ontological and epistemological emergence considering that people many times conflate them. (Silberstein and McGeever

[13] The last term means "mental causation" which is analyzed in the next section.

1999; O'Connor and Wong 2002) Within the unicorn-world, such conflations were inevitable!

Emergence has the same properties as non-reductive physicalism: *distinctness* and *dependence*. (Crane 2001) It involves the whole-part relationships. Now, some properties are simply combinations of parts at the same level, as it were. (For example, a weight of ten kilo is the sum of 5 + 5 kilos.) Ernst Nagel calls these properties those that can be treated from an "*additive point of view*". (Nagel 1963 in Crane 2001, p. 7) The emergent properties are different from the sum of their parts; they presuppose novelty. It is quite difficult to define this "novelty". In Crane's definition, the novel properties of an object would be "those determinable properties whose determinates are not had by all of the object's parts." (p. 8) From this perspective, surface colour and wetness are novel properties. However, in order to distinguish emergent properties from reductive properties, novelty is not enough. According to Crane, a stronger notion of emergence conceives of it as a property of a whole with powers that are not related to the powers of its parts. This strong notion of emergence denies that the emergent properties of a whole are supervenient upon the properties of its parts. A dependent property implies that the properties of the whole "supervene" on the properties of its parts. Therefore, for Crane emergence is strongly related to the supervenience of a whole's properties on the properties of its parts. (Crane 2001, p. 9) However, for an emergentist, such properties would be "over and above" the physical properties.

From my perspective, we can finally explain the meaning of these "spooky" expressions "over and above" or "emergent features go beyond the features of parts". There are two ways of explaining the expression "over and above". Firstly, if there are two epistemologically different entities, in this case "over and above" means two EDWs. Secondly, from an "it" viewpoint, the properties of that "it" are "over and above" the properties of the organizationally different components of that "it". For instance, in interactions with their environment, for a table or a bacterium their organizationally different components do not exist. Both those entities and their organizationally different parts exist at the same time only for us as observers. The same observation is available for "surface colour" and "wetness".

The status of epistemic emergence (weak and strong) is quite complex.[14] For Silberstein and McGeever, Stephan, van Gulick, O'Connor and Wong, Chalmers, and Kim, epistemic emergence is related to our incapacity to explain and predict such a property of a whole system in terms of its parts. However, the property of the whole *is determined* by the properties of parts. For van Gulick, epistemic emergence is subjective and there are weak and strong emergences that characterize predictive and explanatory emergence and representational emergence. For Silberstein and McGeever, we can analyze epistemological emergence only from a viewpoint given by the relationship between human knowledge and simple or complex systems. This concerns the functional or descriptive/analysis of emergence. "Epistemologically emergent properties are novel only at a level of description." (Silberstein and McGeever 1999, p. 186) For Chalmers, a high-level phenomenon represents a *weak* emergence in relation to a low-level domain when that phenomenon is "unexpected" in accord with the laws or principles from low-level area. By "unexpected" he means that emergent properties are somehow deductible from low-level properties (with initial conditions). Examples of such emergence are "the game of life",

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[14] A complicated investigation of the notion of emergence is made by Achim Stephan. (Stephen 2002, 1998) He distinguishes several theories of emergence: *weak*, *synchronic*, and *diachronic* emergence. (About Stephan's notions, see Terhesiu and Vacariu 2002)

connectionist networks, evolution (for intelligent creatures) and high-level patterns in cellular automata. Chalmers introduces a better definition of weak emergence as the phenomenon "wherein complex, interesting high-level function is produced as a result of combining simple low-level mechanisms in simple ways." In this sense weak emergence is a "something for nothing" phenomenon. (Chalmers 2006)

From an EDWs perspective, epistemological emergence reflects the relationship between an entity and its organizationally different parts. As I mentioned above, applying the principle of complementarity, the organizationally different parts and the entity exist, at the same time, only at the "level of description". More exactly, a table or a bacterium does not "observe" its parts. However, there is an important difference between applying "levels of description" to non-living and living entities. A table and its legs are simply various "levels of description". The sum is equal with the whole. This rule is not available for a living entity. Making a small change to what Patricia Churchland mentioned above (Churchland 1996, p. 285), we can say that because (neural) behavior is highly non-linear, the properties of neural networks are complicated functions of properties of parts and not a simple sum of parts. In this context, high-level properties really exist and we need high-level descriptions to explain them, but they do not exist at the same time as low-level properties. A bacterium is not a simple sum of its proteins, and the bacterium cannot observe "its" proteins. We, as observers, can see a bacterium and its proteins at the same time. A bacterium does not observe "its" proteins. However, the bacterium has "implicit information" that corresponds to its organizationally different parts and their interactions. (See 5.9 and 6.10)

Within the same framework, from an EDWs perspective, I want to grasp the explanation the difference between organizational-analysis levels and their relationship with weak and strong emergence in more detail. From an external viewpoint, an organism and its macro-parts do not belong to the EDWs but only to the macro-EW. There are organizational different parts (see section 4.1.): (cell, macromolecular, organs, etc.) and *for us* all these biological elements belong to the same EW macroscopic world. One reason is that all these kinds of entities exist in the same spatio-temporal framework and we use the same observational tools to examine them. Another reason is that all these elements follow the same physical laws. I emphasize here that it would be completely wrong to apply this notion of organizationally different parts to the mind-brain "relationship". As with the emergence problem, the "explanatory gap" between mental and neural levels becomes the relation between two EDWs. The internal tools do not grasp any spatiotemporal feature, and thus the correspondence between a mental state and areas of brain is almost impossible to realize. According to the principle of part-counterpart, mental states involve subjective experience and thus they correspond somehow not only to neural firing patterns, but also to the pyramid and counterpart together. In consequence, the difficulty of the explanatory gap means that it is practically impossible to identify the part-counterpart that corresponds to each mental state that involves the subjectivity of a human. In general, different concepts refer to entities that belong to either the EDWs or organizational different parts. The entities from the EDWs exist because of the epistemological constitutive interactions among each set of epistemologically entities that belong to the EDWs. At the same time, each observational condition is *constitutive* in the sense that such conditions *reveal* the epistemologically different entities to us. Mental representation and neural patterns of activation are not the same entity described at different levels of description or organizational different parts. They are epistemologically different entities that belong to the EDWs. The organizational different parts follow the same epistemologically interactions (epistemologically laws), while EDWs follow epistemologically different interactions (epistemologically different laws).

4.2. Qualia, Kant and the "I"

"Qualia" is one of the most controversial notions in the philosophy of mind. Qualia or qualitative experience implies the "I" or human subjectivity and partially consciousness.[15] According to the principle of knowledge, qualia are (parts of) the "I". Consciousness is a part of the "I" but it is not identical with it. Consciousness and unconsciousness states and phenomena are the "I". (See 4.3.) For Chalmers, consciousness has a phenomenal structure without any spatiotemporal properties. (Chalmers 2003, p. 26) In his view, phenomenal properties (qualia) – or what is like to be in a particular state – are not intrinsic properties (otherwise qualia have to be a substance), but something that is related to their definitions. Moreover, related to the notion of the "I" from the EDWs perspective, I introduced one of Chalmers's ideas that "[p]henomenal properties can also be taken to be properties of individuals (e.g., people) rather than mental states, characterizing aspects of what it is like to be them at a given time". (Chalmers 2003, p. 3, footnote 2) This viewpoint is quite close to the definition of the "I" given by the principle of knowledge. However, the individual means the "I".

Following Chalmers, Kim is aware of the fact that the problem of qualia and qualitative mental states cannot be completely solved and we have to accept a *residue*. (Kim 2005)

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[15] There are a large number of articles and books on consciousness, self, self-consciousness, etc. I do not analyze these particular topics. I only insert some ideas about the "I" in relationship to the EDWs perspective.

According to the principle of part-counterpart, human subjectivity or the "I" corresponds to the part-counterpart of physical elements, i.e., to the whole brain and body. According to the principle of knowledge, the "I" is knowledge. How can we reinterpret the Kantian self within this new framework? From a Cartesian framework or even from an actual scientific framework, the existence of something can be proved only through clear, distinct and complete perception that produces an *explicit* knowledge. Within this framework, Kant knew that we could not prove the existence of the "I". He was right to reject Descartes' argument (with his "I think, therefore I am") for proving the existence of the "I". Descartes claims that the "I" exists because it can think and the process of thinking is its essence.[16] (AT VII 78 [CSM II 54] in Wilson 1998, p. 189) As we saw in 1.1 (Principles, I, 9, AT VII 7; CSM I, p. 195), perception is included in the process of thinking. The role of perception involves the connection between thinking and existing. (Wahl 1998, p. 185) As we saw in 2.8, for Kant the "I think" does not exist *per se* but "only and for thinking in general; i.e. its reality *is* the reality of the act of thinking in itself (of judgment)". (Waxman, pp. 832–3) However, against Descartes' argument, it was considered that thinking can be merely a process or a mechanism and Descartes did not prove a necessary relationship between the "I" and the process of thinking. Therefore, thinking does not prove the existence of the "I". The "I" is, at the same time, indivisible. Kant claims that we cannot prove the existence of the "I". Within an EDWs perspective, his "bare consciousness", i.e., the consciousness without any qualities, is in fact an implicit

[16] Within the EDWs perspective, the notion of essence has no meaning. Even for Descartes, ontology conflates with epistemology and thus, properly speaking, the notion of essence has no meaning. However, Descartes introduced this notion of essence within the Christian religious framework.

knowledge that is different to explicit knowledge. For Kant it is the unity of consciousness or transcendental apperception that "precedes all data of intuitions… This pure and original unchangeable consciousness I shall name *transcendental apperception*." (A107)

Nagel, Chalmers and Kim are right in considering that something is functional when there are tools of observation for that element. Human subjectivity and qualia are not functional. From an EDWs view, the "I" is not functional because the "I" has no tool for observation of itself as a whole. In Kantian terms, for the "I" we do not have any determination or representation. Do all the above elements deny completely the existence of the "I"? No, because otherwise I could ask myself who is writing this thesis? Only a brain with separated elements? Maybe somebody would answer that there are only some mechanisms of perceiving, thinking, moving the fingers and the head and so on that are all encapsulated within a body and their functions are coordinated as the result of the evolution of species.

Kant affirms that "[w]e are conscious *a priori* of the complete identity of the self in the respect of all representations which can ever belong to our knowledge, as being a necessary condition of the possibility of all representations." (A116) We are not conscious *a priori* of the complete identity of the self. In fact the "I" involves conscious and unconscious (and/or explicit and implicit, controlled and automatic) elements. The part-counterpart that corresponds to the "I" is the whole relationship between brain and body. The neural patterns of activation of the brain have different degrees of activation. Some of them correspond to conscious elements, some of them to the unconscious part of the "I". The brain is so strongly related to the body that we cannot avoid this relation in analyzing the "I" that corresponds to the brain-body relation. I emphasize that this unity represents, in the Kantian sense, the unity of knowledge or more exactly implicit knowledge. In 3.3, I introduced Raichle's example of the brain's dark energy. I believe that this dark energy (that reflects the relationship between the large parts of the brain and the body) corresponds to implicit, procedural, unconsciousness and automatic knowledge and is the result of the evolution of species. It corresponds, in fact, to the Kantian empty or bare consciousness "I think". (Chapter 2) The thinking thing can be represented only as something "purely intellectual" as an empty thought. (B157) In this case, there is only an "indeterminately given object" ("indeterminate perception" or a "bare consciousness" (A 346/B404)) that is incorporated in that act of thought and we cannot apply the categories. The "I that thinks" is just a "bare consciousness" that cannot completely prove its existence. It is the *possibility* of our cognition (spontaneous thoughts or the stimulus of independent thoughts) and our experience (interpretations, responses and predictions relating to environmental demands). This is the reason that, using fMRI and PET, we cannot observe/understand 80% of the brain's energy or Raichle's dark energy.

Related to the "I", Kant could not explain the spontaneity of thoughts. From an EDWs perspective, there are two ways to explain the spontaneity of thoughts. Firstly, as explicit knowledge, a spontaneous thought is the result of the reactions of implicit (unconscious, etc.) knowledge. Nevertheless, it is very difficult to explain in detail why one person has a spontaneous thought at one moment. Secondly, we can try to grasp which biological elements correspond to a spontaneous thought. Raichle considers the explanation of the spontaneous activity of neurons is a major actual task for neuroscientists. (Raichle 2006, p. 1250 – see 3.3) Evidently, a spontaneous thought would correspond, with rough approximation, to some observable neural interactions (that correspond to explicit knowledge) as a result of some unobservable neural interactions (that correspond to the implicit knowledge which is the empty "I"). These spontaneous neural patterns of activation are the results of the "silent" or penumbra part of the brain (that is, within the EDWs perspective, the counterpart). As well known, after a period of training certain parts of explicit knowledge become implicit knowledge. But both kinds of knowledge are the "I". In the beginning of training for a task, a large surface of a part of the subject's cortex is implicated in solving that task. After a period of training for that task, this surface becomes smaller. (Baars 1988) It seems that, in some cases, habituation is exactly this process in which the knowledge passes from explicit to implicit knowledge. And this process is the result of species evolution. Moreover, we have to be aware that habituation takes place in all our processes of acting, even if some of these processes are the results of the evolution of our species and others are not (like walking vs. riding a bike).

The "I" is some serial explicit set of mental entities, implicit knowledge and various internal "feelings" in parallel. This idea directly reflects the unity of the "I". This unity is the "I". Without this unity, the "I" does not exist and Hume would be right in claiming that the "I" does not exist but is only an aggregate of various perceptions and ideas. It is difficult to identify which particular parts of the brain correspond to certain mental states that are the "I". We can make a parallel analogy between two pairs: electrons-table and neurons-the "I" (the mind). Without being able to move from the micro-EW, a micro-being could not ask what could be the "unity" of a net of micro-particles (that correspond to a table from the macro-EW). It is meaningless to ask about the unity (in Cartesian terms, about the extension) of a table from the viewpoint of electrons. Also it is meaningless to ask about unity from a leg's viewpoint of a table or about unity of a bacterium from one of its protein's viewpoint. (See 3.4, 5.9 and 6.10) In the same way, we can find only the correspondences between mental representations and neural patterns. Following the conceptual containment principle, we can construct judgments that have objective validity only if we do not mix terms from the mind-EW with those from the brain-EW (mental states with neural patterns). We can construct a judgment like "A certain mental state *corresponds,* with approximation, to some neural patterns of activation" but we cannot construct judgments that include, for instance, the "emergence" of the mental from the neural or the "mental causation" of the body's movement.

According to the principle of the part-counterpart, the "I" corresponds to the part-counterpart (brain and body). If a human being closes her eyes and moves the physical arm that corresponds to the virtual mental arm of the "I", then the "I" includes certain internal feelings that correspond to internal physical, chemical and electrical interaction within the brain-body interaction. If a physical subject has her eyes open, they have a representation of the movement of their physical arm. Even if the "I" can be aware of both processes (internal "perceiving" and feeling) the question is can the "I" pay *attention* simultaneously to both processes? This is not possible because it contradicts the principle of complementarity. Actually, the "I" – with its serial attention – can pay attention to a serial sequence of intermingled states of the visual arm and internal feelings of its arm even if this sequence seems to be in parallel.

In order to restrict the number of EDWs and to avoid the confusion of them with hallucinations, dreams, etc., we return again to the distinction between the "I" and the part-counterpart that corresponds to it. The representations of the external EDWs all belong to the "I". They correspond to the continuous reciprocal interactions between brain, body and environment. According to Lorenz and evolutionary epistemology (Lorenz, Popper, Campbell and Wuketits – see 2.6), we have survived as a species only because of those interactions that have not been hallucinations. The epistemologically different interactions *constitute* the epistemologically different (Kantian) synthetic unities necessary for the individualization of epistemologically different entities and our different conditions of observation have to conform to these epistemologically different syntheses. (See 3.4) During the evolution of our species and the development of each individual, the neural patterns of activation have had to adjust to the unity of various stable entities from the macro-EW. Such adjustments correspond to mental representations that are those Kantian synthetic unities that belong to the "I". Kant could not explain clearly what this synthetic unity of each mental representation that represents an external object means. From an EDWs perspective, such synthetic unities correspond to the adjustments of the brain-body during the evolution of our species and the development of each individual. Every epistemological entity of the macro-EW has a synthetic unity because of certain epistemological interactions. The unities of mental states are mirrors of such synthetic unities. The unities of mental states overlap with the unity of the "I". However, as we saw above, the "I" as knowledge has no interactions with the environment and even "perceptual" mental representations are not the results of the interactions between the "I" and the external environment. The Kantian "I think" is the so-called visual mental representations inside of it; they are entities of the mind-EW, they are the "I". The distinction between the unity of the "I" and the unities of mental representations is a transcendental one.[17]

[17] Recall B137 in which Kant relates the unity of consciousness and the understanding as the faculty of knowledge with the concept of an object of which the manifold of a given intuition is unified. (See 2.4)

The "I" – with its own identity in relation with all representations, self-consciousness, and the possibility of creating the synthesis of mental representations – represents the surrogate or exponent for "synthetic unitary of pure intuitions of space and time. (See 2.3 and Waxman 1995, p. 849) As we saw in 2.4, for Kant, the categorial understanding "usurps the entire burden of objective representation, leaving sensibility with effectively no role to play at all." (Waxman 1995, p. 814) For the EDWs perspective, a real sensibility can only be the interactions between brain, body and environment. Neural patterns of activation which are the results of such interactions correspond, with a considerable degree of approximation, to certain mental states. The introduction of EDWs helps us to avoid the eternal (in the history of philosophy) and infamous amphiboly or heterogeneity between sensibility and understanding. In answering the question "How is thought possible?", Kant has to solve this radical heterogeneity. He is at the door of Leibniz (for intellectualizing the sensible) and Locke (for sensibilizing the intellectual). (Waxman 1995, p. 816) Kant's solution to this problem was the role of understanding with its categories. Working under the unicorn-umbrella, Kant made a great effort to solve the problem of heterogeneity between sensibility and understanding. However, for Kant and all other philosophers, sensibility means the interaction between mind and nature. Therefore, he is forced to introduce the distinction between noumena and phenomena.[18]

From an EDWs perspective, the "I" is certain "categories" that are indeed surrogates for space and time. Perceptions are the "I" because the "I" extends its identity to the "appearances" or

[18] We can recognize this myth from Plato and Kant until our day when physicists search in vain for "ultimate reality" or "fundamental" particles that would explain "everything". (See Chapter 6)

representations of entities and processes that belong to EDWs are the "I". With the EDWs, I avoid the amphiboly by extending Kant's transcendental idealism to all entities. The macro-EW interacts with the brain and body, while the mind-EW or the "I" ("sensations" and "categories" are the self) corresponds to the brain-body. Because of the unicorn-world, Descartes, Kant and other philosophers, were forced to think about the relations between the subject and the world through sensations. But the physical mechanisms of human senses belong to the brain-body. Within the EDWs perspective, according to the principle of part-counterpart, the brain and body correspond to the "I". Certain brain-body-environment interactions correspond to sensations and perceptions that are the "I". We "eliminate" the "I", not the brain and body from the macro-EW: the "I" is another EW, not a limit of the unicorn-world. The understanding with its categories is not "the foundation of all order and coherence in appearance;" (CPR, Bxvi-xvii in Waxman 1995, p. 814). The order and coherence of each EW exists before the "I" observes them. The "I" is the result of such orders and coherences; it is a result of species evolution. (See once again Konrad Lorenz in 2.6) The order and coherence of the macro-EW is reflected by the brain, body and environment interactions. In principle, understanding mirrors the order and coherence of the macro-EW. Without such order and coherence, no animal species could survive.

The view about the "I" is somehow related to the "explanatory" and "knowledge" arguments against materialism. (Chalmers 2003, pp. 4-7) However, the first argument is wrong because it presupposes the existence of "physical accounts" (that explain structures and functions) in the same "world" as consciousness. The problem is that we cannot explain the whole part-counterpart that works for physical, chemical and electrical interactions that corresponds to consciousness and the "I". The second argument (physical facts do not exhaust all the facts) is almost correct, but its framework, the unicorn-world, is erroneous and thus the argument becomes "empty". For the same reason (i.e. the presupposition of the unicorn-world), the situation is even worse for the epistemic argument against materialism. (Chalmers, p. 8)

4.3. Mental causation and supervenience

Mental causation has been the most troublesome anomaly (itself becoming a problem that produced other anomalies) in philosophy of mind. Being strong related to emergence, this notion involves the relationship between mental and physical.[19] For Descartes, Kant, and all other philosophers, the fact that a mental event can cause a physical event and vice-versa creates an enormous paradox: how can we combine free will (mental) with deterministic laws (physical)? In this section, I analyze Davidson's anomalous monism and Kim's mental causation approach from an EDWs perspective. Even if both Davidson and Kim are physicalists (all mental events are physical events), they consider that some mental processes (consciousness and qualia) cannot be explained in physical terms (Davidson's principle of anomalism of the mental). In order to grasp the ubiquitous relationship between the mental and the physical, these authors maintain the bizarre notion of supervenience.[20] If there are no clear definitions for "mental" and "physical" (Davidson 1970, p. 211), then there is no clear definition for "supervenience". What does supervenience mean more exactly?

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[19] "Emergentism cannot live without downward causation but it cannot live with it either. Downward causation is the *raison d'être* of emergence, but it may well turn out to be what in the end undermines it." (Kim 2006, p. 548)

[20] For Kim supervenience is partially but not completely similar to emergence: mental states supervene on or emerge from neural states. (Kim 2005, p. 93) However, emergentism is a form of property dualism. (p. 156)

What does mean that the mental *depends* on the physical but in the same time a mental event *causes* a physical event? Within the physicalist approach, this idea seems to be a contradiction. The main problem for physicalism is the explanation of mental causation (Davidson's principle of causal interaction).

Kim depicts the main problem of mental causation as follows. There is one mental property M that causes the appearance of another mental property M*. Within the supervenience framework, M and M* supervene on P and P*, respectively.[21] Then overdetermination appears: M* is caused by P* and M. According to the exclusion principle, M* must have only one cause.[22] For reconciling the contradiction, Kim introduces another principle: "In order to cause a supervenient property to be instantiated, you must cause one of its base properties to be instantiated." (Kim 2005, p. 20) He argues that it is quite normal to accept the idea that if a mental event occurs then at the same time something happens in your brain. This means that mental states supervene on neural states. Kim's general view involves these notions: physical causal closure, causal exclusion, and mind-body supervenience. For Kim, supervenience and irreducibility are not enough to characterize emergence.[23] (Kim 2006) I mention that Kim is aware that supervenience and irreducibility are both negative characterizations of emergence, showing us only what

[21] "[I]f any system s instantiates a mental property M at t, there necessarily exists a physical property P such that s instantiates P at t, and necessarily anything instantiating P at any time instantiates M at that time." (Kim 2005, p. 33)
[22] On the same topic, see also Humpreys (1997).
[23] "*So the demands of emergentism make the supervenience relation involved in emergence necessarily unexplainable; we cannot know what kind of dependence grounds and explains the supervenience relation involved in emergence*." (Kim 2006, p. 556, his italics) Moreover, "If downward causation goes, so goes emergentism." (Kim 2006, p. 558)

emergence is not, but not what it is. (Kim 2006, p. 557) Within the unicorn-world, following logical reasoning, Kim recognizes that something is wrong with these notions. In the last attempt, to grasp the relation between an emergent property and a basal condition, Kim replaces the deterministic condition between "levels" with a stochastic condition. Thus, he pleads for stochastic supervenience and stochastic emergence. (Kim 2006, p. 550) From the EDWs perspective it would be a "stochastic" correspondence between a property that belongs to one EW and some entities from another EW.

Davidson and Kim both accept the causal closure of the physical domain. From an EDWs perspective, the physical closure principle is extended to all EDWs. Each EW has its own entities, properties, laws and interactions. Anomalous monism and Kim's approach both belong to a kind of identity theory (token identity), but the *constitutive* difference between mental and physical events is given by the difference between mental and physical vocabulary. This notion, "constitutive", is essential in Kantian philosophy because it involves certain epistemological-phenomenal attributes. Here this term has a different meaning. In the context created by Wittgenstein's philosophy and Carnap's linguistic frameworks (See Chapter 6), the debates about these notions are merely linguistic because these notions belong to different vocabularies. In fact, working within the unicorn-world, the Cartesian ontological problem of the union between mind and body is transformed into a linguistic problem. Let see in detail how a pseudo-ontological problem (the mind-body problem) is transformed into a complicated linguistic one in Davidson's anomalous monism.

Davidson's three principles form an inconsistent triad. To avoid this contradiction and to reconcile his three principles that constitute the anomalous monism, Davidson takes as a starting point the Kantian idea that freedom "entails anomaly". Thus he introduces the Kantian scheme of freedom and causal determinism. Anomalous monism is a kind of materialism that considers that all events are physical but mental events cannot be explained in physical terms. Therefore, anomalous monism is a kind of identity theory (token identity), but the *constitutive* difference between mental and physical events is given by the difference between mental and physical vocabulary.[24] We have seen in Chapter 2 that this notion of "constitutive" is essential in Kantian philosophy. The "constitutive" involves certain ontological-epistemological attributes with necessity. This term has a different meaning here. As we will see in the final chapter, following Carnap's linguistic frameworks paradigm, the debates for two opposite notions are only apparent because they belong to different vocabularies (or linguistic frameworks). A mental event is described by an open mental sentence.[25] Something it is described by sentences with physical vocabulary within a closed system. (Davidson 1970, pp. 210–11) Within a closed system, physical laws are possible. According to Davidson, the events described in the vocabulary of thought and actions cannot be integrated into a closed deterministic system. (Davidson, *Psychology as Philosophy*, p. 230)

The notions like causality and the identity from his principles refer to the relations between individual events. The laws are linguistic laws. If the events are described only in one vocabulary, we can instantiate a law. (p. 215) Davidson claims that the "mental is nomologically irreducible" (p. 216) and even if we relate mental and physical events, such relations are

[24] Davison mentions that the categorical difference between mental and physical is a "common place" (Davidson, p. 223) As we will see in Chapter 6, Carnap (and Ryle with his behaviorism) were among the first to promote this idea. For the Kantian notion of constitutive-see 6.10.

[25] Open sentences contain psychological verbs when they create non-extensional contexts.

not law-like. Using Goodman's framework,[26] Davidson claims that "Nomological statements bring together predicates that we know *a priori* are made for each other – know, that is, independently of knowing whether the evidence supports a connection between them… mental and physical predicates are not made for one another." (p. 218) Within the same vocabulary, we can make *homonomic* generalization; when we shift from one to another vocabulary we have *heteronomic* generalization. The propositional attitudes belong to a human subject only within a mental, but not a physical, framework. Davidson claims homonomy's dependence on holism. These attitudes cannot be translated into physical description because of Quine's indeterminacy of translation (Davidson 1970), and their necessarily holistic character of interpretation and thus their intensionality. (*Philosophy of Psychology*, p. 241) Thus, the statements that related the mental and the physical have a heteronomic character. Based on heteronomic generalization, psychophysical laws are not possible. Considering the fact that the mental does not constitute a closed system, psychology that deals with propositional attitudes cannot be a closed science (*Philosophy of Psychology*), Davidson draws the conclusion that there are no strict laws for explaining and predicting mental phenomena. Psychology cannot be a closed science simply because there are psychological events and states that have physical causes. We can see here how Davidson, trying to solve the mind-body problem linguistically, created complicated linguistic notions. Hommonic generalizations refer to entities from the same EW, while heteronomic generalizations refer to EDWs.

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[26] "All emeralds are green." is lawlike but "All emeralds are grue." is not lawlike because the predicate "is an emerald" and "is grue" are "not suited to one another". (Davidson 1970, p. 218)

Outside of this linguistic framework, Davidson offers those "palpable" examples of mental causation. The first example is that when we perceive it is raining, we have the belief that it is raining. From an EDWs perspective, we notice that the event of rain influences the eyes and the brain but not the mind! The clouds, the rain, the brain and the body are all within the same EW, the macro-EW. Evidently, the changes that take place in the brain *correspond* to some changes in the mind. But the notion of "correspondence" is totally different than "causal relationship". The relationship between the mind-EW and the brain-EW is not a causal relation but a correspondence one. The EDWs perspective is not a rediscovery of parallelism. More than this, the EDWs are not parallel worlds from physics. (See Chapter 6) There are epistemologically different worlds, not ontologically different worlds or parallel universes.

The second example is that of a subject raising her hands. From an EDWs viewpoint, there cannot be any influence of the mental to the physical because they exist in EDWs! Certain internal states are the "I". According to the principle of part-counterpart, such states *correspond* to the process of raising the subject's arm; there are no mental orders to *our* physical arm because the mental and the physical belong to the EDWs. The arm, as an external object, belongs only to the physical world. The brain, not the mind, commands the raising of the physical arm. However, according to the principle of part-counterpart, the "I" corresponds to the brain and body, two elements from the macro-EW that cannot be analyzed separately (see Lungarella and Sporns in 3.3) and therefore the "I" or the mind-EW corresponds to the unity between the whole brain and body. It has been thought that the mind causes the movement of a physical arm. It is the "I" that orders one of its mental parts, a "virtual arm", that *corresponds* to the physical arm that is moving. The mind cannot observe an arm or command its movement. Only the eye and the brain can “observe” or command the movement of an arm. But such kinds of observations/commands are just brain-body interactions and not mental observation. The “I” has no place in this macro-EW. Since Descartes, people have made a huge confusion. They thought that if *we* can perceive ourselves raising our arms then there is a mental cause of this process of rising. In fact, the brain commands the raising of a physical arm and the “I” gives order to one of its parts.

Within the EDWs perspective, the exclusion principle is valid for each EW, i.e., each epistemological event and its cause belongs to the same EW. The exclusion principle is available not only for the physical micro- and macro-world but also for the mind-world. Each EW has its own entities, properties, processes, and laws (causalities). According to the principle of objective reality, all the EDWs have the same objective reality. Evidently, within the unicorn-world the exclusion principle leads to “causal powers draining away”. (Kim 1998; Block 2003)

Kim tries to find the place for “mind in a physical world”. (Kim 1998) Within the unicorn or physical-world in this case in accord to the physical exclusion principle, it must be only one cause. After many years of hard working, Kim is aware that he cannot find a definitive answer to the problem of mental causation. From my perspective, it is clear Kim’s failure: the unicorn-world paradigm. In the book from 2005, he introduces one idea in his argument with which I do not agree.[27] His idea is a premise without any support. Almost bafflingly, Kim borrows one idea from “the great” (his expression!) eighteenth century American theologian-philosopher Jonathan Edwards. The notions for this dictum are *vertical* determination and *horizontal* causation.

[27] My explanation for such ideas is that when a bright person works on a problem without knowing that the problem is a pseudo-problem, he can *feel* that there is no chance of a feasible solution in that framework in which he works.

Vertical determination means that macroscopic properties are vertically determined at the same time by their microstructure. (Kim 2005, p. 36) This vertical determination grasps the relationship between micro and macro levels. For Edwards, however, vertical determination assumes God's intervention. Horizontal causation is a normal causal relationship between two objects/events in successive times. Kim calls the following assertion Edward's dictum: "There is tension between 'vertical' determination and 'horizontal' causation. In fact, vertical determination excludes horizontal causation." (Kim, p. 36)

From an EDWs perspective, horizontal causation takes place among organizationally different parts while vertical determination involves EDWs. Therefore, from my viewpoint, this dictum is baffling: in Edwards' period, like Descartes and Spinoza's times, different authors accepted the existence of God and consequently felt no compunction in inserting such a premise in their argument. Kim does not insert this premise. He realizes that it is necessary to preserve of horizontal causation, i.e. ordinary physical causation, and at the same time to preserve vertical determination, i.e., supervenience, but to reject mental causation. However, even in this situation, he knows that in general this argument does not work. Indeed, Kim writes that the tension between vertical determination and horizontal causation has been "at the heart of the worries about mental causation".[28]

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[28] "This *exclusion argument,* as it is usually called, has devastating consequences for any position that considers mental properties to be real, including those non-reductive views that suppose mental properties to supervene upon physical properties. For if mental properties are causally impotent vis-a-vis physical properties, the traditional worry about epiphenomenalism confronts us: What is the point of having them in our ontology if they are idle? Abstract objects escape this worry, for we do not expect them to do causal work, but mental properties are retained in part because we believe them to affect the course of the world. If the exclusion argument is sound, then ratiocination, qualia, and the hopes and fears of mankind are simply smoke on the fire of brain processes." (Humpreys 1997, p. 2)

(Kim 2005, p. 38) He is aware that it is a necessary “refinement” and “clarification” of this argument. (p. 39) Evidently, within the unicorn-world, we need more and more “refinements”!

After analyzing in detail different alternatives to the mind-body problem and its companion problems, in the last chapter Kim draws his conclusion. The title of his chapter is the same as the title of his book. He returns again to the idea that “Causality requires a domain with a space-like structure-that is, a ‘space’ within which objects and events can be identified by their 'locations’” and only the domain of physical objects has such a structure. Therefore, we have to accept a monistic physicalist ontology. (Kim 2005, p. 151) Another reason for this position is that non-reductive materialism cannot explain better than Descartes’ dualism the mental causation that is “fundamental to our conception of mentality”. (Kim, p.153) Therefore he considers that non-reductive materialism (like Davidson’s anomalous monism or Putnam and Fodor’s functionalism) is not a viable alternative for mental causation. The only realistic alternative is a version of physicalism (but not type physicalism) that permits the reduction of certain, but not all, mental states to physical states. The question which is raised in this case is whether we can reduce all kinds of mental states to neural states. Probably Kim has in his mind the explanatory argument that is explained in detail by Chalmers. (Chalmers 2003) This argument asserts that since the physical framework can explain only structure and function, and consciousness and qualia cannot be explained through structure and function, then the physical perspective cannot explain consciousness. (Chalmers 2003, p. 4)

As we saw in 4.2, Kim accepts that we have to live with a *residue*: qualia and qualitative mental states cannot be completely solved from within the physical framework. We can make an analogy between, Newton’s and Kim’s residues (“anomalies”) (and Davidson’s anomalous monism): the perihelion of Mercury and the qualitative states of consciousness. Such residues could not be resolved by the improvement of their approaches - as they probably hoped - but only through completely changing the paradigm in which they constructed their approaches. Only from a first-person viewpoint can someone ask what the "I" is or "what is it like to be or to feel something". Now we can understand that, within the unicorn-world, people made huge intellectual efforts (in which their imagination, in a negative sense, has a significant role) in constructing Ptolemaic epicycles to save the phenomena. There is a considerable dispute between Kim and Block on mental causation. The reader has to imagine many debates in philosophy of mind on various Ptolemaic epicycles as ping-pong games in (de)constructing arguments that require consistency and, because of the unicorn-world framework, a powerful imagination. Many philosophers (like Kim, Block and Davidson regarding mental causation) are very good at the game of (de)constructing such arguments. These (s)wordfights between such good combatants are amazing. From an EDW view, such duels are endless, simply because these fights take place in a surrealist surrounding and the (s)words are no threat or, in Kantian terms, "the words are empty"! It can be a lesson for researchers from various domains that they have to be aware of the possibility of such vain disputes. When a duel over a fundamental problem goes on too long (the researchers fabricating many complicated Ptolemaic epicycles), probably something is wrong with its framework.

CHAPTER 5

Applications to some notions from cognitive science

We saw that Chapter 4 is dedicated to the relationship between the EDWs perspective and some notions from philosophy of mind. In this chapter, I examine the main ideas from computationalism, connectionism, dynamical system approach and robotics in relation to the EDWs perspective. Then, from the EDWs perspective, I will analyze some key elements from cognitive science (representation, levels of analysis, primitives, processes, structures, threshold, self-organization, bidirectionality, emergence, habituation, and tasks) that partially involve these approaches. Then I try to grasp the relationship between these key elements and some philosophical distinctions (continuously-discontinuously, static-in motion, stability-variability). Within this context, I need to examine the role of cognitive neuroscience in cognitive science. I end this chapter with a section dedicated to the status of any living entity.

5.1. Computationalism

In this section I will present certain elements from computationalism (the Computational Theory of Mind, hereafter CTM). CTM was initiated by Putnam (Putnam 1961), but its most important contemporary proponent is Fodor (Fodor 1975) followed by Fodor's friend and collaborator Pylyshyn. (Fodor and Pylyshyn 1988) CTM involves computations over representations, and implies the Representational Theory of Mind (RTM). Until recently, the generally accepted paradigm for CTM has presented behavior as the outcome of computations over representations in the brain. Within this classical paradigm, cognition essentially involves representations and computations. The main difference between classical models and other theories (that assume representations) is that classical models posit combinatorial semantics and syntax for mental representations: structurally, the representations have syntactic constituents, and the semantic content of representation is a function of the semantic contents of syntactical parts of the constituent structure of representation. The representations are symbolic complex structures with combinatorial syntax and semantics, and the computations are rules that allow manipulation of proper symbols (Fodor and Pylyshyn 1988). These symbols constitute the Language of Thought (LOT). Here I have to mention an important aspect: the CTM offers a good explanation only for propositional attitudes that involve judgments. The Language of Thought Hypothesis (LOTH) appeared in the 1970s when "propositional attitudes" such as hopes, believes, desires, etc., were a common topic for the philosophers of mind. The LOTH concerns the nature of thinking with propositional content without having an answer for problems about qualia, phenomenal experience, mental images, sensory memory, hallucinations, etc. (Aydede 2004) Two things inspired Fodor: (1) Formality and computation, syntax and semantic and (2) Compositionality, systematicity, and productivity in LOTH.

(1) Formality and computation, syntax and semantics

The Euclidian a priori intuitions are essential elements in Kant's theory. In the 19^{th} Century, there appeared non-Euclidian geometries that were formally consistent without implying any form of empirical intuition. According to Horst, because of the crises produced by non-Euclidian geometries in the late 19th and early 20th centuries, mathematicians tried to eliminate appeal to such things as intuitions, and developed the concept of "formal symbol manipulation and computation". First Bolzano (who directly rejects the Kantian notion of an a priori spatial intuition) and then Gauss, Peano, Frege and Hilbert tried to replace intuitions in geometry with a formal calculus. "The most influential strategy for formalization was that of Hilbert, who treated formalized reasoning as a 'symbol game', in which the rules of derivation were expressed in terms of the syntactic (or perhaps better, non-semantic) properties of the symbols employed." (Horst 2005) However, Clark mentions the pioneers of *formal logic* from 17th Century Pascal and Leibniz, followed by Boole, Frege, Russell, Whitehead, etc. Formal logic is a system that has a set of symbols, the possibility of combining them, and rules for such combinations. (Clark 2001, p. 9) Following certain rules, such systems can preserve the truth of sentences introduced in the systems. The amazing thing is that formal logic can preserve "at least one kind of semantic (…) property without relying on anyone's actually appreciating the meanings (if any) of the symbol strings involved." (Clark, p. 9) However, Clark mentions that the meaning is "in a certain sense recreated, in a realm whose operating procedures do not rely on meanings at all!" The symbols, ("tokens") are manipulated according to certain rules that act on their physical or syntactic characteristics.

Following Newell and Simon with their physical-symbol systems, Haugeland considers that "If you take care of the syntax, *the semantic takes care of itself*." (Haugeland 1981a, p. 23, original emphasis in Clark 2001, p. 9) The essential thing here is not the physical part but mainly the computations (according to some rules) realized by the system in manipulating the symbols. The idea that mind is equivalent to software was the framework for Newell and Simon to elaborate the physical-symbol system hypothesis. Their idea is that "A physical symbol system has the necessary and sufficient means for general intelligent action. (Newell and Simon 1976, p. 87)" (Clark, p. 28)

This framework sends us directly to the distinction that mind (high-level) and brain (low-level) are different levels of description or analysis. High-level (psychological/conceptual level) (symbols + manipulation of symbols = computation) has to be "*semantically transparent systems* (Clark 1989, p. 17)" (Clark 2001, p. 29) From an EDWs perspective, we can notice that within the unicorn-world the researchers have been forced to find the straight relationship between "physical symbol system" and "intelligent computation". In my approach, the physical system and the computation are not within the same EW but they belong to two EDWs. Obviously, within the physical system there has to be something that corresponds to computation and representation but it is "impossible for us to use" these notions within the brain-EW.

Regarding computation, we may turn to Turing, who constructed the theoretical foundation of the computer. In this sense, Turing defines the class of computable functions:

> [T]he class of computable functions was equivalent to the class of functions that could be evaluated in a finite number of steps by a machine of the design he proposed. The basic insight here was that *any operations that are sensitive only to syntax can be duplicated (or perhaps simulated) mechanically*. (Horst 2005, his italics)

An essential point for the CTM is the causal role of representation: in the cognitive economy of an intelligent system, the causal role of a representation assures the systematic correspondence of the system to the situation that it represents. The causal role of a complex representation is directly given by the causal effects of constituents, the representations being causally and systematically adequate to their content. Thus, the classical explanation of cognitive processes depends upon the causal role of constituents and guarantees that these constituents have a causal role: the complex representations are directly constructed from the instances of their constituents. This simply means that the symbolic representations are syntactically structured.

However, CTM has serious problems in explaining the relationship between syntax, semantics and causation. There is no problem in explaining the relation between causation and syntax because syntax represents the formal features of a well-formed formula. Nevertheless, it is difficult to explain this relation if we *add* semantics. Judgments involve not only the syntactic relations among constituents (words) but also the meaning of those constituents (semantics) and the formulae in which they occur. From an EDWs perspective, both mental representations and their semantics belong to the "I". According to Horst, syntax is the intermediary between semantics and causation. (Horst 2005) However, for such things, the notions of formalization and computation are necessary. Therefore: "Formalization shows us how to link semantics to syntax, and computation shows us how to link syntax to causal mechanisms." (Horst 2005) But in what sense can formalization and computation work with syntax and semantics? Syntax, semantics and causation correspond to the neural processes that take place in the brain, but we cannot identify these processes in the brain.

The computer manipulates symbols without the meaning of sentences/formulae that are constituted by words/symbols. Such a device is called by Haugeland a "semantic engine". (Heil 2004, p. 108) The problem is the following. On one side, the computer has no meaning for symbols even if it displays words and sentences. Even if the meanings are for us as external observers, syntax is considered the mirror of semantics. (Heil 2004, p.111) On the other side, the "I" manipulates symbols but at the same time has access to their meanings. Can the "I" or the EW-mind be similar to a computer? This problem is strongly related to the Chinese Room Argument (see below) and to connectionism (next section). The mind-brain relation has been mirrored by the software-hardware of a computer. If an external observer – using dissection or fMRI and PET – looks inside of a brain she can see noting like words and sentences. The same is available for a computer: inside of it at one level there are electrical changes among different elements and, on another level, the program. However, the confusion was that everybody was interested in finding which parts of the brain are the similar to the central processor of a computer. According to the EDWs perspective, the "I" is all the knowledge that corresponds to the union between the brain and the body. There is no central processor in the "mind".

There are several objections against this analogy between mind and computer. I specify only the most important: Searle's Chinese Room. With his thought experiment, Searle wants to show that the computer, following syntactic rules for manipulating symbols strings, does not understand anything by the symbols being manipulated. In fact, Searle's argument is against the CTM, too. In the article from 1984, his argument against Strong AI[1] has the following steps:

1. A computer has a formal (syntactic) program.
2. Syntax is not sufficient for semantics.

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[1] Strong AI means a machine that can understand something – as humans do – , i.e. they have mental states. When a computer is just a tool we have Weak AI. (Searle 1980)

3. The human mind has mental content (semantics).
Therefore,
4. Programs are not sufficient for the mind.

This argument shows that formal systems are not enough for mental content. This implies that for computers, the symbols have no meaning while for humans mind the symbols have meaning. (Searle 1999) According to Searle, the notion of "understanding" is misunderstood. For him there are different degrees of understanding, as, for example, having a good understanding of stories in English or in French, less well in German and not at all in Chinese. Moreover, there are different kinds or levels of understanding. He points out that we attribute this notion of "understanding" by metaphor and analogy to human artifacts like cars and thermostats but "nothing is proved by such attributions." (Searle 1980) This is the essential difference between what understanding means for us and what it means for machine. The car, the thermostat, and the computer understand in the same way, i.e., they understand nothing. In this way, Searle rejects Strong AI.[2]

Searle considers that there are four "difficulties" for cognitivism. From an EDWs perspective, I would like to analyze these difficulties in detail.

1. Syntax is not intrinsic Physics

[2] Clark criticizes Searle's Chinese Room and its "superficial features" that reflects the relationship between syntax and semantic. Clark considers that it is necessary "a finer grained specification of the relevant computational and syntactic structure." (p. 35) And this is given by the contrast between functionalism and his "microfunctionalism" (1989). Microfunctionalism is just the much finer grained formal description that represents the "fine-detail of the internal state-transition" from which mental states emerge. (p. 36) In this way, Clark wants to avoid Block's China population thought experiment against functionalism.

For Searle, the multiple realizability is not a consequence that "the same physical effect can be realized by different physical substances". It is a consequence that the properties are purely syntactical. In this sense, the consequences are "disastrous": there is a universal realizability and everything can be a digital computer; syntax is not intrinsic to physics. "The ascription of syntactical properties is always relative to an agent or observer who treats certain phenomena as syntactical." (Searle, p. 208) or

> *The multiple realizability of computationally equivalent processes in different physical media is not just a sign that the processes are abstract, but that they are not intrinsic to the system at all. They depend on an interpretation from outside.* (p. 209; Searle's italics)

The use of 0's and 1's reflects the notions of computation, algorithm and program; these notions "*do not name intrinsic physical features of systems.* Computational states are not *discovered* within the physics, they are *assigned to* the physics." (p. 210; Searle's italics) Searle emphasizes that this argument is different from the Chinese Room which shows that semantics is not intrinsic to syntax. Here he shows us that syntax is not intrinsic to physics.

From an EDWs perspective, Searle is right. We cannot "see" the syntax within the brain. Within the brain, there are some elements that correspond to syntax but both syntax (the rules and the representations) and semantics (the meaning of explicit and implicit representations) are the mind-EWs. In fact, the meaning of a representation involves the whole "I".

2. The homunculus fallacy is endemic to cognitivism

For Searle, "Without a homunculus that stands outside the recursive decomposition, we do not even have a syntax to operate with." (p. 213) Dennett's decomposition does not eliminate the homunculus. From an EDWs perspective, we can avoid the homunculus through the "principle of knowledge". If the "I" is knowledge, then we do not need any homunculus. The "I" is both the implicit knowledge and the explicit representations and, according to the principle of part-counterpart, the "I" corresponds to the physical part-counterpart. The implicit knowledge offers the meaning or the understanding of each explicit mental representation. Mental representations have meaning only because, according to the principle of knowledge, all mental representations are part of knowledge and all knowledge is the "I". The understanding is a property of the whole "I" and not part of it or part of the brain. In fact, the Kantian unity of the "I" represents the unity between syntax and semantics.

3. Syntax has no causal powers.

The proponents of cognitivism consider that the symbols manipulated in the brain, 0's and 1's, caused cognition. However, Searle considers that these symbols have no such causal powers "because they do not even exist except in the eyes of the beholder". (p. 215) The program does not really exist; it has no ontological status "beyond that of the implementing medium. Physically speaking, there is no such thing as a separate 'program level'." (p. 215) To support his idea, Searle introduces the difference between a mechanical computer and Turing's human computer. The mechanical computer does not follow rules because "it has no intentional content intrinsic to the system that is functioning causally to produce the behavior." (p. 216) In fact, "without a homunculus, both commercial computer and brain have only patterns, and the patterns have no causal powers in addition to those of the implementing media." Explaining the function of the brain, we have to use neurological and not psychological or terms simulating those related to a computer.

This difficulty clearly reflects the difference between the brain-EW and the mind-EW. Indeed, syntax, given by physical elements, has no causal powers. Such causal powers exist, but only for mental elements and not for neural patterns of activation. There are, of course, some correspondences for these powers but it is quite impossible to identify them. Again, it would be impossible for us to use such "empty concepts". (See Hanna's remarks about Kant's "empty concepts"; Hanna 2001, pp. 90–1. See the footnote 18, Chapter 16)

4. The brain does not do information processing

Again, for Searle the hardware of a computer has no intrinsic syntax or semantics; these processes are only in the eyes of beholders. Inside the computer, there are only electrical processes that are interpreted as symbols with syntax and semantics. (p. 223) This is available regarding the brain's processes. "The 'information' in the brain is always specific to some modality or other. It is specific to thought, or vision, or hearing, or touch, for example." (p. 224) As an essential point for Searle is that

> Where nonconscious processes are concerned, we are still anthropomorphizing the brain in the same way in which we were anthropomorphizing plants before the Darwinian revolution. (p. 230)

Thus, we need an inversion of explanation in cognitive science analogous to the inversion made by Darwin's explanation vs. old teleological biology. For Searle, consciousness is produced by the brain, but this is all. There are nothing like rules, mental information processing, non-unconscious inferences, no language of thought and no universal grammar. (p. 229) Such phenomena are based on a "pre-Darwinian conception of the function of the brain". Searle introduces an analogy with a plant that follows the rotation of the sun. Prior to Darwin, it was a kind of anthropomorphization of plants: they were supposed to have a kind of intentionality. This intentionality has been replaced with "levels of explanation", a hardware level and a functional level. In fact, such movements were produced by a secretion of a hormone, auxin. From an evolutionary viewpoint, the plants that follow the sun are more likely to survive than others are.[3] (p. 230) Searle eliminates the unconscious processes from explanations of conscious states.

From an EDWs perspective, we can say that working within the unicorn-world, many things have been anthropomorphized in the history of human thinking. However, working within the unicorn-world, Searle makes two inevitable mistakes in rejecting the unconscious (implicit, automatic, etc.) processes and states and believing that the consciousness is "produced" by the brain. In other words, he locates the conscious and the brain within the same world, the unicorn-world.

(2) Compositionality, systematicity, and productivity in LOTH

Making an analogy between language and thinking and thus following Chomsky's theory about grammar, Fodor attributes certain features to thinking: compositionality, systematicity and productivity. Fodor and Pylyshyn have strong arguments for compositionality, systematicity and productivity. (Fodor and Pylyshyn 1988) Compositionality refers to the fact that the content of a complex representation is determined by the content of its constituents and their relationships. Systematicity is given by this example. If someone understands "John loves Mary" she can also understand, without additional learning,

[3] Searle extends this example to human vision (Ponzo illusion).

"Mary loves John". Productivity indicates the abilities of the human mind to use recursive syntactic rules and a finite set of lexical representations to produce an indefinite number of thoughts. From an EDWs perspective, the "I" is able to transform one sentence to another only because both sentences are parts of it! As we saw above, syntax and semantics are both the "I" and this is the reason the "I" (the "thinking I") has these properties of compositionality, systematicity and productivity.

5.2. Connectionism

Connectionism, the alternative paradigm, considers (in a similar way to computationalism) that the brain is a large neural network wherein computations over representations take place, the computations being a mapping of an input vector to an output vector. The essential difference between these approaches concerns the nature of representations: in connectionist theory, at least in some kinds of neural networks, the representations are distributed. Typically, a neural net contains input units (or nodes), hidden units, and output units. The input units send signals to the hidden units. Each hidden unit computes its own outcome and then sends the signal to the output units. The pattern of activation in the network is determined by the weights on the nodes. The values of the output (like for neurons) is not the same as the input: what a node "does" (the response function) is the node's activation value that can be linear or *nonlinear* functions (sigmoid activation function or others). (Elman et al 1996, p. 53) Nonlinear means that "the numerical value of the output is not directly proportional to the sum of the inputs." (Clark 2001, p. 63) A connectionist state is a pattern of activity (within an activation space), which contains constituent subpatterns. A pattern of activity cannot be decomposed into conceptual constituents as in the computational approach. The connectionist decomposition is an approximate one: a complex pattern contains constituent subpatterns that are not defined precisely and exactly, but depend on *context*. The constituent structure of a subpattern is strongly influenced by the inner structure included within it. (See the example with a cup with coffee in Smolensky 1988). The conceptual constituents of mental states are vectors of activity with a special kind of constituent structure: the activation of individual units. The connectionist representations have constituents, but these constituents are functional parts of the complex representations, not effective parts of a concatenate scheme, the constituent relations not being instantiated in a part-whole type of relation. While the classical approach deals with a type of concatenate compositionality, connectionism stresses functional compositionality. The task for neural nets is to find the weights that correspond to a particular task. One training method is the backpropagation rule that does not correspond to human learning processes.

Neural nets can perform various tasks. The first important task for a net after its training was to predict the irregular past tense of verbs (PDP Group, 1986). In the classical approach, there are two mechanisms, one for regular verbs and the other for irregular verbs. In connectionism, there is only one mechanism (a single set of connections for regular and irregular). Other nets can recognize faces or associate images with labels (Plunkett & Marchman 1991, 1993 in Elman et al, pp. 124–129), and so on.[4]

From Fodor's framework, Marcus analyzes different kinds of neural networks based on back-propagation rule in detail.

[4] In an excellent paper of analyzing connectionism, Clark grasps in detail three essential features that characterize connectionist networks: superpositional storage, intrinsic context-sensitivity and strong representational change. (Clark 1997c)

(Marcus 2001) His main interest is "to integrate the research on connectionist models with a clear statement about what symbol-manipulation is." (Marcus 2001, p. 2) For Marcus, symbol-manipulation has three meanings: the mind can represent "abstract relationships between variables", these relationships being the "algebraic rules"; the mind has a "mechanism of recursively structured representations" seen as "internally representing knowledge"; the mind can distinguishes between mental representations "the book that is on the table" and "the table that is on the book"; and finally the mind can distinguish between mental representations of "individuals" and "kinds", (between Felix and cats in general). (pp. 3-5) The conclusion of his investigation is that the neural networks have limits in freely generalizing abstract relations, representing complex relations between representations, and distinguishing between individuals and kinds. (Marcus, p. 169)

Who is right from an EDWs perspective? Mental representations have concatenative compositionality, systematicity and productivity only because they are the "I" that has its unity. Only the unity of the "I" creates the possibility of "symbol-manipulation" with Marcus' characteristics. In general, connectionist networks are "neurally-inspired" attempt to grasp certain mental properties. We need to construct a neural network that has two EDWs: the neural-EW and the "I" or the unity of the "I". I think that this is the reason neural networks cannot yet grasp Fodor's properties or Marcus' characteristics. Evidently, using *gradient descent* in weight space (Elman et al, pp. 71-2), for neural networks "the ability to learn may change over time-not as a function of any explicit change in the mechanism, but rather as an intrinsic consequence of learning itself. The network learns, just as children do." (Elman et al 1996, p. 70) However, from an EDWs perspective, a neural network does not have the unity of the "I" proper to a human being. There is a superpositional storage for a network but this storage is not the same thing as the unity of the "I".

Essential for the EDWs perspective is the relationship between this superpositional storage and semantics within a neural network and, therefore, I analyze, in detail, these aspects. What does superpositional storage mean for a network? "Two representations are fully superposed if the resources used to represent item 1 are coextensive with those used to represent item 2." (Clark 1997c, p. 169) The definition of superpositional storage of two items is if

> it then goes on to encode the information about item 2 by amending the set of original weightings in a way that preserves the functionally (some desired input-output pattern) required to represent item 1 while simultaneously exhibiting the functionality required to represent item 2. (Clark 1997c, p. 170)

The combination of two characteristics for superposition:

(1) The use of distributed representations (2) the use of a learning rule that imposes a *semantic metric* on the acquired representations. (Clark 1997c, p. 170) In fact, "semantically related items are represented by sintactically related (partially overlapping) patterns of activation." (Clark 2001, p. 66)[5] Or "The semantic (…) similarity between representational contents is echoed as a similarity between representational vehicle." (Clark 1997c, p. 171) In this way, there is the process of prototype extraction (category or concept) and generalization for a network. Against a symbolic paradigm, neural nets do not work with innate rules (and representations) (Chomsky, Fodor, etc.). Such rules appear as a natural effect of training (learning) so we have learning rules that impose the semantic metric of

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[5] Clark's example is with a cat and a panther vs. a fox.

acquired representations. (Clark 1997c, p. 171) Physical symbol system approaches display semantic transparency.

From an EDWs perspective, the semantic similarity between representational content within the "I" is not only the "echoed as a similarity between representational vehicles". We have to include also the unity of the "I" for reaching the semantic of representations (and their rules) that are parts of the "I". Searle is right in claiming that not only computationalism but also neural networks (i.e., in general, computations over representations) are unable to explain our conscious processes that involve mental representations, and maybe we need to include chemical and biological reactions in our explanations. (Searle 1992) I believe that the inclusion of such reactions can offer a better explanation for the unity of the "I". We have to accept two almost paradoxical characteristics for the "I"[6]: it has its own unity (it exists as an entity given by the implicit knowledge) and *is* the sum of all mental states and processes.

The relationship between syntax and semantics is related to the intrinsic context-sensitivity or Smolensky's "subsymbolic paradigm" from connectionism. Fodor and Pylyshyn consider that neural networks cannot accomplish a combinatorial syntax and semantics. For them, connectionism is just a mere implementation of symbolic system. (Fodor and Pylyshyn 1988) "Symbolic representations have a *combinatorial syntax and semantics*." (Bechtel & Abrahamsen 2002, p. 157) However, Clark believes that for a neural network, there is a kind of "*fine grained context sensitivity*". A representation of an item is given by a

> distributed pattern of activity that contains sub-patterns appropriate to the feature-set involved… [A] network will be able to represent

[6] As I emphasized in Chapter 3, we have to change again the notion of existence.

> several instances of such an item, which may differ in respect of one or more features. …[S]uch "near neighbors" will be represented by *similar* internal representational structures, that is, the vehicles of the several representations (activation patterns) will be similar to each other in ways that echo the semantic similarity of the cases – that is the semantic metric (see above) in operation. (Clark 1997c, p. 174)

and thus

> the contentful elements in a subsymbolic program do not directly recapitulate the concepts we use "to consciously conceptualize the task domain" (Smolensky, 1988, p. 5) and that "the units do not have the same semantics as words of natural language" (p. 6). (Clark 2001, p. 67)

In Clark's words, the unit-level activation differences can mirror the details of various mental functions in interactions with "real-world contexts". Evidently, from an EDWs perspective, the units (that belong to the brain-EW) cannot have any kind of semantics (this property belong only to mental representations from the mind-EW). There is clearly something from physical-EW (brain-EW) that corresponds to a mental representation, but we cannot identify what exactly this element/process is. (See again Hanna 2001 and the footnote 18, Chapter 6) According to the principle of part-counterpart and the principle of knowledge, one mental representation corresponds not only to a pattern of activation but also to the part and the counterpart of the brain plus the body; that mental representation is knowledge and the whole knowledge is the "I".

For Smolensky, a connectionist state is a pattern of activity (within an activation space), which contains constituent subpatterns. (Smolensky 1988) A pattern of activity cannot be decomposed into conceptual constituents as in the symbolic paradigm. The connectionist decomposition is an approximate one: a complex pattern contains constituent subpatterns that are not defined precisely and exactly but depend on *context*. The constituent structure of a subpattern is strongly influenced by the inner structure included within it. The conceptual constituents of mental states are vectors of activity with a special kind of constituent structure: the activation of individual units. The connectionist representations have constituents, but these constituents are functional parts of the complex representations, not effective parts of a concatenate scheme, the constituent relations not being instantiated in a part-whole type of relation. While the classical approach deals with a type of *concatenate compositionality*, connectionism stresses *functional compositionality* (van Gelder 1990). For van Gelder, concatenation means "linking or ordering successive constituents without altering them in any way" and the "representations 'must preserve tokens of an expression's constituents (and the sequential relations among tokens)' (p. 360)." Functional compositionality is the process of having a representation as recovering parts through certain operations. (Van Gelder 1990, p. 360 in Bechtel & Abrahamsen 2002, p. 170 and section 6.3.1 from their book) His examples are Pollack's RAAM nets, Hinton's (1990) reduced descriptions of levels in hierarchical trees, and Smolensky's (1990) tensor product representations of binding relations. The difference between classical approach and connectionism is that

> In the symbolic paradigm the context of a symbol is manifest around it and consist of other symbols; in the subsymbolic paradigm the context of a symbol is manifest inside it, and consist of subsymbols. (Smolensky 1988, p. 17)

In his famous example with the cup of coffee Smolensky considers that

> The compositional structure is there, but it's there in an *approximate* sense. It *not* equivalent to taking a context-independent representation

> of coffee and a context-independent representation of cup – and certainly not equivalent to taking a context-independent representation of the relationship in or with – and sticking them all together in a symbolic structure concatenating them together to form syntactic compositional structure like "with (cup, coffee)." (Smolensky, 1991, p. 208) (Clark 1997c, p. 175)

In neural nets there are no computations defined over symbols but only certain numerical level of units and weights and activation-evolution equation and so

> there are no syntactically identifiable elements that both have a symbolic interpretation and can figure in a full explanation of the totality of the system's semantic good behavior, that is, "There is no account of the architecture in which the same elements carry both the syntax and the semantics" (Smolensky, 1991. p. 204). (Clark 1997c, p. 175)

Let me analyze Smolensky's framework of interpreting a neural network. If the complex pattern contains constituent subpatterns that depend on *context*, i.e., "the context of a symbol is manifest inside it, and consists of subsymbols" (Smolensky 1988, p.17) and we have a kind of "functional compositionality" (van Gelder 1990), it means that something that belongs to the mind-EW is absent: mental representations with their classical characteristics. Nevertheless, the dependence of a symbol on the context can reflect the correspondence from the brain-EW to the relationship between syntax and semantics, i.e., between a symbol and its meaning (mind-EW). In this sense, essentially is that

> Mental representations and mental processes are *not* supported by the same formal entities – there are not "symbols" that can do both jobs. The new cognitive architecture is fundamentally two-level; formal, algorithmic specification of processing mechanisms on the one hand, and semantic interpretation on the other, must be done at

two different levels of description. (Smolensky, 1991, p. 203) (Clark, 1997c, p. 175)

In Smolensky's words, on one level, mental processes are represented by "numerical level descriptions of units, weights and activation-evolution equation". (Clark, p. 175) At this level, we cannot find the semantic interpretation. On the other level, "large scale activity of such systems *allows* interpretation but the patterns thus fixed on are not capable of figuring in accurate descriptions of the actual course or processing. (See Smolensky, op. cit., p. 204)" (Clark 2001, p. 176) However, this state of affairs is mirrored through the EDWs perspective! There is a mixture of two EDWs ("two levels") and we cannot find any "semantic interpretation" within the brain-EW even if there are some physical states and processes that correspond to both symbols and their semantics that belong to the mind-EW. In fact, according to the principle of part-counterpart, we have to include the whole brain and body in explaining any symbol and its semantics. For a neural network, the semantic metric of the system imposes a similarity for *content* when there is a similarity for *vehicle* (similar patterns). Nevertheless, we have here the "tyranny of similarity"! (McLeod et al. 1997) This tyranny (closed related to the systematicity not accomplished by neural nets) is avoided only through the unity of the "I" that is absent to any neural network.

Regarding the neural networks, in recent years other methods have been developed. For instance, in 1991 and 1993, Elman created recurrent neural nets that have something more then classic nets, in that the signal from inputs to hidden units and finally to outputs is sent back from the output units to the inputs or hidden units. In this way, the recurrent net stands for human short-term memory. Let me analyze this kind of network from an EDWs perspective. According to Bechtel &

Abrahamsen (2002), related to time, language-sentences have two features: "(1) they are processed sequentially in time; (2) they exhibit long-distance dependencies, that is, the form of one word (or larger constituent) may depend on another that is located at an indeterminate distance." (Verbs must agree with their subjects – a relative clause … intervenes between the subject and the verb.) (p. 179) For producing such sentences the net has to incorporate such relationships without using explicit representations of linguistic structures. Elman's *simple recurrent network* (SRN) (1990) has 150 hidden units related to *context units* to incorporate information about previous words. In Bechtel and Abrahamsen words, the net processes sentences sequentially in time through grasping the dependencies between nonadjacent words to predict successive words in a sentence. (Bechtel & Abrahamsen 2002, p. 181) Using the backpropagation rule the weights are adjusted after each input. The hidden units define a high dimensional space 150-dimensional hypercube: "the network would learn to represent words which 'behave' in similar ways (i.e., have similar distributional properties) with vectors which are close in this internal representation space." (Elman et al, p. 94) Therefore, this space cannot be visualized: it is a hierarchical clustering tree of the words' hidden unit activation patterns. (Elman et al. 1996, p. 96 or Clark 2001, pp. 68–73) It means

> capturing the hidden unit activation pattern corresponding to each word, and then measuring the distance between each pattern and every other pattern. These inter-pattern distances are nothing more than the Euclidian distance between vectors in activation space

and thus we can get a hierarchical clustering tree, "placing similar patterns close and low on the tree, and more distant groups on different branches." (Elman et al., pp. 94–5) that is VERBS, animates, NOUNS, inanimates. In this case, context-sensitivity means "tokens of the same type are all spatially proximal, and closer to each other than to tokens of any other type." (Elman et al, p. 97) The net "discovered" categories – verbs, nouns, animate, inanimate – "properties that were good clues to grammatical role in the training corpus used." (Clark, p. 71) Elman uses "cluster analysis" and "principal component analysis" (PCA) to determine what the networks learned. For NETtalk, the authors used "cluster analysis": the network learned a set of static distributed symbols and we have the relations of similarity and difference between static states, PCA for a SRN in addition "can promote or impede movement into future states" that is a "temporally rich information-processing detail" (Clark 2001, pp. 71–2)

> There is no separate stage of lexical retrieval. There are no representations of words in isolation. The representations of words (the internal states following input of a word) always reflect the input taken together with the prior state ... the representations are not propositional and their information content changes constantly over time in accord with the demands of the current task. Words serve as guideposts which help establish mental states that support (desired) behavior. (Elman, 1991b, p. 378 in Clark 2001, p. 72)

Again, we have two EDWs inserted within one spatio-temporal framework. The Euclidian distances between vectors in activation space (that is various neural patterns of activation) cannot reflect the "distance" between the semantics of various symbols (verbs and nouns, animate and inanimate, etc.) Within the mind-EW there is nothing like Euclidian space. Moreover, within the brain-EW, we cannot identify such Euclidian distances among neural patterns of activation that correspond to certain mental states. I emphasize that, without any knowledge of semantics, an SRN learns to group the encoding of animate objects together only because they were distributed similarly in the training corpus. (Bechtel & Abrahamsen, p. 182) This artifact ("tokens of the same type are all spatially proximal, and closer to each other than to tokens of any other type." – Elman et all., p. 97) is an artificial method for relating two EDWs.

For neural networks, there is a "deep interpenetration of knowledge and processing characteristics" for a network. (Clark 2001) Processing involve the weights to create patterns of activation that are the outputs. But these weights are the knowledge stored of network. "And a new knowledge has to be stored superpositionally, that is, by amending existing weights." (Clark, p. 184) We can see that, from an EDWs perspective, there is a mixture among two EDWs and a mixture between explicit (symbols) and implicit (rules) knowledge.

Some philosophers see neural networks with their distributed representations as similar to the brain structure. The net is just an implementation of the mind. Others consider that the nets are the mind. Connectionism has been accused (first by Fodor and Pylyshyn 1988) of not being able to explain various abilities of the human mind but mostly its systematicity. "The systematicity of thought is an effect of the compositionally structured inner base, which includes manipulable inner expressions meaning 'John' 'loves' 'Mary' and resources for combining them." (Clark, p. 77) If the nets have the requisite compositionality, systematicity and productivity then they are simple implementations of computationalism. Yet we know that the nets have serious problems with systematicity. They can be trained to recognize "John loves Mary" but are unable to recognize "Mary loves John". Human beings are able to do this without any problem due to the unity of the "I". This suggests that connectionism is a false theory for explaining human mind.

Neural networks can be interpreted in different ways but it is still accepted that until present days connectionism does not reflect completely human cognition. In conclusion, from an

EDWs perspective, I think that neural networks cannot accomplish the Kantian unity of the "I". Mental representations are the "I"; in the case of neural networks, the constituent sub-patterns depend on the context but they do not offer the complete unity of a network. In my opinion, this is the main reason that connectionist networks cannot accomplish systematicity. Even if the superposition of various patterns in a neural network is a step toward this property, still a neural network does not have the unity of the "I". Evidently, the unity of "I" corresponds to some brain-body mechanisms. A neural network needs a mechanism that would be able to "observe" all the information from the network as a whole.

5.3. The dynamical system approach

More recently, some authors maintain that dynamic systems theory is the most appropriate framework for understanding cognition. Cognitive systems are taken to be dynamical systems as van Gelder suggests: "cognitive agents are dynamical systems and can be scientifically understood as such". (van Gelder 1999) The new metaphor discusses the core notions of the preceding paradigms – notions such as computation and representation. Within this new metaphor, there are already some tendencies for various classifications of the dynamicists: representationalists, non-representationalists, or meta-representationalists, computationalists and non-computationalists, connectionists and dynamic connectionists, and so on.

A dynamic system is characterized by a set of state variables and a dynamic law that governs how the values of those state variables change with time. The set of all possible values of the state variables constitutes the system's state space. The parameters of the system determine the dimensions of space. A state of the system is a point in its state space. The sequence of the states represents the trajectory of the system. The behavior of a system (that changes over time) is represented by a sequence of points in its *phase space* (a numerical space described by differential equations). (van Gelder and Port 1995, p. 5) Usually, geometric images are used to grasp this trajectory: “behaviors are thought of in terms of locations, paths, and landscapes in the phase space of the system.” (van Gelder and Port 1995, p. 14) The common notions are *control parameters* (factors that affect the evolution of a system) and *collective variables*. A common example of a dynamical system is the solar system in which the position and the momentum of one planet differ from that of other planets and mathematical laws relate the changes over time. (van Gelder 1995, p. 363 or van Gelder and Port 1995) In fact, scientists try to explain such a real system by means of a mathematical dynamic model. The rates of change are represented by differential equations.

Space state is a set of possible trajectories; to describe the laws that are giving the shape of possible trajectories (the flow) are used for either the conceptual tools of discrete mathematics or of continuous mathematics. The main concepts taken into account to describe state space are the following: (1) an *attractor* is a point or a region with the property that any trajectory which is passing near to a point or a region is attracted in that point or region; the surface of such influence is called the basin of attraction (2) the *repellor* is a point or a region which has the contrary property of attractor: rejects all trajectories which are passing near to that point or region (3) a *bifurcation* is a point in which a small change in the values of the parameters can change the direction of the state space’s flow and can shape a new space of attractors and repellors.

The radicals among the dynamicists pretend merely that terms such as “representation” and “computation” are useless in any explanation of human cognition.[7] In the framework offered by dynamical systems theory cognition is viewed "in motion". The Cartesian distinction between mind and body is abandoned. Mind, body and the environment are dynamical-coupled systems, which interact continuously, exchanging information and influencing each other. The processes happen in real continuous time. In connectionism, van Gelder claims, a change in system is a transformation from one representation to another, these being "static" entities which exist only at an instant of time: "they result from freezing the behavior of the system". (van Gelder 1995) In a dynamical system we do not have discrete identifiable steps in which one representation gets transformed into another. From this perspective there are two points of view regarding the problem of representation. The radical one considers that the brain does not compute representations. (van Gelder 1991, 1995; Kelso 1995; Thelen and Smith 1994; Skarda and Freeman 1988) The moderates suggest that we need only to replace the vehicle of representations or to take the notion of representation in a weaker sense. (Bechtel 1998; Clark 1997a, b; Wheeler and Clark 1997)

From an EDWs perspective, there are many errors embraced by the proponents of this approach. Mental representations exist within the mind-EW, and these entities are, in the same time, the "I". The mind is not coupled with the body. Only the brain is coupled with the body and the environment. The introduction of mathematical tools does not help us to study the mind, at least in this period! It seems that some authors want to

[7] "We posit that development happens because to the time-locked pattern of activity across heterogeneous components. We are not building representations of the world by connecting temporally contingent ideas. *We are not building representations at all! Mind is activity in time*… the real time of real physical causes." (Thelen and Smith 1994, p. 338)

convince us about this approach by appealing to some complicated mathematical tools, even if it is impossible for them to apply such notions in explaining cognition.

The notions that dominate dynamical theory are those of pattern and self-organization, and they are strongly related to coupling and circular causation. (Clark 1997b; Kelso 1995; Varela et al. 1991) They are used especially to describe and analyze the patterns that emerge from interactions between organism and environment (where "organism" means the totality of neural and bodily elements). Important is to grasp the processes through which "regular structure in space and time are produced … without either a specific plan or an independent builder …but simply *organize themselves*." (van Gelder and Port 1995, pp. 26–7) The organism and the environment could be considered as a single coupled system (composed of two subsystems), the evolution of which is specified by a set of differential equations. The coupled system unfolds by a kind of special causation, called circular causation: each subsystem is continuously influenced by the other and at the same time influences the evolution of the other subsystem. This kind of causation is known as continuously reciprocal causation. (Clark 1997a, Chapter 8) Evidently, there is a kind of circular causation between the brain, body and environment. Nevertheless, this circular causation has nothing to do directly with the "I". The "I" has no interactions with the environment but only some correspondences with these interactions.

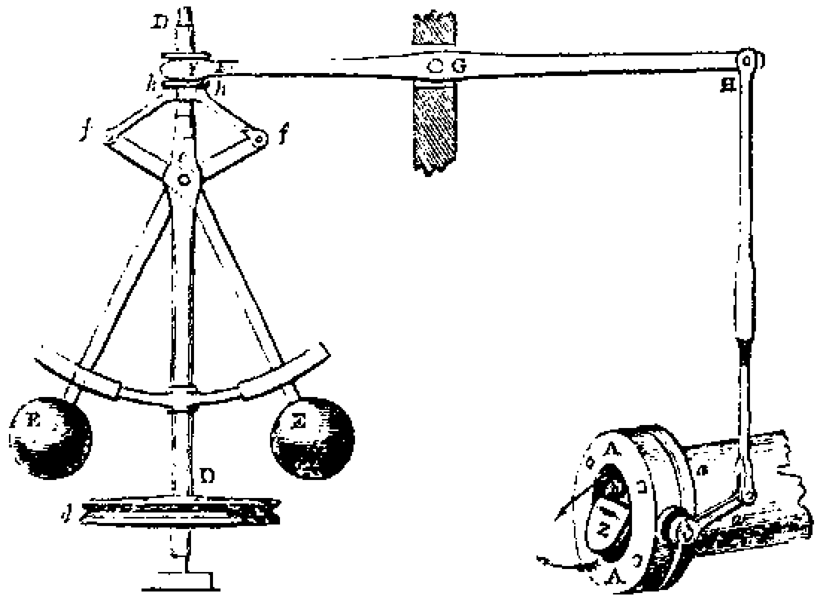
Van Gelder rejects mental representation and computation. He makes an analogy between mind and a particular mechanism – Watt's governor – that is in motion. (van Gelder 1995) Van Gelder compares two kinds of governor (and their "conceptual frameworks", van Gelder 1995, part III): computational and centrifugal governors. On one side, the computational governor follows an algorithm with a few steps and has three characteristics:

(1) operating internal representations and symbols; (2) the use of computational operations over the representations (3) discrete, sequential and cyclic operations (4) "homuncular in construction": homuncularity is the decomposition of a system in parts/ components, each realizing a subtask and communicating with the others. (van Gelder 1995, pp. 347–8 and 350–1; comments Clark 2001, p. 126 or Bechtel & Abrahamsen 2001, p. 266) On the other side, the centrifugal governor is norepresentational and noncomputational. The relationship between the two quantities (arm angle and engine speed) that are coupled in a "continuously reciprocal causation" can be explained only within a mathematical framework of dynamics. (van Gelder 1995, p. 353) Through analogy, this process is available for the relationship between brain, body and environment. In Clark interpretation, the dynamic system approach reflects the *continuous reciprocal causation* between brain, body and environment. (Clark, p. 128) From an EDWs perspective, we can accept a continuous reciprocal causation between brain, body and environment but not between mind and the environment.

About the Watt centrifugal governor for controlling the speed of a stream engine:

> The governor was designed by Watt to solve the problem of maintaining constant speed for the flywheel of a steam engine. Watt solved this problem by a technology already employed in windmills. It involved attaching a vertical spindle to the flywheel which would rotate at a speed proportionate to the speed of the flywheel. He attached two arms with metal balls on their ends to the spindle; these arms were free to rise and fall and, due to centrifugal force, would do so in proportion to the speed of the governor. Through a mechanical linkage, the angle of the arms would change the opening of a valve, thereby controlling the amount of steam driving the flywheel. This provided a system in which, if the flywheel was turning too fast, the arms would rise, causing the valve to partly close. This would reduce the amount of steam available to turn the flywheel, thereby slowing it down. On the other hand, if the flywheel was turning too slowly, the

arms would drop and this would cause the valve to open, resulting in more steam and hence an increase in the speed of the flywheel (Figure 2a). (Bechtel 1998, p. 303)



Such mechanisms are "control systems" that are noncomputational and non-representational: in this system we cannot find any kind of representations and any discrete operations (so no steps in an algorithm). The only way to explain them is the dynamic analysis. The idea is that the relationship between the arm angle and the engine speed cannot be explained by computational explanation. These two quantities continuously influence each other and this process involves the dynamic notion of coupling.[8] (Clark 2001, p. 127)

[8] It reminds me Leibniz's example with two clocks on the same wall...

For van Gelder, if everything is in motion, then we do not have any static and discrete representations. Thus he tries to prove that everything is in motion. Let me analyze this example from a different perspective. Depending on the subject's conditions of observation, in our ecological niche we can represent things continuously or discontinuously, in motion or as static. I think van Gelder is wrong in introducing this analogy in order to reject the existence of mental representations. Let us imagine that we can spatially extend the wheel on which the driving belt moves this, being, in Ptolemaic epicycles, a blow-up from the macroscopic "level" to the level of macromolecules. The wheel would not be even anymore, but like that of a clock. And if we have a cog system instead of a driving belt, the transmission would be discrete, involving certain steps of movement. In this case we have a different organizational "level". However, if we move to the quantum world, then we have epistemologically different phenomena from an EDW. Thus, we cannot compare human cognition with Watt's governor unless we specify exactly what mechanisms and therefore what EW we perceive in trying to explain it by means of this analogy. We cannot explain all the EDWs through only one condition of observation/interaction. Otherwise, we are working in the unicorn-world. Therefore, van Gelder is not right since in the mind-EW there are primitives, representations or mental symbols which have properties in opposition with continuity and movement. However, in the mind-EW, there are also continuous processes such as those that are represented by procedural knowledge.

Usually, the examples offered by the proponents of dynamical system theory (DST) are taken from a physical system (the Watt governor, van Gelder 1995) or sensoriomotor control systems – learning to walk (Thelen and Smith 1994) or rhythmic finger motion (Kelso 1995). For radical dynamicists, high cognitive processes are just the result of the evolution of perception and sensoriomotor control systems. Thus, if the last phenomena are the result of continuous reciprocal causation between brain, body and environment ("on-going coupling", Clark's notion), then the cognition is in the same situation. For instance, Pollack (1994) considers that for "unifying nature cognition with nature" we should look not at "software law" but at physical law. (Pollack 1994, p, 119 in Clark 2001, p. 130) Evidently, from an EDWs perspective we cannot accept such assertions: "nature", i.e., the unicorn-world does not exist or we cannot unify the "nature cognition", the mind-EW, with the "nature", the macro-EW.

Rejecting the use of representations in explaining cognition, the proponents of DST consider that the representations can be replaced by certain dynamical processes. In DST, the rules are defined over numerical states; dynamical systems are representational "without having their rules of evolution defined over representations." (van Gelder and Port 1995, p. 12) More then this, the DST can manages discrete state transitions (a) using discrete states (catastrophe model that leads to a bifurcation) or (b) imposing discreteness in describing "how a continuous system can undergo changes that look discrete for a distance". (van Gelder and Port 1995, p. 23) If cognition (an intelligent system interacting with the world) is a particular structure in space and time, the mission for researchers is to discover how the structure "turns out to be a stable state of the brain in the context of the body and environment". (van Gelder and Port 1995, p. 27) For van Gelder, if everything is in motion, then we do not have any static and discrete representations. Thus he tries to prove that everything is in motion and "*everything is simultaneously affecting everything else*." (van Gelder and Port 1995, p. 23)

> dynamicists conceptualize cognitive processes in *geometric* terms. The distinctive character of some cognitive process as it unfolds over time is a matter of how the total states the system passes through are

> spatially located with respect to one another and the dynamical landscape of the system. (van Gelder and Port 1995, p. 15)

and

> cognitive processes always unfold in real time; that their behaviors are pervaded by both continuities and discretenesses; that they are composed of multiple subsystems which are simultaneously active and interacting; that their distinctive kinds of structure and complexity are not present from the very first moment, but emerge over time; that cognitive processes operate over many times scales, and events at different times scales interact; and that they are embedded in a real body and environment. (van Gelder and Port 1995, p. 18)

In their view, the embeddedness of cognition within the neural system is the framework for the idea that a system can be simultaneously described at two levels: dynamical and computational levels. In fact, the dynamics of central cognitive processes and dynamics of neural processes are two-levels (high and low) of description. "Dynamical systems theory provides a framework for understanding these level relationships and the emergence of macroscopic order and complexity from microscopic behavior." (Van Gelder and Port 1995, p. 29) However, the proponents of this approach try to force us to accept that discreteness (mental representations) can be represented through continuous processes. This is clearly false: within the mind-EW, we have static and discrete entities that cannot be replaced by continuous processes. The distinction between appearance (discrete) and reality (continuous) is false; it reminds us of the Kantian noumen-phenomen distinction.

Clark introduces the distinction between on-line and off-line processes. "Off-line cognition are decision making and contrafactual reasoning where the subject has to think about representations in their immediate absence." (Clark 1997b) Clark (and others) notices that there is a problem regarding the extension of continuous reciprocal causation from on-line to off-line processes. He believes that we cannot follow DST in rejecting the computation of the brain. And computation involves representations. In “Open Peer Commentary” on van Gelder’s article from BBS (1998), many people argue that DST can explain only perception and sensoriomotor control systems and not higher level cognitive processes.

Essential it would be the difference between *knowledge-based* and *physical-causal* systems (Clark 2001, p. 134) that reflects the relationship between perception/action and high-level cognitive processes (“embodied cognition” or “cognitive incrementalism”, Clark p. 135) For grasping this relationship from an evolutionary neural perspective, Clark introduces Milners and Goodale’s “two visual systems” hypothesis (p. 136): dorsal stream supporting on-line visuomotor action and ventral steam for off-line visual reasoning, visually based categorization and verbal report. It seems that Milners and Goodale’s hypothesis partially supports the EDWs perspective. However, their approach is constructed within the unicorn-world! The mechanism for visually based categorization and verbal report corresponds to certain processes from the mind-EW.

5.4. Robotics

From an EDWs perspective, it seems that something essential is missing in constructing robots in our days. In general, there are different kinds of robots but I will analyze here only Brooks’ type of robot and evolutionary robots.[9] Analyzing the

[9] For instance, another type is a hybrid robot that is a mixture of a computer with mechanisms that work in parallel. The most performant example is Asimo, constructed by the Honda Company. The majority of researchers cannot accept such kinds of hybrid robot. They consider that nature could not create such creatures. From an EDWs perspective, it is evidently a mixture of two EDWs.

robots, Clark considers that, due to the evolution of our species, perception and action are interrelated.[10] (Clark 2001, p. 88) In this context, Clark describes robot Herbert (Connell 1989). Herbert was able to collect soft drink cans from tables in a laboratory. Instead of "sense-think-act" perspective, Herbert's actions involve only collection of sensors and "independent behavioral routines": with a ring of ultrasonic sound sensors the robot halts in front of object. The main difference between these two approaches is that the random movement of the robot within the laboratory is interrupted if its visual system detects a "table-like outline" and a new robot function begins: the sweeping of the surface of the table. If a can is detected than "the whole robot rotates until the can is centred in its field of vision". The arm's robot with touch sensors skims the table surface until a can is encountered, grasped and collected. Then the robot continues its movement. (Clark, pp. 91–2) According to Clark, perception is not a "passive phenomenon" but perception and action are strongly interconnected. From an EDWs perspective, we have only one EW, the macro-EW where we can find the interaction between the brain, the "body" and the environment but the mind-EW is missing.

The standard cases for such robots are those constructed by Rodney Brooks (1991), one of the pioneers of the "new robotics" (his slogan "The world is its own best model"). A Brooks' view for constructing robots is labeled "*subsumption architecture*". (Brooks 1991) A robot is constructed as having three different layers. Each layer accomplishes a simple function

[10] Clark mentions a new view on describing vision, "interactive vision" (Churchland, Ramachandran and Sejnowsky 1994) against classical approach of simple division of labor (i.e., "sense-think-act": perceptual mechanism produces an inner representation of the 3D visual scene that is the input to the reasoning and planning centersfollowed by calculation the action and the commands to the motor mechanisms). (p. 88)

from input to motor action. It means there is a separate control system (a layer = hard-wire finite state machine) for each task performed by the robot. (Bechtel and Abrahamsen 2001, p. 302) Those three layers are for avoiding obstacles, moving randomly, and moving toward a particular location. The coordination between layers (depending of the external input received by robot, one device turns off, another turns on) produces the sequences of a serial processes. Subsumption architecture is a decomposition of activities horizontally by task and not vertically by function. (Bechtel and Abrahamsen 2001, p. 302) In this way, no central processor is necessary to plan the behavior of a system. The system is without any kind of representation (no semantic interpretation) or Fodorian modules. From an EDWs perspective, this robot's architecture (and that of all robots of the same type) is missing the unity of the "I". From an external viewpoint, we can check for such decomposition of activities but, in this way, we cannot construct a robot that has consciousness. We have to remember that within the unity of the "I" is also made of various mental processes (and representations) that correspond to such horizontal activities.

For supporting the idea of a strong relationship between perception, action and the brain, Clark appeals to "mirror neurons" (Di Pellegrino et al., 1992): there are some neurons in the monkey ventral premotor cortex that are "action oriented, context dependent, and implicated in both self-initiated activity and passive perception." (Clark 2001, p. 95) These neurons are activated when the monkey observes and performs an action. Clark's conclusion is that perception, action and cognition has to be considered strong related and interconnected. On the evolution line, the brain is an "organ of environmentally situated control". (p. 95) Again, we have to understand and explain the relationship between computation and neuronal level. Clark notices the question posed by Churchland and Sejnowski (1990,

p. 249: at what level of neural organization – "the biochemical . . . the membrane, the single cell, and the circuit, and perhaps . . . brain subsystems, brain systems, brain maps and the whole central nervous system" – does the implementation take place? Clark's answer is that the answer depends on the function or task that we want to explain. However, this answer avoids the ontological status of "levels". Within the unicorn-world, functionalism (and other such approaches) is a refugee for philosophers against paradoxical situations. From an EDWs perspective, to get a correct answer we have to appeal to notions like EDWs and organizational or hyperontological theresholds.

Returning to his approach, Clark considers that we need to explain the "fine-grained patterns" of a level and in this way certain elements considered just implementation level can become organizational components. (p. 96) From my viewpoint, this answer is in some degree under the functionalist's umbrella. Hyperontologically, we have to find an answer to the problem of implementation of conceptual/psychological/computational "level", independent of functions or tasks that are realized at this level. The "mirror neurons" support the existence of the mind-EW that is epistemologically different from the brain-EW. These kinds of neurons show us that the identification of specific groups of neurons for particular functions is a wrong route within cognitive neuroscience. (About cognitive neuroscience, see 5.8)

Let see how Clark investigates the relationship between computation and implementation. This topic is very important for people interested in AI. Obviously, they construct or analyze the robots from the unicorn-world paradigm. Within the computational paradigm, we saw that the implementation of the conceptual framework (the results being a series of conscious states and processes) is just the "neural level". Through "neatly decomposable" systems, there is instantiated a map between the abstract sequence of algorithmic steps and independent mechanical/electronic mechanisms. (Clark 2001, p. 97) Here we remember that Searle criticizes not only the relationship between syntax and semantic (Chinse Room) but also between syntax (algorithm) and the physical level in a computer. (Searle 1992) The relationship between computation and implementation is one of the very hot topics in AI just because everybody works within the unicorn-world. Searle is right in criticizing the relationship between syntax and physical level in a computer but he is missing the EDWs framework to offer a hyperontological basis of his critics.

In contrast to computationalism, but related to robotics, Clark emphasizes the biological evolution that is not "bound by the process of conscious, step-by-step design". (Clark, p. 97)

> But there is no need for biological design to conform to the principle of neat functional decomposition. Instead, evolutionary search (by processes such as random variation and differential selection) can uncover problem solutions that depend crucially on complex interactions between multipurpose circuits. This is a corner of design space curiously opaque to conscious human reason, which is far and away most comfortable with simple linear interactions between multiple single-purpose components. (Clark 2001, pp. 97–8)

From an EDWs perspective, such "complex interactions between multipurpose circuits" is given only through the unity of the "I". In constructing robots, we have to deal with this problem; otherwise, we will not be able to construct artificially something similar to human consciousness. There are no robots with intentionality (again, Searle's Chinese Room): simulated robots (and real robots as well) have representations that are only formal and lack content. (Bechtel and Abrahansem 2001, pp. 303–304) The content of mental representations has to be implicit knowledge! In neural networks, we can find something like implicit knowledge, but it is still missing the unity of the "I".

Much more radical than Andy Clark is Michael Wheeler, with his thesis against two Cartesian dogmas: the split between mind and world (accepted by most people from cognitive science), and mind-body distinction (rejected by almost everybody). (Wheeler 1996 in Bechtel and Abrahamsen 2001, p. 302) Wheeler rejects the notion of representation and computation from computationalism. For him, the primary function of internal processes for sensations and control action and basic sensoriomotor processes are not isolated from higher abstract processes. This view is constructed within a Heideggerian paradigm. (Wheeler 1996 in Bechtel and Abrahamsen 2001, p. 302) Obviously, from my perspective, both classical thesis and Wheeler alternatives are wrong because everything is elaborated within the unicorn-world. The mind is not within an EW but is an EW. Moreover, according to the principle of part-counterpart, we cannot separate the brain (not the mind) from the body. The mistake made by many people is understandable: within the unicorn-world, they mix the mind with the brain, i.e., two EDWs.

Wheeler is a proponent of the anti-representationalism view. In his paper (2001), he introduces two "treats" against the idea that the explanation of online behavior needs notions of representation: if extra-factors are necessary to explain the behavior of a system ("*non-trivial causal spread*"), then we do not need the notion of representation. Any representation's view appeals automatically to homuncularity and Wheeler rejects this notion because of causal contribution of each component of a system is context-sensitivity and variable over time ("*continuous reciprocal causation*"). From an EDWs view, Wheeler is right to claim that representations require the homunculus. However, this is available only when we make the distinction between mental representations and the "I". If mental representations are the "I", then we do not need any homunculus to "perceive" mental representations.

To grasp online cognition, Wheeler introduced the already classical examples from robotics, Brooks (1991) and Franceschini et al. (1992) with a robot with elementary motion detectors avoiding obstacles:

> … shape, absolute position, or orientation of the objects in the environment are neither calculated nor stored. The upshot is that although, in a sense, the maps perform the traditional representational role of being internal stand-ins for external states of affairs, they emerge more fundamentally as agent-centred, dynamic control structures that code for context-specific possibilities for action. (Wheeler 2001, p. 215)

For Clark and Wheeler, the *causal spread* means that some internal elements depend upon certain causal factors external to the system. (Wheeler and Clark 1999) There are some examples from the computational neuroethology of robots that support this idea. (Dave Cliff 1991, Cliff, Harvey and Husbads 1997 in Bechtel and Abrahansem 2001, p. 300). The main idea of Cliff, Harvey and Husbads (1997) is that they simulated a robot, a room and the network: the network evolved to control the robot moving about in rooms. Their conclusion is that

> The task of analyzing an evolved neural-network robot controller is similar to the task an analyzing a neuronal network in a real animal. The techniques we have employed bear some resemblance to those used in neuroethology, and they give broadly similar results: a causal mechanistic account of the processes by which perturbations in the system's inputs give rise to alteration in the system's output. That is, the internal mechanisms of the agent are not treated as a black box, and so it is possible to understand how the observed behavior is generated. (pp. 149–50) (Bechtel and Abrahansem 2001, p. 301)

From my viewpoint, it is clear that Cliff, Harvey and Husbads work within the unicorn-world. Of course, the "internal mechanisms of the agent" are not like a behavioristic black box but the robot is constructed in macro-EW without the robot having its internal-EW. Within the same umbrella, Clark offers another example from the evolutionary robotics – Husbands and Meyer (1998). Also, Wheeler presents us with the robot constructed by Harvey et al. (1994) and the conclusion is that

> an artificial neural network connected to some rather basic visual receptors – that would enable a robot to approach the triangle but not the rectangle. The evolutionary algorithm was allowed to determine the specific architecture of the neural network, the way in which the network was coupled to the visual receptors, and the field-sizes and spatial positions (within predetermined ranges) of those visual receptors. (Wheeler 2001, p. 216)

In this example, there is a "causal spread" between or "causal contributions" from nervous system, body and environment. (p. 217) Against the classical *asymmetry* between the nervous system and the normal ecological backdrop is that in "cases of non-trivial causal spread is that causal factors located in the non-neural body and/or the environment *do* make that intelligence-related style of contribution." (Wheeler 2001, p. 219) The distinction between online and offline cognitions is blurred if we reject arbitrariness (different classes for the same function) and homuncularity

> it can be compartmentalized into a set of communicating subsystems, each of which performs a well-defined subtask that contributes towards the collective achievement of an adaptive solution. Typically, such subsystems will be hierarchically organized... So certain subsystems are interpreted as producing information that is then consumed downstream by other subsystems. … What this tells us is that the ways in which functionally integrated clusters of homuncular subsystems exploit inner elements, so as to collectively generate on-line intelligent behavior, are intelligible only if we treat the subsystems involved as being responsive to the information that the elements carry. (Wheeler, pp. 221–2)

For Wheeler, what does it mean that the subsystems are "hierarchically organized" and how do "functionally integrated clusters of homuncular subsystems exploit inner elements" generate the "on-line intelligent behavior"? In fact, from an EDWs viewpoint, within a human being or any live entity such "clusters of homuncular subsystems" hierachically organized are inside the implicit knowledge, but this knowledge is not clearly a homunculus! The implicit knowledge corresponds to the functions of various biological mechanisms that are the result of millions of years of evolution. Such biological mechanisms require the unity between brain, body (the principle of part-counterpart) and environment but this unity corresponds to the unity of the "I". I believe this is the main problem for constructing robots: following the "nature", i.e., the evolution of species, we have to construct the unity of certain physical mechanisms that has to correspond to the unity of the "I" of that robot.

Wheeler emphasizes that homuncularity is strong related to *modularity*. (Part 4 of his article) Wheeler uses c*ontinuous reciprocal causation*

> (multiple simultaneous interactions and complex dynamic feedback loops, such that (i) the causal contribution of each component in the system partially determines, and is partially determined by, the causal contributions of large numbers of other components in the system, and, moreover, (ii) those contributions may change radically over time)

versus Wimsatt's notion of *aggregate system*

> ((a) it is possible to identify the explanatory role played by any particular part of that system, without taking account of any of the other parts, and (b) interesting system-level behavior is explicable in terms of the properties of a small number of parts.). (Wheeler, p. 224)

Taking into account this continuous circular causation, Wheeler believes that we have to adopt a dynamic holistic perspective (against representation and modularity) in explaining the system. Indeed, we have to adopt a holistic view but regarding only the unity of the "I", on the one side, and the interactions between brain, body and the environment, on the other side, but we do not have to try to create a meaningless interaction between mind, body and the environment.

Wheeler offers another example from robotics: Thompson (1995) – "artificial evolution is applied to the low-level evolutionary building blocks offered by reconfigurable electronic circuits." This example suggests that the non-aggregate biological systems (no modules or humuncular decomposition) exist as the result of evolution and the idea of representation is thus rejected. (p. 226) The essential point is that the organization of elements from "implementation" level (low-level physical properties) and not abstract computational design can solve certain computational tasks (problems-solving). This fact tries to mirror the work of nature in creating man and her consciousness. Again, from an EDWs perspective, within the brain-EW, there are no representations. Within the mind-EW or the "I" there are no modules. However, what is missing within these robots (and all the others) is the principle that offers the unity of all the mechanisms, i.e., the "subjectivity" of the robot.

Clark considers that robots are constructed as complete but low-level systems in which a strong relation between body, action and environment produces adaptive behavior. These elements involve *emergence* and *collective effects*. He presents two other examples from robotics: Webb's cricket phonotaxis (the male cricket's song has to be heard, identified, and localized by the female, which has to locomote towards it) and Reynolds's boids (flocking behavior of birds). In the first case, instead of classical model ("hear-localize-locomote" routine = task decomposition and identifies a sequence of subtasks), Webb constructed her robot inspired by cricket anatomy and neurophysiology (the ears and its inner tracheal tube). (pp. 104–6) ("The vibration is greater at the ear nearest to the sound source" and thus the cricket has an orientation and locomotion.) One of the fundamental principles of this system is that the cricket's tracheal tube transmits sounds of the desired calling song frequency, and the phase shifts in this transmission are suited to that particular wavelength. (Webb, 1996, p. 64) (Clark, p. 106) I believe that the difference between human beings and insects (and other living beings) is that even if insects have a kind of implicit knowledge and thus a kind of subjectivity of their actions, they do not have any kind of consciousness. So, it seems that something that corresponds to conscious states and processes is missing. Probably, due to evolution, the implicit knowledge has become more and more complex and this is the route to consciousness. Maybe we can relate this idea with Langton's synthetic strategy. Bechtel and Abrahamsen emphasize that for Langton this strategy is responsible for the label "artificial life". (Bechtel and Abrahamsen 2001, p. 284) Langton's idea is that this area has to appeals to a synthetic approach of

> understanding the evolution and operation of living systems: researchers build simulated systems out of already identified components and see what emerges from their operation. In contrast, biologists (and psychologists) primarily take the analytic approach of decomposition and localization in their investigation of naturally occurring systems: starting with a real organism, they figure out what component processes are involved in its functioning and where in the system each process is carried out. (Bechtel and Abrahamsen 2001, p. 285)

From an EDWs perspective, what emerges from the operation of components of a living system is in fact the unity of the "I" or a kind of implicit knowledge for any living entity. Nevertheless, due to evolution there are different degrees of complexity for such implicit knowledge among living beings. As we saw in Chapter 3, for humans after training certain processes that are explicit knowledge are transformed into implicit knowledge. As we saw in section 5.2, neural networks are able to make this transformation for some kinds of knowledge but these tools do not have the unity of the "I". The researchers from AI have to implement exactly this transformation which involves the unity of the "I" for constructing robots that would have characteristics closer to those of a human being.

5.5. Dichotomies concerning the notion of mental representation and processing[11]

There are others approaches, more or less in this direction, that come from different domains: Skarda and Freeman (1987) in *Neuroscience*; Port and Van Gelder (1995), Van Gelder (1995) in *Philosophy*; Brooks (1991), Beer (1995) in *AI*; Kelso (1995), Varela et al. (1991), Globus (1992, 1995), etc. These approaches are rooted in the work of J. J. Gibson, Berthalanfy, Waddington, and others. We notice that there are various interpretations of the term "representation", which can be situated, for a more suggestive illustration, on a imaginary axis: at the left extreme are Chomsky, Fodor, Pylyshyn and others, who consider that cognition is based on computations over symbolic representations, and on the other side, at the extreme right, we can situate the perspective influenced by *Artificial Intelligence* as in Brooks (1991), Beer (1995), Harvey (1992), and so forth, or *Neuroscience* as in Skarda and Freeman (1987) which assumes that the cognitive systems do not use any kind of representation. Authors like Bechtel, Clark and Wheeler

[11] This and the next two sections of this chapter contain some paragraphs from Vacariu et al. (2001) re-interpreted from the EDWs perspective. However, these paragraphs come from my contribution to that article.

maintain that even in the case of a dynamical system, we are dealing with very low-level representation. (Wheeler and Clark 1999; Bechtel 1998; Clark 1997a, b) In cognitive science there are certain essential dichotomies concerning the notion of representation. From an EDWs perspective, this imaginary axis is the result of a mixture between the brain-EW (that belongs to macro-EW) and the mind-EW (the "I").

As we saw in Chapter 3, Mandler synthesizes these dichotomies in pairs: declarative-procedural, accessible-inaccessible, conscious-unconscious, conceptual-sensorimotor, symbolic-subsymbolic, and explicit-implicit. (Mandler 1998, p. 265) These dichotomies are interconnected and partially overlap without being identical. (Mandler 1998, p. 265) I mention here her summary about procedural and declarative knowledge. Procedural knowledge (perceptual and sensorimotor) has these characteristics: it is inaccessible to conscious awareness, difficult to describe in language, slow to learn, context-bound, sensitive to frequency, and not represented in rule-like form. The conclusion is that for procedural knowledge a subsymbolic format is better, rather than symbolic forms of representation. On the subject of declarative (conceptual) knowledge, Mandler considers this knowledge to be accessible to consciousness, describable in language, requiring attention to be encoded in this format, potentially learnable in a single trial, of a static character, and symbolic representation. (Mandler 1998, p. 268)

According to the principle of complementarity, the "I" cannot access two explicit elements at the same moment. However, the "I" can access a representation of explicit knowledge and several elements of implicit knowledge at the same time. But according to the principle of knowledge, all these representations are the "I". On Mandler's view, symbolic representations proper to a computationalist perspective are best suited to resolving the tasks involved in declarative knowledge, whereas subsymbolic representations (proper to a connectionist approach) are suited to solving the tasks involved in procedural knowledge. Smolensky considers that the level of cognitive analysis adopted by the connectionist paradigm is lower than that of the computationalist paradigm: whereas the level adopted by the former is a conceptual one, the level adopted by the latter is subconceptual. (Smolensky 1988) Again we see here the mistaken notion of "levels". The "I" uses explicit or implicit elements that can be continuous or discrete. Usually, declarative knowledge involves certain static and discrete representations, whereas procedural knowledge involves not statically and discrete primitives, but only certain continuous processes.

In this sense, let us take as an example of declarative knowledge a subject learning a foreign language or logic. As a novice, he starts with a set of general instructions and relies explicitly on declarative knowledge, not on implicit or procedural knowledge. In order to reach the expert level, through training (solving problems and exercises, constructing several statements using various new words and rules, etc) part of the explicit processing becomes implicit. The explicit becomes implicit because of habituation, but here again we focus on the notion of a threshold. This notion of a threshold, a habituation threshold, is different to organizational and epistemological thresholds. The knowledge of logic is declarative knowledge, but according to Mandler the process involved in declarative knowledge is either implicit or explicit, while the process necessary for procedural knowledge can be only implicit. (Mandler 1998, p. 267) Mandler emphasizes that we are aware about perceptual knowledge (or sensorimotor knowledge) but most of this knowledge is not accessible to consciousness because of its procedural form of storage in memory. "… it can only be run." (Ex.: Face recognition) (p. 266) On the contrary, verbal information is formed in conceptual form or declarative: recall, planning or reasoning. Conceptual knowledge refers to symbolic knowledge (vs. subsymbolic knowledge – Smolensky – that usually refers to procedural knowledge).

What happens within the brain-EW when a subject passes from novice to expert within the mind-world? At the beginning, for a novice the surface of activation patterns that corresponds to that task is very large. After training in that task, the surface of activation patterns becomes smaller. (Baars 1988) As mentioned above, the indivisibility of the "I" is a stability which implies conceptual constancy. This means that this stability is maintained, even though through habituation the corresponding surface of activation patterns of that task is reduced.

Let us take an example concerning procedural knowledge given by Mandler: to tie a shoe. How do we carry out this action? What elements are involved when we repeat this process? Of course, we appeal to memory (that is the "I"), but it is not clear what kind of information is stored in our memory. There are two solutions: either we memorize discrete representations or we memorize certain processes. However, the "I" continuously moves its virtual arm (that is part of the "I" and corresponds to a physical arm). What happens in the brain-EW in this case? There are two alternatives. First, the brain sends a command to the muscle using discrete representations and in a very short time it receives feedback from the body on what is happening there. The process is repeated many times so that it appears to us to be a continuous process. Second, the brain "memorizes" certain processes, i.e., the representations involved are a kind of representation in motion.[12]

[12] The dispute between propositional representations (Phylyshyn and Fodor) and image representations (Metzler, Shepard, and Kossylyn) is well known. In the last few years, using fMRI, Kossylyn has attempted to prove his theory. Others argue for the concept of analogical representations (Mandler, Lakoff, and Fauconnier).

Dynamic system theory rejects the existence of representations and introduces an essential parameter: *time*. (Port and van Gelder 1995) Usually, dynamicists give examples of bodily actions such as a child's walking (Thelen and Smith 1998) or the movement of fingers (Kelso 1995), and they extrapolate the conclusions from procedural to declarative knowledge. They are not taking into account concrete declarative tasks. Thelen and Smith, van Gelder and other dynamicists replace static and discrete representations with attractors that are in continuous movement and, at the conceptual level, these attractors *seem* static and discrete. I claim that symbolic representations that are the "I" are static and discrete exactly as a table is static and discrete within the external macro-EW. Within the micro-world, a table does not exist but only the corresponding network of microparticles (some in motion). The macro-EW that is our ecological niche has certain stable entities. However, Canaiello is wrong when he claims that "[s]tructure emerges as a discrete quantification of a continuum" (Caianiello 1987, p. 477) because "discreteness ensures stability" (p. 476). Moreover, concerning the structure and process, Anderson and Stein say that "structures and processes occur at all material scales, from elementary particles to the Cosmos". (Anderson and Stein 1987) They claim that at each "level of analysis" there are some structures and processes, but how can we identify them? What entities and relations between entities must be taken into account in order to capture and better describe all aspects of structure or process, stability or variability? For Anderson and Stein, certain relations hold between the elements of these distinctions: "Structure and process are causally linked: process is guided and constrained by structure; structure is laid down, maintained, changed, and degraded by process". (Anderson and Stein 1987, p. 460) In addition to this, Hardcastle considers that whether a description can count as "structural or functional depends upon the analytical levels involved, the question asked, the related explanations available, and the background of knowledge at hand". (Hardcastle in McCauly 1997, p. 623) Again we have here the unicorn-world and "levels". In fact the explanation is much better if we replace levels with EDWs. The notion of structure has a meaning (only for us as observers) within a complex organizational different parts of a system from the same EW. Of course we can say that a structure of neurons *corresponds* to a particular mental representation. In this sense we have to replace Canaiello's notion of "emergence" with the notion of correspondence. As the result of evolution, stable mental representations and processes are the "I". Moreover, it is probable that all species have such stabilities, otherwise they would not survive in their environment. Without an EDWs perspective, people tried to explain the *stability* of the unicorn-world.[13] And this attempt produced controversial approaches that are in fact only Ptolemaic epicycles. In the same way, we cannot give up – on the Kantian line – the role of human observers in the ecological niche in which we are thinking, perceiving, and acting, nor can we abandon the static and discrete representations from the mind-world; they are not an appearance.

Coming back to declarative-procedural dichotomy, I wish to introduce another example. Driving a car is a process that occurs because the "I" controls mental representations and processes that correspond to the brain and the body. Of course, a novice will concentrate her *attention* on the process and knowledge that are involved in the procedural and declarative knowledge necessary to drive a car on a street. For an expert this is not necessary because the "I" or cognitive agent is able to

[13] This ancient dichotomy between stability and motion can be found in the debate between Hume and Kant. As we saw in Chapter 2, in trying to reject Hume's pessimism, Kant maintains that stability is given by the conditions of experience that are "ontologically immanent".

drive the car and have a conversation with their partner at the same time. Thus, procedural knowledge takes place concomitant with declarative knowledge. Certain implicit and explicit knowledge are implicated in parallel processes. Nevertheless, attention is a serial process that corresponds to specific neural patterns of activation that pass a threshold. The rapidity of processes of brain could be the explanation of serial attention that at the same time almost continuously controls declarative knowledge and sequentially procedural knowledge.

5.6. The EDWs perspective and some key elements in cognitive science[14]

In all the approaches of the cognitive sciences there are some key elements by means of which various aspects of human cognitive behavior can be captured. However, such key elements have been constructed within the unicorn-world. In this section I will try to grasp the relationships between each key element and the EDWs. What I take to be key elements and then analyze forward are as follows: levels of analysis, primitives, processes, structures, threshold, self-organization, bidirectionality, emergence, habituation, tasks, the interaction between "levels" and also the interactions between elements of the cognitive system and the environment.[15] As we will see in the next section, these elements always entail certain philosophical distinctions such as continuity-discontinuity, (state of) motion-(state of) rest, variability-stability, part-whole, and "micro-macro". I will show that placing all these key elements within the unicorn-world requires the construction of various Ptolemaic

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[14] Parts from the this and next sections are from my ideas from Vacariu et al. (2001).
[15] Evidently, there are other key elements in cognitive science.

epicycles. As we already saw in Chapter 4, because of the unicorn-world, there are some very controversial key elements in the philosophy of mind. I believe the situation is not the same in cognitive science. There are two cases.

a) In general, scientists explain local processes and entities that belong to a particular EW. In such cases there are no immediate problems for these scientists from various particular sciences to explain particular states and processes. However, the framework is the same and the scientists try to explain various events, processes and states situated within this unique world.

b) There are some trends in some cognitive sciences like cognitive neuroscience, in which the scientists try to relate information from various particular sciences. (See the last section of this chapter.)

In the first place, I consider levels of analysis. As I wrote above, in general scientists are not interested in ontological levels. They analyze what they can observe without asking too much about the nature of observable entities. In cognitive science, researchers consider that there is a cognitive architecture with a hierarchy of levels but, in order to avoid empty philosophical debates, they simply consider these levels as levels of analysis. In this context a "hot" question has been how many "levels of analysis" are required to explain cognition. In order to avoid an infinite regression, some researchers have thought that we must confine ourselves to a limited number of levels of analysis. In this sense, the most familiar positions are Marr's position – with the three levels of analysis: computational, algorithmic-representational, and implementational – and Smolensky's position – with conceptual, sub-conceptual and neural levels (Smolensky 1988). Sometimes other levels of analysis are also taken into account: either lower levels, such as the cellular, molecular, genetic and even quantum levels (Bickle 1998; Globus 1995; Black 1991, Atmanspascher 2005, 2006), or higher levels such as body, brain and environment connections, situated action, society, and culture. Other versions have been the traditional reductionism focused on bridge laws between levels, Churchland's eliminativism, Fodor's irreductibility of psychology, and so on.

Within the EDWs perspective, we know that concepts from various levels cannot refer to the same entity/event/process because some levels are in fact the EDWs. Various concepts refer to entities that belong to the EDWs or to organizational different parts. These entities exist because of either the epistemological constitutive interactions among each set of entities that belong to the EDWs or the organizationally different interactions that belong to epistemologically different parts. Mental representation and neural patterns of activation are not the same entity described from different levels of description. They are epistemologically different entities that belong to the EDWs. For us, each set of observational conditions is, in restricted Kantian terms, *constitutive,* i.e. only revealing and creating certain entities and processes that belong to the EDWs. In fact, the epistemologically different interactions are epistemologically constitutive in creating the epistemologically different entities and processes that follow epistemologically different laws.

In Chapter 4, we saw that some philosophers are trying to explain the controversial concept of emergence. Related to this concept in cognitive science there is another pseudo-concept, "bidirectionality". The impossibility of explaining cognition through only one level has been acknowledged, thus emphasizing the emergence of primitives from one level to another and the bidirectionality of cognitive processes, usually between neural and conceptual levels (Fischer and Bidell 1998; Black 1991; etc.). Bidirectionality means that the primitives of the conceptual level emerge from the neural level and the conceptual level influences the activity of the neural level. However, this notion of bidirectionality is equivalent to both downward causation and emergence taken together. Black was among the first to insist on this idea with arguments from neuroscience. For other people, this was an essential idea: the *continuously circular causation* that exists between conceptual and neural levels. Changes that appear at a later level imply changes at a former level and vice-versa. The idea of bidirectionality pushed many people to draw the conclusion that cognition cannot be explained using only one level, either conceptual or neural. Therefore people like Gazzaniga and Kosslyn created another "special science", cognitive neuroscience. (See the last section of this chapter.) As I wrote 5.3, this continuous circular causation reveals to us our inability to fully explain an EW. Evidently, the continuous circular causation is a pseudo-notion. As we saw in Lungarella and Sporns' research (see 3.3), there is a continuous circular causation between brain, body and environment. However, according to EDWs perspective, there is no continuous circular causation between mind, brain, body and environment. Otherwise, what are the constitutive interactions that form this continuous causation? We can accept emergence or, in our terms, *organizational emergence*, only between organizational different parts; that means, for instance, an organism is composed of its parts. We have here only weak emergence. However, I strongly emphasize that this weak emergence is a theoretical notion imposed by us as thinking observers! Organizationally different parts of a table exist only for us as observers, but not for the table itself or for other macro-objects that interact with (parts of) the table. As we will see in Chapter 6, the table and all epistemologically different entities except the "I" exist only at their "surface" in EDWs.

In connectionism, Smolensky tried to relate sub-computational (not computational) to neural levels. Identifying the classical paradigm with a symbolic paradigm, Smolensky shows that cognitive descriptions are, according to this perspective, constructed from entities that are, at the same time, semantic symbols (they refer to external objects) and syntactical symbols (the operations over representations are manipulations of symbols). On the other hand, considering that the connectionist perspective can be regarded as a subsymbolic paradigm of cognition, Smolensky takes cognitive descriptions to be constructed out of entities that correspond to the constituents of symbols proper to the symbolic paradigm. These constituents are called subsymbols and denote the activation of processing units of connectionist networks. In the symbolic paradigm, the entities represented by means of symbols are represented in the subsymbolic paradigm through a great number of subsymbols. However, these subsymbols are not operated thorough manipulation of symbols, but through numerical computation (vectorial addition within a vectorial space of activation). Therefore, the level of cognitive analysis adopted by the subsymbolic paradigm is lower than the proper level of the symbolic paradigm. Whereas the level adopted by the symbolic paradigm is conceptual, the level adopted by the subsymbolic paradigm is subconceptual. From an external viewpoint, the nodes and weights and their combinations belong to the same EW. In this case, we have only weak emergence. Fodor and Pylyshyn consider that connectionism is just an implementation of the mental level. (Fodor and Pylyshyn 1988) The conceptual level cannot be reduced to the neural level because of the representational character of mental symbols. The representational character of mental symbols is an argument against reductionism and against the unity of (cognitive) science. (Fodor and Pylyshyn 1988) In neural networks with distributed representations such “context-free symbols” do not exist but only “context-sensitivity responses to inputs.” (Clark

1997c, p. 180) Even mental representations exist only at their "surface" within the "I". They are the "I".

Another key element is *primitives*. It was considered that each "level" has certain primitives. At the conceptual level, primitives are *symbolical representations* which are static and discrete. The counterparts of symbolic representations at the neural level are neuronal patterns of activation. Fodor and Pylyshyn insist on saying that the *correspondence* between the primitives of the conceptual level and those of the neural level is not univocal. "[t]he structure of 'higher levels' of system are rarely isomorphic or even similar to the structures of 'lower levels' of a system" (Fodor and Pylyshyn 1988, p. 63). These patterns of activation are permanently moving and changing. At the subconceptual "level", primitives are *subsymbolic representations* and their content depends upon the processing capacities of the network and the medium in which it operates. In this chapter, we saw how Fodor and Pylyshyn try to explain these "levels". However, Fodor and Pylyshyn do not understand by "correspondence" what we understand from an EDWs perspective. For them, there are only "levels of description" or "layers of reality". Other people from various domains have thought about the relationship between levels in different ways. For instance, Clark underlines the co-evolution of representations with processing dynamics (Clark 1997a). In connectionism, Elman et al. stress that we cannot speak any longer of a clear distinction between data and processing (Elman et al. 1995). Clark showed in detail that "text (knowledge) and process (the use and alteration of knowledge)" are "inextricably intertwined". (Clark 1997c, p. 184) Clark seems to accept a form of weak representation that belongs to dynamic organizational systems. In connectionism, where data and processing are not distinctive elements, we can say the same thing about the brain, that there is no clear distinction between data and processing.

However, we cannot maintain the same thing about the mind. To observe a mental representation it is necessary to have different conditions of observation then those that we use to observe a neural pattern of activation.[16]

Usually, a representation is stored information which stands-in for something and whose function carries specific information. (Bechtel 1998; Clark 1997b) The systems that use representations accomplish a special kind of coordination with features from the environment: they correlate signals received from the environment with certain inner states that guide behavior. However, the existence of such correlations is not enough to establish the representational status of that inner state; the nature and complexity of that correlation being more important. (Clark 1997a) In order to speak about representation as standing-in for something, we need to mention the process in which a representation is used. If a process uses a certain representation, then the process must be correlated with a representational format which is a system of conventions for expressing the content of representation. (Bechtel 1998) What does it mean for the EDWs perspective to correlate a process with a mental representation? Does the process belong to the mind-EW or to brain-body-EW? For instance, any kind of memories belong to the mind-EW. It can be useful for the "I" to "access" the implicit knowledge for instance in reactivating mental represent-tations. If we want to see the link between a neural pattern of activation and a mental representation, than we create the unicorn-world. Mental representations exist only in the mind-EW.

Usually, the debates concerning the notion of representation have focused on the format or nature of representation. Fodor and

[16] This idea is related to the principle part-counterpart from the EDWs perspective: we can identify only with rough approximation the correspondences between entities and processes that belong to brain and body-EW (that is the macro-EW) and mind-EW.

Pylyshyn argue in favor of the propositional format of representation. Representations must have concatenative compositionality[17] in order to instantiate the productivity and the systematicity of thought. (Fodor and Pylyshyn 1988) Fodor has an atomistic viewpoint regarding the meaning of a symbol. He strongly criticizes Quine's holism. (Fodor 1998) However, in general, philosophers think that the meaning of a symbol is not intrinsic to that symbol, but depends on how that symbol is used by an agent or system.[18] (Heil 2004, p. 114) But again, Smolensky argues in favor of an implicit functional compositionality (not explicit like the one proposed by Fodor and Pylyshyn), enough, by itself, to assure the advantages of a compositional structure to the brain. (Smolensky 1988)

What are the mechanisms that produce mental representations and their properties within the mind-EW? For instance, language acquisition requires different psychological mechanisms such as short and long-term memory or native mechanisms of learning acquisition that are essential during the critical period of development. However, always in such cases it is not only these mechanisms (mental representations and some cognitive processes) that are involved but also human subjectivity, i.e. the "I". We have to apply the principle of

[17] Another criticism of computationalism is that there are mind-processes for human thinking that are not computable. For instance, before Searle there was J.R. Lucas (1961) who used Gödel's incompleteness theorem to show that the idea that the mind is a computer is problematic. After Searle, Penrose follows the same line. (Horst 2004) The idea is that the mathematicians "understand and prove more about arithmetic than computation." (Horst 2004) From an EDWs perspective, both the computation and the mental representations are the "I". "Computation" is implicit knowledge while representations can be implicit or explicit knowledge.

[18] As we see next section, in a connectionist network a symbol has a meaning only in context. On the contrary, Fodor – against Quine – asserts an atomistic view.

part-counterpart here, which means that not only are explicit or conscious processes necessary for cognition but also implicit or unconscious (automatic and controlled, etc.) knowledge and computation/processes that are involved for producing these explicit or conscious mental states.

There are some dynamicists in cognitive science (Globus 1992, 1995; Kelso 1995) who reject not only the representations but also the process of brain computations. Globus replaces the process of computation with *constraints* that take place between elements and levels of the system, and Kelso mentions that "[r]ather than computes, our brain dwells (at least for short times) in metastable states". (Kelso 1995, p. 62) I consider that both authors are right but only from the brain-EW perspective. Computation is a notion that describes processes from the mind-EW, not from the brain-EW. We simply cannot describe directly such processes within the brain-EW but only certain processes that correspond to mental states and processes.

When the interactions between the human organism and the environment are very complex, certain bodily and outer aspects take over the tasks usually associated with some pure innate computational resources, which leads to the increase of behavioral fluency and flexibility. In such situations, the participating processes and states cannot be completely specified and the adaptive hookup does not follow from a set of instructions generated by a general control, but from self-organization processes that underlie the brain, the body and the environment. (Wheeler and Clark 1999) Clark takes into consideration "hungry representations problems" (decision making, counterfactual reasoning, etc.). These involve a potential decoupling between the representational system and the environment that is a kind of off-line cognition rather than on-line as the dynamicists suggest. He considers that in such cases the cognitive system has to create a certain kind of item, pattern or inner process that stands for a certain state of affairs, in short, a representation. (Clark 1997a) If the dynamicists take into account only the brain-body-EW they are correct. Indeed, within the brain-body-EW, we do not have any representations or computation, but only processes and entities from the brain-body-EW. But this does not mean that the mind-EW does not have representations and computations. Only the conflation of two EDWs (imposed by the unicorn-world framework) and the domination of dynamical processes (that is usually available within the brain-body-world) push us to completely reject notions like mental representations and computations.

For grasping the notion of representation, it is interesting to mention the relationship between visiomotor action and visual reasoning. I will analyze again Milner and Goodale's famous but controversial supposition (introduced in 5.3) about "two visual systems", vision for action versus vision for perception. (Milner and Goodale 1995) In Clark's words, Milner and Goodale consider that there are two different visual systems, one being for on-line visuomotor action (the dorsal stream) and one for off-line visual reasoning and visually based categorization and verbal reports (the ventral stream). (Clark 2001, p. 136) Clark's suggestion that it is difficult to draw a line between the neural mechanisms that implement off-line and on-line processes is important for my approach. According to the EDWs perspective, the impossibility of drawing the difference between on-line and off-line processes is normal. We can make the distinction between two EDWs (brain-EW and mind-EW) but not between on-line and off-line processes. The same situation is for the binding problem – i.e. what neural processes correspond to elementary mental states, for instance, the perception of a "cup of coffee" – and it is not a surprise for me that this problem cannot be solved yet! We already know that there are various patterns of neural cells that are responsible for various colors, shapes, etc. The question is where does the *unification* of all these characteristics that "corresponds" to the formation of a unitary mental representation for the "I" take place? I recall Damasio's "convergence zone" which would be one alternative for solving such problems. But, we must ask for whom is the "convergence zone" convergent? Trying to identify the convergence zone within the brain means for us to appeal to some concepts that are "impossible to use"! It is meaningless to use notions like computation and representations within the brain-EW. We can try to find certain neural states and processes that, with rough approximation, can correspond to some mental representations and computations, but we cannot identify these states and processes that belong to EDWs.

Against four anti-representationalist approaches from cognitive science, Dietrich and Markman (2003) consider that cognition must use discrete representations. The main idea is that a system has discrete representations only if it can discriminate inputs. (p. 101) In fact, for a system to categorize it needs to discriminate and to discriminate discrete representations are necessary. They offer seven arguments why cognition needs discrete representations. Cognitive systems must discriminate among states in the represented world and access specific properties of representations; they must combine representations and have a compositional structure; they must have functional role relations among concepts and be able to create abstractions and non-nomic representations. They argue for the difference between continuous and discrete representations. For them, criticizing other paradigms (dynamical system approach), computationalism (that uses discrete representations in explaining cognition) "is the best paradigm for cognitive science". (p. 114) However, they miss the EDWs paradigm to avoid the critics against this approach.

As I mentioned above, scientists as well as philosophers have worked within the unicorn-world. They thought that the unicorn-world has different “levels”. Merzenich and deCharms maintain that there is a *representational perceptual constancy* even though, at the neural level, the pattern of activity of ensemble of neurons – from which perceptual representations emerge – is permanently changing and moving. Here again the EDWs are missing. In addition, Merzenich and deCharms take the relations between neurons to be more important than neurons themselves. This offers a better explanation of the construction of “novel complex representational combinations” (Merzenich and deCharms 1996, p. 66), which are not directly experienced. This representational perceptual constancy belongs to the mind-EW and the idea of being “isomorphic across changing pattern of activity” means nothing more than that a representation *corresponds* to the changing patterns of activity. Extending this idea, we can say that the same thing also happens in the case of conceptual representation. Even though the ensemble of neurons that *corresponds* to a conceptual representation is continuously changing, within the mind-EW we have this conceptual constancy. Karmiloff-Smith proposed the concept of *representational redescription* that is similar to perceptual or conceptual constancy. (Karmiloff-Smith 1994) I want to stress that the primitives from the mind-EW correspond to certain primitives and processes from the brain-body-EW. The constitutive entities from the mind-EW, i.e. mental states, play an essential role (we mentioned above Fodor and Pylyshyn’s position concerning this idea). Their importance is comparable to that of Bohr’s *primitive concepts*, concepts referring to the macro level: “every image of the world has to be compatible with their existence”. (Bohr 1948 in Prigojine 1978, pp. 11–12) According to the principle of part-counterpart, primitives or representations are parts of the “I”.

Let us now return to the dynamical systems approach. As we saw in 5.3, the proponents of one trend reject mental representations and computation. Other directions represent applications of mathematical dynamical system theory. The theory of dynamical systems best captures the complexity of change. This is why it has been used to explain:

(a) the constitutive interactions between neurons and between ensembles of neurons and

(b) the constitutive relations between primitives of the conceptual level (representations and concepts) through child development using mathematical apparatus (especially differential equations).

Although these approaches cannot predict the course of events, as in classical physics, they can explain them. (Fisher and Bidell 1998; van Geert 1994) In both cases, the application of the dynamical system approach is correct. There are no mixtures of elements that belong to EDWs.

Following the dynamical system approach, there are other people who reject the notion of representation by again conflating the EDWs. For instance, according to Skarda and Freeman's experiment, a rabbit has a certain pattern of activity of neurons while smelling something. (Skarda and Freeman 1988) After the mouse smells something else, it returns to smell the first thing again. In the latter case, the pattern of activity is no longer identical with the first pattern even though it is similar. In this way they consider that there are no representations.

> There is nothing intrinsically representational about this dynamic process until the observer intrudes. It is the experimenter who infers what the observed activity patterns represents to or in a subject, in order to explain his results to himself (Werner, 1988a, 1988b). (Freeman and Skarda, 1990, p. 376) (Bechtel and Abrahamsen 2001, p. 271)

Nevertheless, they conflate the mind-EW with the brain-body-EW. Within the mind-EW, we have the conceptual constancy (that is the existence of mental representations) mentioned above. Otherwise the mouse would not be able to survive in its natural environment. The same is true for human beings. There are certain constitutive epistemological interactions between mental representations and epistemologically constitutive interactions between neural patterns of activations (and neurons). However, these epistemologically constitutive interactions belong to the EDWs. As I mentioned above, it is quite difficult to find the exact correspondence between a mental representation and a neural pattern of activation. From one side, looking to the dynamical processes of the brain, we can say that a subject cannot perceive any mental representations. From the other side, if we use fMRI we can grasp certain constant neural patterns of activation. With loose approximation and ignoring the part-counterpart relationship (that corresponds to human subjectivity), we can say that these neural patterns correspond to a mental representation.

We can make a parallel between two pairs, the mind-brain and the macro-micro. From Merzenich and deCharms' perspective, at the conceptual level (that is the mind-EW), we have a perceptual constancy but the pattern of activation that corresponds to the neural level (the brain EW) is in continuous motion. We perceive a table as static and discrete in relation to the surrounding environment.[19] Within the quantum-EW, a table does not exist but only the corresponding network of microparticles of which some are in movement. The "I", as the result of species evolution, observes clear distinct and complete internal mental representations. Some internal representations

[19] The shape of the table depends on the environment. In a short period of time and in a "standard environment" the changes are not important.

correspond to certain external objects like tables and chairs. The changes from the brain-body-EW are continuous, but there is a *threshold* of change within this EW. This threshold is in fact an *organizational* threshold of neural patterns of activation. When such threshold is passed, the neural patters of activation change their structures. The *corresponding* entities (mental representations) from the mind-EW are changed. In order to avoid the epiphenomenalist position, I claim that the properties of the "I's" correspond to certain neural pattern of activation. The mental states are not determined by neural states but only correspond to them. According to the principle of objective reality, both EDWs have the same objective reality. However, we have to be aware that there are no interactions between the EDWs because these EDWs represent the hyperverse not the "universe" or the "unicorn-world". We can find the same situation in connectionism, where the excitation or inhibition of a node depends on the signals received from other nodes. There is an organizational threshold of an activation function. If the value of the received signal is higher then the value of the threshold function the node is excited. In the contrary situation, the node is inhibited. The activation state of a unit is determined by the net input, i.e., by the total input of that unit, the relation between nodes being more important then units taken separately.

Another important key element is the *task*. Each scientific theory supposes the explanation of one EW and the construction of a theoretical model. Because of the existence of EDWs, when we are trying to scientifically explain some phenomena we have to reject the unicorn-world and to avoid the hypothesis that each element from the universe depends on all other elements. When researchers propose a theory to explain some phenomena, they have to select certain tasks: the explanation of a phenomenon that belongs to an EW that has a particular task. For instance, in connectionism, each network has to solve a particular task.

These tasks are merely functional or structural tasks that are different to qualitative states or human subjectivity.

5.7. The relation between key elements and some philosophical distinctions

In this section, I will analyze some philosophical distinctions involved in the above key elements. The abilities of our mind-EW (that is our internal sensations and cognitive system which, according to the principle of part-counterpart, all are to the "I") corresponds to certain brain and body mechanisms that are determined by the ecological niche in which our species evolved. For example, the mind of a subject "feels" a certain frequency field when someone tickles their corresponding physical arm. Under a certain threshold, the tickling is discrete. Above this threshold, it becomes continuous. The same thing is available for vision, the experiment with a stroboscope being a proof in this sense.[20] Concerning our normal cognitive system and our "senses" (that correspond to physical sensibility given by the interaction between brain, body and the environment) in a standard environment, passing from one element of such divisions to another (continuously-discontinuously, static-in motion, stability-variability) is equivalent to passing a threshold determined by our ecological niche. In the mind-EW, the correspondence between certain states of mind and brain can be understood as an *interval of similarity* within the structures; the states and the processes (understandable as approximations of the structures, the states and the processes from the brain-body-EW)

[20] See for instance the example given by Vilayanur Ramachandran of a women from Zurich who had an accident and was unable to see objects in motion but only as static and discrete images "as though lit by a strobe light in a discotheque". She cannot see the motion of a car. (Ramachandran 2003)

appear identical, even though the patterns of activity of neurons that *correspond* to them are different. Thus, if we represent an entity at time t1 and the same entity at time t2 (where t1 and t2 are close enough and the cognitive system is taken to be in a "standard environment"), the resulting representations appear to be the same. The phenomena that happen between t1 and t2 do not determine the changing of representation that *corresponds* to them. According to the dynamical theory, the introduction of time and continuous brain-body-environment interactions motivates the rejection of representations. Van Gelder and Port claim that dynamical system theory catches both the continuity and discreteness aspects of cognition (van Gelder and Port 1995). What is missed here? There is, of course, the conflation of the EDWs. We can grasp both continuity and discreteness taking into account Fischer and Bidell or van Geert's directions that are interested in the dynamical combinations of representations. (Fischer and Bidell 1998; van Geert 1993) However, we cannot reject the existence of representations. Fisher and Bidell speak about a dynamical structuralism where variations appear within stability. (Fischer and Bidell 1998) They claim that structure is in motion. Then what is stable? From an organizational viewpoint, we can think that a structure is in motion only if we consider that that structure is given by the relations among the entities (in our case, the neurons). According to Merzenich and deCharms, relations are more important than entities. (Merzenich and deCharms 1996 in 3.3) Thus we can say that the relational structure of entities that is constant in a brain-body that belongs to macro-EW corresponds to a particular mental representation from the mind-EW. In the dynamic of structure, the organizational structure of a system is maintained through the relations between neurons, not through the neurons themselves. The structure is stable but it can appear to be in motion when regarded in the light of the interactions of a system with the environment. Again, a certain *organizational threshold* must be passed in order to change the structure. The organizational threshold is different to the epistemological threshold (that presupposes the jump from one EW to another). Again I emphasize that we have to make a clear distinction between organizational different parts that belong to the same EW and epistemologically different entities that belong to EDWs.

Related to the notion of the threshold, Haken applies the concept of the hysteresis effect to perception, using an order parameter. His example consists of 12 pictures, arranged in two lines of six, which show a gradual transition from a man's face to a woman's body. In the second line, a "jump" comes about in our perception. From my perspective, this happens because the process at the neural level pass an organizational threshold that corresponds to the "I" epistemological threshold. This is the effect of hysteresis in perception. (Haken 2000, p. 62) A small difficulty here is that the pictures that stand next to each other in the same line are very similar. Otherwise, the pictures appear to be obviously different. Heeding the similarity interval and the epistemological threshold, we find ourselves back with the distinction already mentioned. Certainly, this depends on another key element, the (Humean) *habituation* of each observer.

If we do not make the distinction between the organizational threshold (which helps us to make the distinction between organizational different parts) and epistemological threshold (that means that the "I", changing the observational conditions, passes from one EW to another) then the theory of complexity becomes a proper framework for conflating the EDWs. The theory of complexity is used for explaining living beings, among other things. Levels of organization or organizationally different parts are considered to range from molecules, the gene, and cell, to structures within organs, and organs such as brain as a whole. The human cognitive system corresponds to organizational different parts. These structures manifest alternations that are discrete and that lie in a continuum. At some spatial-temporal scale of observation, a system can be viewed acting as a continuum system, but on another scale or EW, this continuity can be viewed as a static and discrete collection of entities (the macromolecules of a fluid or the cells of the organism). The behavior of a system is the result of dynamical interactions between body, brain and environment. According to many authors, behavior is a self-organizing macroscopic structure that arises as a result of mutual interactions between micro and macro scales of organization. Cognition is seen as an outcome of multiple interactions between levels of the organism and between each such level and the environment. Again, we have to take into account the essential difference between organizational different parts and EDWs. I want to emphasize that from an internal viewpoint (that is internal or mind-EW), we do not observe such things as organizational different parts. From an external viewpoint, cells, macromolecules and the brain as a whole belong to the same EW, the brain-body-EW. The brain belongs to the macroscopic-EW where we can find other macro-entities such as tables, chairs, stones, and planets.

5.8. Cognitive neuroscience

In the last century, people from the field of psychology were not able to explain human cognition. Therefore, having in their mind the picture of a "layered view of nature", researchers from various special sciences created cognitive science. Within this domain two decades ago, there appeared a new discipline, cognitive neuroscience. This new special science tries to relate knowledge from psychology and neuroscience that deals respectively with the conceptual and neural "levels". We saw in Chapter 4 that within the unicorn-world, philosophers could not find a consent regarding the relationship between mind and brain. What does this relationship reflects: the identity between levels, the supervenience of one level on another, or the emergence of one level from another? Evidently there has been no clear and decisive answer to this question. However, people working in this area reject the reduction of the psychological level to the neural level. I think that many people working in cognitive neuroscience (Kossylyn, Gazzaniga, and Johnson) use various concepts within the unicorn-world. I present only two of such cases.

1) Working in cognitive neuroscience and following Shepard and Metzler, Kosslyn tries to demonstrate the existence of image representations. (Kosslyn 1992) Kosslyn and Smith define "lower" brain functions as those functions that are involved in early perception and motor control. (Kosslyn and Smith 2001) These functions depend on relatively small neuronal areas and processes. The functions engaged in reasoning and problem solving are "high-level" functions that rely on relatively large neuronal areas and processes. (Kosslyn and Smith 2001, p. 961) A few years earlier, rejecting both eliminative materialism and the classical approach for explaining the mind (Fodor, Newell and Simon, etc), Kosslyn introduced the idea of the "wet mind", which means that we can explain cognitive processes only by appealing (but not reducing) to neurobiological data-information. (Kosslyn and Keonig 1992) This means the combination between mind-information and brain-information. Kosslyn and Smith indicate that, at the neural level, it is difficult to grasp such higher cognitive functions.

2) Chapter 9 of Johnson's book *Developmental Cognitive Neuroscience* (Johnson 1997) is called "Representational Change in Development". In many places, we can find the concept of "the emergence of representation". For instance, he asks: "… what factors determine the location within the cortex that a representation emerges?" (Johnson 1997, 172)

From my perspective, we can notice that the relations between observational tools, entities and processes observed produce such difficulties. We have no difficulties in recalling from our memory a mental representation or concept and image (i.e., to observe that mental representation with internal tools of observation). Using fMRI or PET, it is difficult to grasp exactly what neural patterns and processes correspond to that mental representation. With loose approximation, we can indicate that a particular mental state corresponds to an activated neural area. Again, in these cases there are mixtures of concepts from EDWs. As a science, cognitive neuroscience is possible only within the unicorn-world. We can try to find only the *correspondences* between different higher cognitive functions or representations and neural patterns and processes. Nonetheless, explaining mental states and processes by relating them to neural states and processes and vice-versa seems to be the result of our epistemological and linguistic limitations. In the first case, we try to relate mental states and processes to neural states because of the principle of part-counterpart: every mental state implies the "I". In the second case, to explain the neural or the brain-body-EW through the mind-EW we can try to make an analogy with Bohr's idea. Because we have to use classical instruments of measurement, phenomena from the quantum level have to be expressed in classical terms. In the same way, brain functions that correspond to cognitive functions are expressed by our mind.

Evidently, connected to the mind-body problem is the relation between special sciences (psychology vs. neuroscience). In his article "Special sciences" (1974), Fodor explains the relationship between the mind and the brain by analyzing the relationship between *special* sciences (neuroscience, psychology, economics, etc.) and *basic* science, physics. The main idea is that the entities and processes from the special sciences cannot be defined/described using the entities and processes from basic science. In particular, he argues that psychology cannot be reduced to neuroscience, and any special science cannot be reduced to physical science. Each special science has a distinctive "taxonomy" or "distinctive ways of classifying and organizing descriptions and explanations of phenomena." (Heil 2004, p. 116) One taxonomy, proper to one special science, cannot be reduced to another taxonomy.[21] The concepts from the high-level science that explains the functions of the mind (psychology as a special science) depict the genuine properties of objects and these properties cannot be reduced to the lower level (neuroscience as a "local stop" for psychology toward physics). According to Heil, the genuine property is "one that makes a *causal difference* to objects possessing it" or is "a property that figures in some causal laws." (Heil 2004, p. 119) There are different particular sciences that deal with different "levels of reality": physics with the lowest level (even if it has not been yet discovered); chemistry is for the next level followed by biology and then psychology and the social sciences.

One alternative for the relationship between special sciences and physics is reduction via "bridge laws". Such laws must contain the predicates of both the reduced and the reducing science. According to Fodor, these laws hold only for contingent event identities, which imply only "token physicalism". (Token physicalism is weaker than type physicalism, where every property mentioned in the laws of every science is a physical property.) (p. 431) Any event that is an instantiation of psychological property is identical with some events that are the instantiation of a neurological property. Classical reductionism, that which is involved in the Unity of Science, means that every

[21] This notion of taxonomy corresponds to Carnap's "linguistic framework". (See Chapter 6)

kind is, or is coextensive with, a physical kind.[22] Fodor rejects reductionism and implicitly the Unity of Science. Every kind cannot correspond to a physical kind because each special science offers essential *generalizations* that have nothing in common with the physical descriptions. We can understand certain natural phenomena only through such generalizations. Moreover, even if we can make certain correspondences between one physical event and one event from a special science, that physical event is "entirely irrelevant to the truth of the generalizations, or to their interestingness, or to their degree of confirmation, or, indeed, to any of their epistemologically important properties."

The correspondences between the taxonomies of the special sciences and the taxonomy of physics require the correspondences between kinds of special sciences and physics. In this way we loose the generalizations of special sciences. (Fodor, p. 439) For Fodor neuroscience does not posit the kinds proper to psychology. Special sciences exist not because "of the nature of our relation to the world, but because of the way the world is put together: not all the kinds (not all the classes of things and events about which there are important, counterfactuals supporting generalizations to make) are, or correspond to, physical kinds." (Fodor 1974, p. 439) He continues saying that if we want a general science of physics then all taxonomies must apply to the physical things. (p. 440) But the taxonomies of the special sciences cannot be reduced to physical science. According to this view, we have to reject the unification of science and to return to the "layered picture of reality" and a kind of supervenience in which each layer has

[22] "Every kind is a physical kind if bridge statements express nomologically necessary property identities, and every kind is coextensive with a physical kind if bridge statements express nomologically necessary event identities." (Fodor 1974, p. 432)

specific entities and laws. Under this framework, the unity of science is meaningless.[23]

From an EDWs perspective, Fodor is right in denying reductionism. But his mistake is again the unicorn-world. Each special science has its "taxonomy" but his error is that of accepting the layered view of nature. For me, each special science is proper – in some cases – to a particular EW.[24] Much later, Piccinini remarks that:

> "[I]n the language of neurology …, presumably, notions like *computational state* and *representation* aren't accessible" (Fodor, 1998, p. 96). For ease of reference, I will call this view 'computational chauvinism': when it comes to explaining cognitive capacities, computational explanation is proprietary to psychology – it does not belong in neuroscience. (p. 343, Piccinini 2006)

Piccinini emphasizes that there are many neuroscientists who use notions like computation and representation "in interpreting data, forming hypotheses, and building models." He mentions journals named *Neural Computation*, *Journal of Computational Neuroscience*, and *Network: Computation in Neural Systems*. (idem) Computational chauvinism's main idea is that the neuroscientists have to discover the neural mechanisms that *implement* the computational processes from the psychological level. Thus, there has to be an autonomy of psychology in relationship to neuroscience. However, Piccinini thinks, "Nature has been uncooperative with this approach."

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[23] Following Fodor, Duprė (1983) considers that the unity of science requires reductionism, reductionism is false, therefore we must reject the unity of science. Ten years later, Duprė (1993) believes that rejecting three thesis (essentialism, determinism, and reductionism) that represent the metaphysics of order, we reject the unity of science, too. (in Grantham 2004, p. 136)

[24] I mention here that two years earlier than Fodor, Anderson fights against reductionism from physics from the same viewpoint! (See 6.10)

(p. 344) because nobody has discovered such implementation.[25] Analyzing certain areas related to neuroscience (computational neuroscience-computational models of neural processes, cognitive neuroscience- how the brain performs cognitive functions, and theoretical neuroscience- (mathematical) theories about the brain), Piccinini believes that neuroscience cannot be limited to computational neuroscience. Again, from an EDWs view, computational neuroscience is an improper term, "nature" cannot be cooperative regarding the *implementation* of mental states and processes in the brain. "Nature" does not exist and "implementation" is equivalent with my term "*rough approximations*" that refers to the correspondences between mental and neural states and processes that belong to two EDWs. Thus it has been difficult to find the correspondences between them simply because mental states have no spatial dimension.

From an EDWs perspective, if Fodor is right regarding the status of "special sciences", he put to much accent on modularity of the mind. I believe that the notion of modularity is an old one and with the new tools like fMRI and PET in scanning the brain, we have to go beyond such notions. According to the last two principles of EDWs perspective, neither mind nor brain is modular; the "I" corresponds to the union between brain and body. Therefore, I analyze in detail some arguments from two papers that criticize the modularity.

Hardcastle and Stewart are two people among many from evolutionary psychology and in cognitive neuroscience who criticize the modularity of mind hypotheses. (Hardcastle and Stewart 2002)

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[25] Neural networks are unable to help the researchers to find such implementation. (Piccinini 2001, p. 345)

> Cognitive neuroscientists assume that they can localize brain function; they seek discrete, physically constant brain 'modules' a material analogue for the psychologists' set of distinct mental software packages. Indeed, the criticisms should be all the more pointed because, according to some, the brain is where we should be finding these alleged cognitive units. … If anybody has localization data that would support modularity, it should be the neuroscientists. (Hardcastle and Stewart 2002)

The main attack is that not only on the fact that there are no empirical data for this strategy but also on the theoretical framework. They analyze three methods in which the neuroscientists believe in finding the modularity of the brain:

(1) Localization and single cell recordings. They emphasize that are many neuroscientists spending their careers in researching on "delineating small functional areas in the brain". The researchers are unable to record more than simultaneously around 150 and a few thousand cells through local field potential activity. According to the last years of research, our knowledge about the brain has become more and more complicated. The neurons are of different types having different response properties and different interconnections with other cells (neurons). The question is what do we record in such cases? (p. S72) "In addition, the actual processing of information that goes on in those cells involves lots of different kinds of excitatory and inhibitory inputs from other areas in the brainstem, cerebellum, and cerebral cortex."

(2) Lesion studies and the assumption of brain constancy. The main problem with these studies is that, in general, a lesion produces a functional change and "What neuroscientists know, but generally ignore, is that *any* functional change in the central nervous system will

lead to compensatory changes elsewhere. (See more details in Hardcastle and Stewart, 2001)" (p. S76)

(3) Functional imaging. This method cannot offer the wanted images about brain activity:

> … magnetic resonance imagining, the best non-invasive recording device we currently have, only has a spatial resolution of about 0.1 millimeter and each scan samples about five seconds of activity (cf., Churchland and Sejnowski 1988). This imprecision forecloses the possibility of directly connecting single cell activity – which operates three to four orders of magnitude smaller and faster – with larger brain activation patterns. (p. S77)

The authors analyze in detail these methods offering, for each method, various examples. Their conclusion is that none of these methods can support the modularity of the mind. One of the most interesting examples seems to be the Brodman area 6. "Area 6 appears significantly active after subtraction in studies of phonetic speech processing, voluntary hand and arm movements, sight-reading music, spatial working memory, recognizing facial emotions, binocu,lar disparity, sequence learning, idiopathic dystonia, pain, itch, delayed response alternation, and category-specific knowledge…" (p. S79) More than this, each function depends on "neural context" (McIntosh 1999, 2000). That is it depends on the connections with other areas. (idem) In this context, if we recall Sporns and Lungarella's new framework of inseparability of brain and body (Chapter 3), then the notion of modularity is meaningless. Losing the notion of modularity, we can hope only to find some very rough approximations between mental and neural states and processes that belong to two EDWs.

For Prinz, the main task in his article from is to criticize Fodor's modularity of the mind (1983). (Prinz 2006) At the beginning of his article, Prinz mentions that the title of Fodor's book would have been more aptly given as *The Modularity of Low-Level Peripheral Systems.* Throughout the paper, Prinz attacked each property of the modular system: localization, automatization, fast, shallow, ontogenetically determined, domain specific, inaccessible, and information encapsulated. I would not analyze in detail all the aspects of this paper, but I mention that it would be impossible to criticize in only one article all these characteristics. Probable for Prinz, a different strategy of attacking Fodor's concepts would have been better. However, I introduce something about the first and the last characterizations. Regarding localization and characteristics breakdown, Prinz offers some examples from neuroscience. One of these examples is that there is little agreement about the location of Broca's area (Poeppel 1996 or Pulvermuller 1996). The same situation is true for vision. However, Prinz's position does not concur with Lashley's equipotentiality hypothesis (1950); he emphasizes that "the rejection of equipotentiality does not support modularity." (p. 24) Regarding inaccessibility and encapsulation, Prinz believes that inaccessibility can refer only to conscious processes and knowledge: the operations within modules are conscious inaccessible. (p. 30) Fodor's argument based on perceptual illusions for encapsulation is flawed: perception always trumps belief when those two processes are in conflict. (p. 31) Of course, there are many other examples of top-down effects. Prinz's conclusion is that "at best" we can talk about "functional" (p. 33) components of the mind but not modules. (p. 33) "The mind can be described as a network of interconnected systems and subsystems." (idem) Such functional systems cannot be fast, automatic, innate, shallow and encapsulated. (p. 34) Again, the functionality is indeed the only solution for such problems.

As a conclusion, we can say that these arguments against modularity support the some principles of the EDWs perspective. Indeed, it seems that it is difficult even to grasp rough approximations between certain mental and neural states and processes. The main reason now is much more clear: these states and processes belong to EDWs!

5.9. The status of any living entity

On the webpage of First International Conference on Self-Adaptive and Self-Organizing Systems (Boston, Mass., USA, July 9–11, 2007), we can find definitions of self-adaptive and self-organizing systems. "Self-adaptive systems work in a top-down manner. They evaluate their own global behavior… Such systems typically operate with an explicit internal representation of themselves and their global goals." From an EDWs perspective, the self-adaptive systems presuppose the "I". Only the "I" has a global behavior because of its unity, i.e., the unity of implicit knowledge that produces explicit mental representations. "Self-organizing systems work bottom-up. They are composed of a large number of components that interact according to simple and local rules. … Such systems do not use internal representations of global properties or goals …." In this case, we have an external view of an artificial mechanism that has organizational different parts. Of course, we cannot deduce the "properties of the global system" from organizational different parts. The researchers have to be aware that self-adaptive and self-organizing systems belong to EDWs. Otherwise, being a combination of unrelated notions, their work is in vain.

We apply the principle of part-counterpart to all living entities (from cells to animals). A cell or an animal has its "implicit subjectivity". According to evolutionary theory, the main goal of subjectivity for that cell or animal is to survive in its standard environment. Such subjectivity can be grasped by us only through an analogy of its behavior with our behavior. But the behavior of a cell or an animal can be interpreted only from a holistic viewpoint of the cell or animal and not as an amalgam of biological mechanisms/elements. The subjectivity of a self-adaptive system is given only by its implicit organizational different parts, their functions and their collaboration. For a cell or an animal, we have again the external EW (part-counterpart or organizational different parts) and internal EW (their implicit "subjectivity"). For instance, from an external-EW, a cell is a simple self-organized system or an "it" with organizational different parts, but from an internal viewpoint the cell is an "I", i.e., a self-adapted system. It is an "I" that corresponds to all organizational different parts organized in such manner that the system is self-adaptive. In this sense,

> the single cell with its membrane bound proteins constitutes an *observer* of the same aspects of its immediate environment (other macromolecules that can be recognized as signals or nutrition), and multicellular organisms depend critically on inter-cell signalling." (Baas and Emmeche 1997, my emphasis)

This kind of "observation" would involve the Kantian synthetic unity and can be analyzed through Langton's synthetic method. (See 5.3) Again, to grasp such synthetic actions of some wholes on their parts, we have to appeal to EDWs perspective, mainly to the part-counterpart principle and the principle of knowledge. From one side, for a human observer both the whole and the parts exist within the same EW. From another side, for the viewpoint of a whole, the parts do not exist! This is the reason the synthesis action is so important. Because of the synthesis, the number of EDWs becomes quite fuzzy, not for a human being but just taking into account the viewpoint of all epistemologically different entities! More than this, what "emerges" from the operation of components of a living system is in fact the unity of the "I" or a kind of implicit knowledge for any living entity. Due to the evolution, there are different degrees of complexity for such implicit knowledge among living beings. However, at the same time, this implicit knowledge has to form the unity of the "I".

What are the differences between the "it" of a cell, that of an animal and the "I" of a human being? There are billions of years of evolution that have created more and more complex self-adaptation.[26] From an external viewpoint, the difference is given by the complexity of organizational different parts of a living entity: its organizational different parts and their relationships are organized (through billions of years of evolution) in such a manner that their implicit unity is the "I". The unity of each "I" (and even of those "I"s that belong to simple living entities) is represented by a kind of "implicit information" or "implicit knowledge". Deutsch constructs a multiverse view of "knowledge".[27] His definition of life takes in "knowledge": "… an entity is adapted to its niche if it embodies knowledge that causes the niche to keep that knowledge in existence." So "life is about the physical embodiment of knowledge." (p. 181) For instance, genes embody knowledge about their niches. (p. 179) However, this kind of knowledge is a physical quantity. (p. 190) For me, "implicit information" is this kind of knowledge.

In order for a human being to construct artificial self-adaptative systems, the main task will be to create mechanisms that have a unity that reveals this "implicit information". The rule can be: more implicit knowledge for a system, a more complex and more self-adaptive system. In other words, the

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[26] Adding the application of the EDWs perspective to electrons and planets from Chapter 6, we can make the equivalence between the "I" and the "it". The difference between the "I" and the "it" is given just by the amount of information. However, if the "I" is thinking, the "it" is behaving.

[27] About the notion of the multiverse, see 6.9.

problem will be how the artificial system “has”, implicitly, information for behaving as a self-adapted system. The major mistake has been to consider both the complexity of the relationship among organizational different parts of a living entity and its self (i.e., its implicit knowledge) in the same EW. This mistake implies the famous distinction between bottom-up and top-down. In general, “bottom” elements are considered to be neural patterns of activation and “top” elements are our cognitive abilities that imply mental states and processes. The researchers have placed both bottom and top elements in the same world. According to EDWs perspective, bottom-up or top-down elements and processes belong to EDWs. I repeat that for analyzing the top-down elements and processes we have to appeal to Kant’s synthetic unity and Langton’s method of synthesis.

CHAPTER 6

Applications to some notions from philosophy of science and science (physics)

The unicorn-world has dominated human thinking from the Ancient period until our day. As we saw in Chapter 3, replacing this framework with EDWs framework the mind-body problem becomes a pseudo-problem. However, in 3.4, I stressed that I need to extend this new framework to all epistemologically different entities. There are some philosophical approaches (Carnap, Goodman, Putnam, and Friedman) and scientific theories (Einstein's theory of relativity and quantum mechanics) that explain different entities within the unicorn-world. In this chapter I will analyze them in relation to the EDWs perspective.

In the last century, science – and especially physics – has developed in a tremendous way, including the appearance of the theory of relativity, quantum mechanics, and so on. How then has it been possible for the unicorn-world to preserve its domination? We saw some reasons for this domination in the introduction. In this chapter, I want to analyze what has happened in philosophy of science in this context. I start my criticism with logical positivism (criticism that is available for analytic philosophy, in general) that appeared after the theory of relativity has become one of the most important theories in physics. Then I analyze the approaches of certain philosophers-not in details but only in certain aspects—in relation to EDWs perspective. The main aspect that I attack is the *relativisation of conceptual frameworks* of scientific knowledge. Starting with Wittgenstein and then Carnap, the philosophers in the last 100 years have become aware of the incoherent and illogical relationship between different theories and the unicorn-world. For solving these apparent paradoxes, they have taken refuge in the linguistic/conceptual area. Philosophers from the philosophy of mind have followed them. My movement is quite similar movement to Kant's rejection of Hume's scepticism. I try to replace contemporary relativism with a consistent, coherent and anti-metaphysical foundation, the EDWs perspective. This will be done by replacing the unicorn-world with the hyperverse.

As we will see below, Friedman relativises Kantian a priori principles within a scientific framework. (Friedman 2001) In Chapter 2, we saw the role of *constitutive* elements for the unity of the world and of scientific knowledge in Kant's philosophy. Like other philosophers and scientists of his day, Kant believed in Newton's theory of gravitation as explaining the motions of different objects (from tables and stones to planets) within the same world. Kant's aim was to construct the foundation of Newton's theory and one of his main epistemological questions was "How do we know an object?" He generates a "Copernican revolution" in philosophy by explaining scientific knowledge by asserting that the objects (internal and external) conform to our modes of cognition in our process of knowing them. This means that the *conditions of possible experience* (transcendental apperception with its functions, categories and pure forms of intuition) that belong to a subject *constitute* the phenomenal objects. In order to avoid Humean scepticism, Kant offers arguments for the objective reality of the categories. The phenomenal objects are objects of our experience and the conditions of experience – pure intuitions of space and time and categories – offer us the objective validity of our knowledge. However, these conditions of possible experience are ontologically loaded. We can say that Kant has two reasons for not questioning the unicorn-world. (1) Pure intuitions generate a one-to-one relationship between the categories and the external world. (2) Newton's theory explains one external world. In Kant's day, long before the existence of quantum mechanics, it was quite unexceptional to assume the existence of the unicorn-world and a single set of constitutive principles. For Kant, the transcendental apperception and empirical intuitions establishes an objective reality for a one-to-one relationship between human knowledge (that includes Newton's theory) and the one world (the unicorn-world).

In the first decades of the 20th Century there were two main quite abstract scientific theories – Einstein's theory of relativity and quantum mechanics – that explained "different empirical parts" of the world or "levels of reality". Without any intuitions, which become useless in these scientific theories, the relationship between the empirical and theoretical parts of scientific theories turned out to be quite problematic. The process of abstraction of scientific theories creates the proper framework for philosophers to multiply only the conceptual frameworks but not the world. The Kantian one-to-one relationship was therefore replaced by a many-to-one relationship, i.e., many linguistic/conceptual frameworks-to-one world. I want to show that, even if the elimination of intuitions was a useful development in scientific theorizing, the preservation of the unicorn-world, especially by philosophers, has been a huge error. In philosophy the main trend against Kant in this direction was analytical philosophy. From my perspective the problem is that the unicorn-world has dominated philosophy and science in general even after the appearance of quantum mechanics in the first decades of last century. It does not face within the scope of this book to analyze the relationship between Kant, analytic philosophy (philosophy in general) and the EDWs perspective. However, the main idea is that in the last century the majority of philosophers gave up on the Kantian constitutive elements (mainly intuitions) in explaining the "world" focusing on relativising the Kantian categories and principles. As we will see below, Reichenbach eliminates the Kantian intuitions and relativizes Kantian constitutive principles. With his "constitutive of the concept of the object of knowledge", he makes a step toward Wittgenstein's "linguistic turn". Carnap formulates a further step in defining the meaning of logical empiricism, so that "the sense provides the material of cognition but mathematics and logic form the organized system of knowledge".[1] (Carnap 1928a/1967, v-vi in Friedman 1999, p. 9) The "linguistic turn" eradicates the constitutive elements in constituting the external world. Wittgenstein and Carnap (with his "linguistic framework") are emblematic of "linguistic philosophy". (Hanna 2001) One might add other important approaches that follow this unique direction compelled by the unicorn-world: Goodman's "ways of worldmaking", Kuhn and Feyerabend's incommensurability of scientific theories, Davidson's conceptual schemes and Friedman's relativised a priori principles.

However, I believe that in the context created by scientific theories, these philosophers should have enquired about the unicorn-world from a meta-scientific or philosophical level. (See Friedman below) In this chapter I analyze the relationship between the anti-metaphysical foundation of EDWs perspective and other anti-metaphysical approaches in the philosophy of

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[1] For Carnap, intersubjective communication draws from "purely structural definite descriptions" and not from sensory ostension. (Carnap's expression in Friedman 1999, p. 9)

science of the last century, the relationship between general theory of relativity and quantum mechanics, and some notions from quantum mechanics.

6.1. A glance at logical positivism[2]

For Kant, the transcendental apperception or schematism and empirical intuitions establish an objective reality for a one-to-one relationship between human knowledge (that includes Newton's theory) and the one world (the unicorn-world). In philosophy a main trend against Kant was analytical philosophy. It is quite difficult to define analytic philosophy. According to Hanna (2001) there are three essential parts of the analytic tradition: "(1) logicistic philosophy (led by Frege, early Moore, and early Russell); (2) linguistic philosophy (led in its first or ideal language by early Wittgenstein and Carnap, and then in its second or ordinary language phase by the later Wittgenstein); and (3) scientific philosophy (led by Quine)." (Hanna 2001, pp. 10–1) Logical empiricism or positivism (with Schlick, Reichenbach, Carnap, etc.) which I am about to examine, is included in analytic philosophy.

Let me say a few words about analytic philosophy. There are two factors in analytic philosophy that determine the preservation of the unicorn-world: (a) the elimination of human subjectivity, of intuitions, and the method of synthesis that involve in fact the elimination of constitutive elements from their approaches[3], and (b) the over-evaluation of the analytic

[2] Some paragraphs from this chapter are published in Vacariu (2007).

[3] In Hanna (2001) we can find these ideas: Frege rejects logical psychologism; Moore is strongly against the Kantian synthesizing subject; Russell eliminates all "essentially singular or intuitional components and also all totality-collecting or synthesizing components…. He realized Moore's goal of anti-Kantian doctrine of judgment according to which no appeal

method. Regarding the final factor, Hanna characterizes analytical philosophy through Russell's words: "Ever since I abandoned the philosophy of Kant… I have sought solutions of philosophical problems by means of analysis; and I remain firmly persuaded…that only by analysis is progress possible." (Russell, *My Philosophical Development* pp. 14–15 qtd. in Hanna 2001, p. 5) If Ryle considers that the theory of meaning was the "occupational disease of twentieth-century Anglo-Saxon and Austrian philosophy", Hanna continues with this "tone of voice" saying that analytic philosophy "is the joint product of two intimately connected occupational diseases: a preoccupation with the theory of meaning, and a preoccupation with the logico-linguistic theory of necessity." (Hanna 2001, p. 6) Wittgenstein's *Tractatus,* the "linguistic turn" in analytic philosophy, strongly influenced logical positivism. Logical positivism was against the metaphysics of the 19th Century and this is one reason that it embraced Wittgenstein's philosophy. Romanos emphasizes the difference between metaphysics and positivism: metaphysics inquires into the existence and structure of reality, i.e. the unicorn-world, while positivism replaces these inquiries with "What are we really talking about?" and "What is the structure of our language?" (Romanos 1983, p. 33) While Romanos stresses the Kantian aspects of positivism, concerning the conceptualisation of empirical experience, I wish to emphasize the idea that positivism concentrates only on concepts that belong to language and eradicates the notion of intuitions. Wittgenstein underlines the role of language in relation to reality: "Language pictures the world through

whatsoever to consciousness, intentionality or synthesizing subjectivity is required." (p. 58); for early Wittgenstein and Carnap "logic fills the world" because language fills the world. For Kant logic fills the world because the human mind fills the world. "(A)ll language signifies thought". (Kant quoted in Hanna 2001, p. 71) projecting the logical form of the facts." (Wittgenstein quoted in Romano 1983, p. 34) Within this frame of analytic philosophy, it made no sense to question the existence of the unicorn-world. Wittgenstein, and the philosophers that followed him, probably realized that asking about the nature of the "world" led to contradictions.

As I wrote in the introduction, I am interested in pointing out the relationship between logical empiricism and scientific discoveries from that period. In the first decades of the 20th Century there were two main quite abstract scientific theories – Einstein's theory of relativity and quantum mechanics – that explained "different empirical parts" of the world or "levels of reality". Without any intuitions, which become useless in these scientific theories, the relationship between the empirical and theoretical parts of scientific theories turned out to be quite problematic. The process of abstraction of scientific theories creates the proper framework for philosophers to multiply only the conceptual frameworks but not the world. The Kantian one-to-one relationship was therefore replaced by a many-to-one relationship, i.e., many linguistic/conceptual frameworks-to-one world. I want to show that even if the elimination of intuitions was a correct process in scientific theorizing, the preservation of the unicorn-world, especially by philosophers, has been a huge error. We can say that there are several elements that constituted the framework for the elimination of intuitions from logical empiricism (and later from philosophy of science): logicistic philosophy (Frege and Russell), Wittgenstein's *Tractatus*, Poincare's conventionalism, and the development of abstract scientific theories from mathematical physics (Einstein's theory of relativity) that eliminates the role of intuitions in explaining the external world.

Following Friedman, let us analyze the relationship between science and logical empiricism in more detail.

(Friedman 1999; 2001) The development of modern geometry in the late 19th century (Riemann, Helmholtz, Lie, Klein and Hilbert), together with the theory of relativity, created the framework for logical empiricism to reject synthetic a priori judgments in scientific knowledge. Through Hilbert's axiomatization of Euclidean geometry, the necessary role of intuition in pure mathematics was rejected. Moreover, through the development of non-Euclidean geometries and the theory of relativity they rejected the Kantian notion of applied mathematics. (Friedman 1999, p. 60) However, Schlick and Reichenbach accepted one of the main Kantian ideas: there is no direct relationship between sensory information and our correct knowledge/explanation about/of the world. Thus, they rejected the immediate given and eradicated completely the role of intuitions. Nonetheless, the Kantian notion of the *a priori* is preserved because it creates the possibility of experience. I note that the whole experience belongs to the same unicorn-world. Reichenbach makes the distinction between axioms of coordination (nonempirical principles that are, in Reichenbach's terms, "constitutive of the concept of the object of knowledge") and axioms of connection (empirical laws). Such *a priori* principles are not anymore universal and necessary principles. (Friedman 1999, p. 61) Reichenbach maintains that not only traditional Kantianism is wrong, but also traditional empiricism. Again, the argument is that there is no direct relationship between mathematical concepts (geometrical concepts) and physical reality. Analyzing in detail the relationship between Schlick and Reichenbach, Friedman draws the conclusion that for Reichenbach "in the context of general relativity, physical geometry (the metric of physical space) is *no longer* constitutive. …the metric of physical space (-time) is now dependent on the distribution of mass-energy via Einstein's field equation. …geometry is empirical, and, in fact, Euclidian geometry is now empirically false." (Friedman 1999, p. 66) Because of this reason, Reichenbach rejects Poincare's conventionalism, while Schlick accepts conventional or nonempirical geometry.

As I mentioned above, Reichenbach and Carnap made the decisive movement toward the "linguistic turn". For Carnap, intersubjective communication draws from "purely structural definite descriptions" and not from sensory ostension. (Carnap's expression in Friedman, p. 66) The "linguistic turn" eradicates the constitutive elements in constituting the external world. Wittgenstein and Carnap (with his "linguistic framework") are emblematic for "linguistic philosophy". (Hanna 2001) The domination of the unicorn-world has remained untouched. Or even worse, realizing that something is problematic with the unicorn-world but being unable to replace it with something else, people from different scientific domains and philosophy abandoned the fight and took refugee in linguistic and conceptual frameworks. Let us see in the next section how Carnap – following Frege and Wittgestein – introduces linguistic frameworks.

6.2. Carnap's linguistic frameworks

In the 20th century, Carnap insists on the relation between analytic and synthetic statements in science. This notion has been related to the notions of syntax and serial computation that are usually involved in conscious processes.[4] Thus, conscious processes are serial and they imply explicit knowledge. Unconscious processes are in parallel and involve implicit knowledge. Understanding entails not only explicit knowledge but also implicit knowledge. I first present Carnap vs. Gödel – concerning the notion of syntax and understanding – and then

[4] Serial computation is computation in sense of Turing machine. In the connectionist paradigm, computation means parallel not serial processes.

Carnap vs. Quine – concerning the analytic – synthetic distinction and ontological relativity.

Carnap is a representative figure of analytic philosophy and therefore my criticism of his linguistic frameworks can be viewed as a critique of analytic philosophy in general. Moreover, it turns out that a similar critique is valid for science in general as well. Scientists have not been concerned with the unicorn-world because particular scientific theories have local empirical success in explaining "aspects of the world" (that are in fact parts of EDWs).[5] However, I believe philosophers should have enquired about the unicorn-world from a meta-scientific or philosophical level. (See Friedman below)

Carnap replaces traditional metaphysical and ontological frameworks with linguistic frameworks. In this he definitely follows Wittgenstein. The Kantian constitutive elements that realize the relationship between subject and world are replaced with something more abstract than Reichenbach's principles of coordination: linguistic frameworks. According to Friedman, linguistic frameworks are based on two related distinctions:

(1) *The distinction between formal or analytic sentences (L-rules) that include logic and mathematics and empirical or synthetic sentences (P-rules) that are empirical laws.* (Friedman 2001, pp. 31–32) I emphasize Friedman's remark that this distinction is a purely formal or logical one (Friedman 2001, p. 40) and therefore that the principles of coordination (from Reichenbach) become "lost" in linguistic frameworks, and that in the *Aufbau* Carnap tries to "incorporate the problem of coordination *within* the logical systematization of science". (Friedman 2001, p. 82) This problem is transformed into a

[5] A few decades ago, Everett multiplied the world into many worlds or parallel universes and later this notion became a fashion in theoretical physics. However, these parallel universes presuppose the unicorn-world. (See section 6.9)

logico-mathematical one in making a distinction between logical and descriptive terms, and analytic and synthetic sentences. Losing even the role of Reichenbach's coordination principles the constitutive part is eliminated and the relationship between linguistic frameworks and the world becomes empty.

(2) *The distinction between internal and external questions.* Each framework has its rules and internal questions. Questions about the existence of new entities take place within the particular framework. The answers to such questions are given by purely logical methods or empirical methods if the framework is logical or factual. The role of the linguistic rules is to form and test the statements. The rules of each linguistic framework determine the "existence" of objects. That means the objects themselves *exist* as long as the linguistic rules allow for the formation of certain linguistic expressions corresponding to them. The ontology is based not on metaphysical principles but on the rules and entities of each linguistic framework. Carnap abandons the idea of *absolute correspondence* between reality and human knowledge and this necessitates the elimination of the constitutive part. Each linguistic framework is neither true nor false in relation to reality. The external questions refer to the existence or reality of the system as a whole, such as the system of physical objects or that of natural numbers. (Carnap 1950, p. 73) Thus, which linguistic framework we adopt is an external question and the answer to such question is a conventional or pragmatic one. All linguistic frameworks have the same objective value.

We can say that Carnap has relativised ontology precisely because of the elimination of the Kantian constitutive part (mainly the intuitions) but for preserving the unicorn-world. Otherwise, the constitutive part would require the absolute correspondence (or one-to-one relationship) between "reality" and a unique linguistic framework. In the EDWs perspective, the extended Kantian constitutive parts, which correspond to EDWs, discard the reduction of an object's existence to linguistic entities. Because of the constitutive different interactions, all epistemologically different objects exist in EDWs without any help from our linguistic rules and entities. Missing constitutive elements, the linguistic frameworks are simply "conventions" (Poincare) because they explain the same "world".

It seems that Carnap's approach is an approach characteristic of analytic philosophy. For the past century, analytic philosophy has created a confusing path for philosophy. It is a path that misses the constitutive elements of the EDWs. However, only partial re-introduction of constitutive elements in philosophical approaches (of explaining scientific theories) (see Friedman's approach below) is not enough to discard the unicorn-world. Transcending the analytical approach (and all its remnants) is possible only by replacing the unicorn-world with the EDWs.

6.3. Carnap vs. Gödel or syntactic vs. semantic

With his different "linguistic frameworks" (Carnap 1950) and Principle of Tolerance (Logical Syntax of Language), Carnap wants to give up to the "absolutist" conception of logical truths and analyticity common to Frege. As we saw above, he replaces traditional metaphysical and ontological frameworks with linguistic frameworks.

Gödel criticizes the linguistic accounts of the foundations of mathematics developed by Carnap. Based on his First and Second Incompleteness Theorems, Gödel claims that 1) a rule about the truth of sentences is a syntactical one if it is consistent without implying factual sentences and 2) Carnap is not correct when he maintains that the truths of mathematics are meant to be consequences of the adoption of a linguistic framework (in this case there is a condition: *the syntax has to be finitary*). Thus here we have a vicious circle: mathematics is obtained from syntactic rules but the rules are available only if mathematics is taken for granted (in the metalanguage). The first Incompleteness Theorem shows that no deductive system will yield all mathematical truths. It is necessary to admit the semantic notion of the consequence in the metalanguage, i.e., the use of a *nonfinitary reasoning* (Goldfarb, p. 333). For Gödel syntactical rules are void of content because they do not refer to meaning. (p. 336)

From an EDWs perspective, the syntactic elements are the entities of the mind, i.e., there are the explicit (conscious, etc.) mental representations. Mental entities are endomental entities. However, their meanings are not explicit but implicit (unconscious, etc.) The "I" can observe these mental representations clearly, distinctly and completely but not their meanings. Their meanings – that are certain processes not entities – belong to the "I". These procedural processes are implicit knowledge: they are not clear, distinct and complete processes for the "I".

Goldfarb remarks that when Gödel and Quine maintain that mathematical objects are as objective as physical objects, they are thinking along the same lines. From an EDWs perspective they are both right. According to the principle of objective reality, all EDWs have the same objective reality. Mathematical entities have the same objective reality as physical entities. However, Gödel is completely different from Quine when he claims that objects of this kind have different natures. The mathematical objects and facts are as objective (independent of our conventions or constructions) as physical or psychological objects and facts but they have a completely different nature (Goldfarb, p. 337). The EDWs perspective supports Gödel's position: mathematical objects belong to one

EW that is different than the EW of physical objects. However, Gödel's distinction between mathematical and psychological entities is just a methodological one.

The main idea is that, in order to avoid vicious circularity, Gödel claims that there is no distinction – regarding the objective reality – between the mathematical realm and the empirical one. But Ricketts and Goldfarb showed that Carnap himself relativized the above distinction by means of different linguistic frameworks and the Principle of Tolerance. Carnap admits that logico-mathematical rules, like physical rules, can be revised. A sentence is analytic only in a linguistic framework. Moreover, Friedman emphasizes that Carnap in his "Introduction to Semantics" officially renounced to the definitions from *Logical Syntax*. (Friedman 1999)

Penrose rejects the syntax, also embracing a Platonic view: there are three worlds, three mysteries: the Platonic world of mathematics, the mental world, and the physical world. (Penrose 1997) Penrose is closer to the EDWs perspective than Carnap and even Gödel. But he makes the same *methodological* difference as Gödel between mathematical and mental entities. One of his essential ideas is that consciousness and awareness do not compute. He argues that he uses Gödel's argument to show that human understanding or, to use a better word, "insight" (Penrose) cannot be an algorithmic activity. I think "insight" is in fact a process that belongs to the "I" as a whole. Therefore it cannot be a functional process. A syntactic perspective depends upon algorithmic procedures. The idea that "awareness" does not compute is available not only for the mathematical processing arena but also for all the processes made by brain. For instance, merely carrying out some computation can in no way evoke a sensation of red. Qualia have nothing to do with computation. The neural networks are in the same situation as computers. They also compute because they have rules and fixed elements like connections and nodes. Penrose's argument for this idea is that "if the synapses all had fixed strength, the brain would be very much like a computer." (Penrose 1997, p. 125) Evidently, computing is just a functional tool of the "I" that computes internal entities. As we showed in the previous chapter, the qualia belong to the whole "I".

6.4. Carnap vs. Quine or rational reconstruction vs. naturalized epistemology

The naturalization of epistemology proposed by Quine is a consequence of his attacks on the Carnapian *rational reconstruction* of the *Aufbau*. What was is that Quine "roughly summarized" (his expression) in "Two Dogmas" about the *Aufbau*? The fact that Carnap failed in his project by which all statements could be translated into statements composed by sense-datum language, logic and mathematics. Again, Carnap avoids the semantics of statements; his approach to syntax deals with the notion of computation. He needs only the space-time framework for the individualization of sense – data and syntax for the individualisation of elements of language, logic and mathematics.

In "Naturalized Epistemology", Quine's attack on Carnap's *Aufbau* goes as follows. In Carnap's terms, a quality should be assigned to point-instants. Quine asks "How quality q is at x; y; z; t could be translated into Carnap's language of sense data and logic? The connection "is at" remains an added undefined connective." Quine rejects the main thesis of logical positivism: the translation of all statements into statements of logic and sense data. Instead he proposes the naturalization of epistemology by means of psychology. In "Two Dogmas", Quine rejects the analytic – synthetic distinction and the a posteriori and reductionist thesis that every statement can be reduced to sense experience.

> The dogma of reductionism survives in the supposition that each statement, taken in isolation from its fellows, can admit of confirmation or infirmation at all. My counter suggestion, issuing essentially from Carnap's doctrine of the physical world in the *Aufbau*, is that our statements about the external world face the tribunal of sense experience not individually but only as a corporate body. (Quine 1951)

Thus, he embraces and develops Duhem's holism. As we shall see 6.8, Friedman shows this holism is not an acceptable position regarding the theories of physics and philosophy of science. The existence of the EDWs rejects completely this kind of holism.

6.5. Quine's ontological relativity

Quine's conception of "ontological relativity" is quite close to Carnap's notion of "linguistic frameworks". Before Quine, the indeterminacy of reference was not acknowledged. Quine's famous example for the indeterminacy of translation regards the translation of the native expression "gavagai" as "rabbit". (Quine 1968) The main idea is that nobody can translate "gavagai" into "rabbit" just because of the significance of the word "rabbit". "Rabbit", as a word, is an indeterminacy of translation because it can refers to one rabbit as a whole, undetached rabbit parts, or rabbit stages.

The question for Quine is how we can individuate something. From an EDWs perspective a different question would be to what EW does this or that entity belong. In general the rabbit and its macro-parts (that include its molecules) belong to the same EW.

For Quine, "The only difference between rabbits, undetached rabbit parts, and rabbit stages is in their individuation." (Quine 1968, p. 2) Thus Quine's slogan is: "No entity without identity." What are the conditions for identity? There are two cases: empirical individuation and individuation in language. Usually empirical the individuation is by ostension. But even by ostension we cannot solve this problem of indeterminacy because when we point to different parts of the rabbit we point also each time to the rabbit.

In natural language, the extension of an expression is much clearer than its intension. To avoid a complete indeterminacy (i.e., an indeterminacy not only for radical translation but also for the native language) Quine introduces the frame of reference or coordinate system which is the vocabulary that includes "rabbit", "rabbit part", "formula", "number", and two-predicates of identity and difference, etc. Using this vocabulary we can say that *this* is a formula and *that* is a number, *this* is a rabbit or part of the rabbit.

> For the indeterminacy between "rabbit", "rabbit stage" and the rest depend only on a correlative indeterminacy of translation of the English apparatus of individuation – the apparatus of pronouns, pluralisation, identity, numerals and so on. No such indeterminacy obtrudes so long as we think of this apparatus as given and fixed. … At the level of radical translation, on the other hand, extension itself goes inscrutable. (Quine 1968, p. 4)

Relative to the frame of reference, it is meaningful to ask about the difference between rabbits and parts, formulas and numbers. In this way the inscrutability of reference is applied to ourselves: "reference is nonsense except relative to a coordinate system". (Quine 1968, p. 8)

This relativity implies a regress from one frame of reference to another. The background language, i.e. our mother tongue, stops this regress. Thus the ontology is doubly relative: "Specifying the universe of a theory makes sense only relative to some background theory, and only relative to some choice of a manual of translation of the one into the other." (Quine 1968, p. 10) In Romano's terms, the double relativity involves the problem of empirically determining linguistic reference and the thesis of the indeterminacy of translation. (Romano 1983, p. 43)

From my viewpoint, the rabbit and its parts (the molecules and cells are included here, but not the micro-particles that correspond to these parts) belong to the same EW. The identification of "rabbit" is a methodological problem.

6.6. Goodman's relativity

Goodman's book *The Structure of Appearance* contradicts the *Aufbau's* thesis of "erlebs". For his phenomenalist constructional system, Goodman replaces Carnap's "erlebs" with qualia that are the atomic individuals. (Goodman 1951) If individuals are concrete then nominalism involves phenomenalism. Thus Goodman rejects realism.

Goodman is among the first philosophers that relativise the image/representation/ description/picture of the world. For me the structure and the ideas of his article "The Way the World Is" are important. (Goodman 1978) The main parts of the article are: The way the world is given; the way the world is to be seen; the way the world is to be described; and the way the world is. In the first part he rejects the notion of the "given": "The question is not *what* is given but *how* it is given. Is it given as a single whole or is it given as many small particles?" (Goodman 1978, p. 25) and in the next two parts he relativises the ways in which we see and describe the world. And thus in the end his conclusion is "There are many different equally true descriptions of the world … None of them tell us *the* way the world is, but each of them tells us *a* way the world is." (Goodman 1978, p. 30) Following Kant and rejecting the physicalist doctrine, Goodman claims that we do not have absolute immediate sensory data free from categorization. But having different conceptual schemes or representational systems, we can construct many different worlds. Two different true descriptions that refer to the same thing are apparently contradictory; "apparently" because they are not descriptions of the same thing. Each description is true not in the same world but in different worlds. (Goodman and Elgin, p. 51) The conceptual schemes dictate the identification of objects.[6]

In the introduction of *The structure of the appearance*, G. Hellman points out the main ideas of Goodman's work: the methodological outlook of constructionalism, an anti-foundationalist epistemology (the rejection of the "given"), methodological and ontological pluralism (multiple systems of knowledge) and methodological and ontological relativism (the rejection of ultimate metaphysical questions concerning the components of reality).

Even with his concept of "worldmaker", Goodman rests, in the end, on the "unicorn-world". The same observation as was made about Carnap is applicable to Goodman: human beings are not worldmakers because these EDWs exist before we observe them. However, Goodman's overall approach comes relatively close to the idea of EDWs.

6.7. Putnam and the rejection of the "thing-in-itself"

Recognizing the Kantian influence on his work ("my indebtedness to Kant is very large" – Putnam, *Realism with a Human Face*, 1990, p. 3) Putnam is anti-foundationalist, i.e. he rejects "metaphysical necessity" (see "*Is Water necessarily*

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[6] We can find the same ideas elaborated in more detail in Goodman (1978).

H_2O?" in Putnam 1990) and he puts forward internal realism. Along the same lines as Goodman, but avoiding the relativism, Putnam rejects the absolutist picture of the world to be found in realism. Different languages, different theories, and different representations have the same value in different contexts. "In my picture, objects are theory-dependent in the sense that theories with incompatible ontologies can both be right." (Putnam 1990, p. 30) Both language and science are deeply pluralistic in their ontology. For Putnam absolute realism or foundationalism has no sense. "I criticize the idea that the world picture of fundamental physics is metaphysically complete." (see "Is the causal structure of the physical itself something physical?" in Putnam 1990, p. 95) Like Quine, Putnam accepts that stars, tables and micro-particles "exist" only because we can describe all these things in different conceptual schemes. Thus the concept of existence has to be related to conceptual frames. For Putnam, the question "How many objects really exist?" is an illusion. (Putnam 1987, p. 20) In fact the conceptual schemes are very similar to Carnap's linguistic frameworks.

Putnam internal realism (see "I should have called it pragmatic realism!" Putnam 1987, p. 17) rejects the notion of the thing-in-itself". (Putnam 1987, p. 36) In this sense, realism is not incompatible with conceptual relativism. (Putnam 1987, p. 17) Again, from the EDWs perspective, there is the same problematic relationship between the world and the so-called "relative concepts" or "relative descriptions". Conceptual schemes are empty in describing different entities that belong to the unicorn-world. As we shall see in the next section they are missing a kind of Kantian *constitutive* framework.

Putnam asserts that assuming that there is a "thing-in-itself" presupposes a view from an "Archimedean point". In this case it is about an ideal or impersonal knowledge.

> The same notion of a "God's Eye View", the same epistemic ideal of achieving a view from an "Archimedean point"—a point from which we can survey observers as if they were not *ourselves*, survey them as if we were, so to speak, *outside our own skins*—is involved in both cases. The same notion that ideal knowledge is *impersonal* is involved. (Putnam 1990, p. 17)

This Archimedean point is similar with Nagel's "view from nowhere". This Archimedean point would presuppose entities outside from all EDWs and this is evidently impossible. It presupposes entities that have certain interactions with the elements from all EDWs at the same time. Certainly such entities do not exist.

6.8. Friedman's relative constitutive a priori principles

I will first examine the work of Michael Friedman (as a philosopher of theoretical physics) in which he relativised the Kantian a priori principles in investigating Newton's and Einstein's scientific theories.

Friedman re-introduced and developed Reichenbach's notion of *relativized a priori principles* in explaining Newton's and Einstein's theories from mathematical physics. He replaces Quine's holism[7] of belief with a dynamical and stratified system of knowledge constituted on three levels: (1) empirical laws of nature (like Newtonian laws of universal gravitation or Einstein's equation for the gravitational field; (2) constitutive a priori principles, such as principles from geometry and mechanics that construct paradigms (in Kuhn's sense) or

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[7] All mental representations (judgments) belong to the internal epistemological world. However, different sets of mental representations *refer* to EDWs. From this viewpoint, the EDWs perspective rejects Quine's holism (that is equivalent to the unity of knowledge).

conceptual frameworks and "define the fundamental spatio-temporal framework within which alone the rigorous formulation and empirical testing of the first or base level principles is then possible"; and (3) philosophical meta-paradigms or meta-frameworks that guide the transition from one paradigm or conceptual framework to another. (Friedman 2001, pp. 45–6) Extrapolating Kant's idea, Friedman considers that *a priori* constitutive principles define "the fundamental spatio-temporal framework of empirical natural science." (Friedman 2001, p. 43) For each scientific theory there are certain *a priori* constitutive principles that define its proper space of empirical possibilities. (Friedman 2001, p. 84) Extrapolating Kant's idea, Friedman considers that *a priori* constitutive principles define "the fundamental spatiotemporal framework of empirical natural science". (2001, p. 43) For each scientific theory there are certain *a priori* constitutive principles that define its proper space of empirical possibilities. (Friedman 2001, p. 84) However, the question is how we can define "the space of empirical possibilities" for each individual theory. Are *a priori* principles equivalent to observational conditions, i.e., do the *a priori* principles create EDWs and therefore make "the space of empirical possibilities" equivalent to EDWs?

In addressing this question, let us see how Friedman explains Newton's and Einstein's theories within his framework. Newtonian mechanics and Einstein's theory of relativity contain two parts: (1) the empirical part containing such laws as universal gravitation or Einstein's equations for the gravitational field; (2) the constitutively *a priori* part containing both mathematical principles utilized for constructing the theory (Euclidian geometry vs. the geometry of Minkovski's space-time, the Riemannian theory of manifolds) and fundamental physical principles or the "mechanical part" (the Newtonian laws of motion vs. the light principle, the equivalence principle). (Friedman 2001, p. 71)[8] Newton's and Einstein's theories offer us different spatio-temporal structures. Do these structures belong to EDWs or to the same EW? There are different reasons for which we cannot even compare these two theories. Einstein has transformed the light principle that was an empirical principle for Newton into a constitutively *a priori* one. "Einstein has 'elevated' an empirical law to the status of a convention or to the status of a coordinating or constitutive principle". (Friedman 2001, p. 88) Within the special theory of relativity the spatio-temporal framework is Minkovski's four-dimensional space-time.[9] If in Newton's theory the gravitational force is independent of inertial mass, in the general theory of relativity they are equivalent. "The inertial structure is defined in terms of 'free-falling' trajectories in a gravitational field" and so the "gravitational force is directly incorporated into the geometry of space-time and thus into the constitutive framework of our theory." (Friedman 2001, pp. 89–91) In Newton's period, people could not even conceive certain notions from Einstein's theory. The general theory of relativity requires a different spatio-temporal framework than the one postulated by Newton's theory. In this sense, Friedman presents "three

[8] We have to recall that, in Parvu's interpretation, for Kant, the "condition of possibility" appears at two levels: mathematical (axioms of intuition and anticipations of perception) and physical (analogies of experience, i.e. the transcendental laws of nature).

[9] "… for Einstein uses his light principle empirically *to define* a fundamentally new notion of simultaneity and, as a consequence, fundamentally new metrical structures for both space and time (more precisely, for space-time)." (Friedman 2001, p. 88) Friedman shows that the principle of equivalence has the same status within the general theory. The empirical content of the general theory is given by the application of the principle of equivalence to the inertial structure of Minkovski's space-time. (Friedman 2001, p. 115) Friedman mentions that this idea is from Norton 1985/1989.

revolutionary advances”: a new field of mathematics, tensor calculus or the general theory of manifolds (originally elaborated by Riemann), Einstein’s principle of equivalence, and his equations for the gravitational field. (Friedman 2001, pp. 37-8) The principle of equivalence and Einstein’s field equations require a curved space-time structure. Thus geometry “functions” as part of the constitutive framework for our experience. (Friedman 2001, p. 62) The constitutive *a priori* part establishes knowledge about experience and in this sense “they are *a priori* to or independent of experience.” (Friedman 2001, p. 73) The *a priori* physical principles (mechanical part) mediate between abstract mathematical tools and empirical phenomena. The function of this mechanical part is to create, in one mathematical-physical theory, the necessary link between two parts with different structures: abstract and empirical. But a legitimate question here would be what exactly this concept of the “empirical part” designates? For Einstein, the coordinating principles constitute a new framework for space, time, and motion (Friedman 2001, p. 107) and therefore all the empirical laws have constitutive meaning only in the framework created by *a priori* constitutive principles. Even the individuation of entities requires such conceptual frameworks.[10] That is necessary not only because

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[10] “The transcendental laws of nature” are, for Kant, the analogies of experience that determine the formal Nature. (See 2.3) From an EDWs perspective, the individuation of epistemologically different entites is given by the corresponding constitutive epistemologically different interactions. (See 3.1) Following Friedman, we can say that his constitutive a priori principles of scientific theories represent the “transcendental laws” of EDWs and these principle, as “formal experience”, are “ontological loaded” and constitute the “formal unity of experiantial object”. (Parvu 2004 in 2.3) An object is immanent determined through structural constraints or conditions (“the form of law-likenesss in general”). (Parvu 2004 in 2.3)

the entities that are in motion belong to a certain spatio-temporal framework, but also because "the knowledge of physical rigidity presupposes the knowledge of forces acting on the material constitutions of bodies." (Friedman 2001, p. 110) For describing these forces it is a necessary geometry. Essential for the EDWs perspective is Friedman's footnote on page 55 about Einstein, who adopted a perspective on the relationship between this necessary geometry and the entities as "practically rigid bodies" that ignores microphysical forces. (Friedman 2001, p. 114) The frame of reference for both theories is given by space, time, and motion but the theories refer to the same entities even if we can individuate empirical objects and their relationship only through such constitutional frameworks. In fact, the spatio-temporal structures of these theories are different mainly regarding their metric. Therefore, even if the forces that operate within each theory are different, these theories refer to the same EW, one theory being better than the other. Empirical tests – the perihelion of Mercury – supported Einstein's theory.

6.9. Some notions from quantum mechanics

At the end of his book, Friedman speculates about the application of his approach to quantum mechanics. (Friedman 2001, pp. 120–4) He suggests as a constitutive principle Bohr's correspondence principle which is strongly related to the idea of complementarity. Friedman's suggestion is that a better understanding of this principle would guide us to a better comprehension of how a mathematical framework (a non-commutative algebra of Hermetian operators on a Hilbert space) represents a system of physical entities. We will see in this section that the relationship between Bohr's correspondence principle (the relation between micro- and macro-particles) and the idea of complementarity (the relation between the wave and the particle) is indeed the key element in quantum mechanics. However, I will try to show that the superposition of wave and particle, the relationship between micro- and macro-objects, and Hilbert space which represents the superposition of several positions of a particle before measurement are the main interrelated problems imposed by the unicorn-world on quantum mechanics. Other related features give the conundrum of quantum mechanics. For instance, if the notions of complementarity and non-locality or even if certain empirical notions like "matter" and "energy" are only theoretically characterized, then quantum mechanics has great empirical application. The main problem consists in the unification of the conceptual framework of quantum mechanics with the "best contemporary space-time theories (both the special and general theories of relativity)." (Friedman 2001, p. 120) In a speculative manner, Friedman considers von Neumann's idea of classical logic's revision for understanding Bohr's complementarity as a viewpoint from a philosophical or meta-scientific level. However, he concludes by accepting that this idea has to be further verified. (Friedman 2001, pp. 122–3)

As we noticed above, the constitutive *a priori* principles "secure the empirical content of each theory". What does "empirical content" mean for general theory of relativity and quantum mechanics? The classical answer is that these theories refer to different *local* empirical aspects of the same world or different levels of reality. What do "different aspects of the world" or "levels of reality" mean? From an EDWs perspective, these questions are pseudo-questions because they involve the unicorn-world error. Notions like "aspects of the world" or "levels of reality" pose no problems to scientific theoreticians because their theories are "local". Friedman remains a prisoner of this scientific framework. In fact these notions are empty concepts, in the Kantian sense. Friedman is missing one more step to achieve the right approach – the EDWs perspective. He applies these conceptual frameworks to the same unicorn-world even if each scientific theory has certain relative *a priori* principles, a constitutive framework that "secures the empirical content of the theory"! (Friedman 2001, p. 83) For Friedman there is only one world, or more precisely one "external space with empirical possibilities." (Friedman 2001, p. 84)

I think that the EDWs perspective could be a better alternative for explaining Bohr's complementarity and superposition, entanglement, nonlocality and nonseparability. The Copenhagen standpoint on the measurement problem makes the same error, assuming the existence of the unicorn-world. In this interpretation, at one moment using one tool of observation a subject can observe the wave. When she changes the measurement apparatus for observing an electron, the wave function collapses at a certain location. The measurement apparatus produces this collapse. Bohr always emphasized that before the measurement of the position of an electron, it is meaningless to ask where that electron is. For Bohr, "the electron simply *does not have* a definitive position before the measurement is taken." (Greene 2004, p. 94) The error in this conception is that three objects are postulated in the same unicorn-world – the wave that collapses, the electron (microscopic object) and the measuring instrument (macroscopic object). To avoid this paradox, Bohr's stratagem was to negate the existence of the particle until that particle is observed, at which moment the wave function collapses into the electron at a certain location. Bohr's approach represents one extreme position. The other extreme position for the quantum measurement problem is the many-worlds approach (Everett, De Witt, Deutsch, etc. – see below). Between these extremes there are other approaches, but all these theories assume the existence of the unicorn-world.[11] For a general image of quantum mechanics, I will first introduce a few ideas from two views, one by a philosopher (Putnam 2005) and the other by a scientist (Penrose 2004), about the problems from quantum mechanics and their relationships with the EDWs perspective. Then I will end this section by analyzing recent papers written by other physicists on the same problematic notions of quantum mechanics. I am directly interested in analyzing how scientists constructed their alternatives as they tried to solve "quantum mysteries" within the unicorn-world paradigm.

Taking the "collapse" as a criterion, Putnam makes a classification of different interpretations of quantum mechanics.[12] (Putnam 2005) He replaces the "measurement problem" from quantum mechanics with the "collapse problem". For him, the question is "Do we or don't we need to postulate a 'collapse' and if we do assume a 'collapse', what should we say about it?"[13]

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[11] There are various approaches to the quantum measurements problem but the main approaches are the Copenhagen interpretation (with Bohr, the leader), the many-worlds approach (Everett, Deutch, etc.), Bohm's approach, and Girardi, Rimini & Weber's approach. (See Putnam 2005; Greene 2004) Trying to save the phenomena (the empirical measurements), different researchers introduced Ptolemaic epicycles in constructing various alternatives to the quantum mechanical-world, but working within the unicorn-world their approaches are wrong. We know from the history of human thinking that human imagination has played a powerful role in creating ardent arguments for fanciful Ptolemaic epicycles.

[12] I will introduce some of Putnam's ideas about his classification during the whole section.

[13] Everybody knows that quantum mechanics has incredible empirical results in its application. However, Greene mentions that "*After more than seven decades, no one understands how or even whether the collapse of a probability wave really happens.*" (Greene 2004, p. 119; his italics!) Or Davies: "Although quantum mechanics is a breathtakingly successful theory in its application, its interpretation remains confused and hotly debated." (Davies 2006, p. 290) Evidently, within the unicorn-world, nobody could explain what happens with the wave during measurement of the position of an electron.

(Putnam 2005, p. 624) The collapse problem refers to the relationship between waves and microparticles or between micro- and macro-observables. From the EDWs perspective, this kind of interaction seems to be a "Ptolemaic epicycle" of the unicorn-world. We can see these interpretations of quantum mechanics as paradigmatic Ptolemaic epicycles arising from a pseudo-problem. Putnam is right in saying that the interpretation of quantum mechanics is "a philosophical problem in detail"[14] but he is wrong when claims that "scientific realism" is the premise of his discussion. Scientific realism is "scientific" unicorn-world. The rejection of the unicorn-world can be done only from a philosophical meta-paradigm and this is the EDWs perspective.

As we will see in this section, all the authors offer various alternatives to the same problems. After presenting various interpretations to quantum mechanics, using "collapse" as a criterion, Putnam makes a classification of the main alternatives (the Von Neumann, many-worlds, Bohm and Ghirardi-Rimini-Weber interpretations). As I mentioned above, one of the main problems in quantum mechanics is the relationship between micro- and macro-particles. Putnam reinterprets the Copenhagen interpretation in the following sense:

> [T]he macro-observables have sharp values at all times… while micro-observables have sharp values only when measured, where measurement is to be defined as a certain kind of interaction between

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[14] Initially, I started to construct the EDWs perspective for solving the mind-body problem. In the same time, I keep in my mind the idea of applying my perspective to some problems from cognitive science and physics (quantum mechanics). However, for applying my perspective, for instance, to the problem of wave-corpuscul duality, I follow the strategy of solving this problem from a completely different area and not attacking it directly from within the physics. The majority of physicists and philosophers have attacked directly this problem but their strategy involved the incarceration of their approaches within the framework of the unicorn-world.

> a micro-observable and the macro-observable. (Putnam 1965, pp. 149–55 in 2005, pp. 624–5)
>
> And I said (Putnam [1965], p. 157) that the remaining problem for quantum mechanics was to say what is so special about macro-observable: 'The result we wish is that although micro-observables do not necessarily have definite numerical values at all times, macro-observables do.' (Putnam 2005, p. 625)

Later he wrote that the first alternative in his classification (Von Neumann − "collapse" produced by something external) presupposes the collapse as "something external to the system and not subject to superposition" and this case is an unsolved problem.

> 'Macro-observables' is not the sort of term that can be an irreducible primitive in an ultimate physical theory, so I called for some future extension of quantum mechanics that would explain why macro-observable do not go into such states as 1/√2(Live Cat) + 1/√2(Dead Cat). (Putnam, p. 628)

Let me analyze this paragraph in detail. From an EDWs perspective, I consider that, within the unicorn-world, scientists are forced to introduce the collapse of the wave. Otherwise, they could not accept that two things simultaneously exist at the same place or the same thing has two positions (one being observed or measured by us) within the unicorn-world. Evidently, without the difference between epistemological-ontological and organizational thresholds, the "irreducible primitives in an ultimate physical theory" (that would be the so-called "theory of everything") could not be macro-objects. In other words, the planets, for instance, could not be irreducible primitives! Therefore, scientists have been working to find the gravitons that are the cause of gravity! (About gravitons, see below.) From my perspective, the planets are indeed irreducible primitives because, according to Einstein's general theory of relativity, gravity is caused by massive objects that warp the surrounding space, gravity being a property of space. As we saw above, ignoring microphysical forces, Einstein adopted a perspective on the relationship between this necessary geometry and the entities as "practically rigid bodies". (Friedman 2001, p. 114) Within EDWs, we do not "ignore any forces" and each EW has its own irreducible primitives! Planets and macro-objects are the irreducible primitives in the macro-EW and microparticles are irreducible primitives in the micro-EW. The "theory of everything" is the "theory of the unicorn-world"! (About "superposition" and the many-worlds interpretation from Putnam's paragraph, see below.)

Putnam concludes that are three alternatives: Bohm's or Ghirardi-Rimini-Weber's which, is the correct interpretation, or Pitowski's alternative (a commentator of Putnam's paper to a conference, as Putnam indicates), which indicates that we will "fail to find a scientific realist interpretation which is acceptable". (p. 631) (As we will see below, Bohm's interpretation is the closest alternative to the EDWs perspective. However, his alternative is also constructed within the unicorn-world.) From an EDWs perspective, it is indeed impossible to find a "scientific realist interpretation" of quantum mechanics within the unicorn-world. Replying to Putnam's presentation, Pitowski said "You are saying that before we can interpret quantum mechanics we have to *change* it." (Putnam 2005, p. 632) Putnam's answer was that Von Neumann

> .. *already* changed quantum mechanics, certainly from Bohr's point of view. *All* interpretations of quantum mechanics are in a sense 'changes' of quantum mechanics, because it is an *incomplete theory*–one cannot 'regiment' it, formalize it in standard logical notation … *unless* you add an 'interpretation'. (p. 632)

From my perspective, any interpretation of quantum mechanics is an "*incomplete theory*" within the unicorn-world and the search for "hidden variables" (Ptolemaic epicycles) is useless.

Penrose has his own interpretation of the existence of the quantum "level". He considers that if we believe that "any one thing in the quantum formalism is "actually" real for a quantum system then I think that it has to be the wave function (or state vector) that describes quantum reality". The momentum state is:

> (i)n no way localized like an ordinary particle. It is spread out evenly over the whole of the universe.… What has happened to our ordinary picture of a particle, as something (at least approximately) localized at a single point? Well we might say that a momentum state is only an idealization. We can still get away with having a very well-defined (if not perfectly precisely defined) momentum if we pass to somewhat similar states referred to as "wave packets". These are given by the wave function that peaks sharply in magnitude at some position and are "almost" eigenfunctions of momentum, in an appropriate sense. (Penrose 2004, p. 508)

Evidently, Penrose is logically constrained by the existence of the one world, the unicorn-world, to eliminate the existence of particles. For Penrose, "the question of 'reality' must be addressed in quantum mechanics" and, accepting that the quantum formalism applies to the whole of physics, then "if there is no quantum reality, there can be no reality at any level". Therefore we have to accept the existence of the quantum level. His opinion is that we cannot deny physical reality completely but we need a "notion of physical reality, even if only a provisional or approximate one, for without it our objective universe, and thence the whole of science, simply evaporates before our contemplative gaze!" (Penrose 2004, p. 508) Within the unicorn-world and, from my viewpoint, trying to avoid

Kant's criticism against dogmatism ("empty concepts"), Penrose is forced to reduce all levels of existence to the one level, the quantum level. From the EDWs perspective if we reduce all levels to the quantum level, then it is not only "our objective universe" and the whole of science that evaporates, but also each of us, i.e., each "I" that *corresponds* to each physical human being. We have to remember that through EDWs we have the conversion of ontology into hyperontology given by the constitutive epistemologically different interactions.

Changing the ordinary and eternal notion of the "world", the extended perspective of the observer with its hyperverse is beyond all approaches to quantum mechanics. Using different macro tools of observation, a human subject can observe, at different times, the electron and the wave that belong to EDWs. This idea is more clearly appreciated if we imagine a person who has no senses, except that she was born with an electron microscope instead of eyes. For the "girl with electron microscope instead of eyes", micro-particles and their relationships exist but not tables, electron microscopes or planets. That much-wanted interaction between micro- and macro-particles exists only in the unicorn-world! It is an error to consider that the wave, the electron, and the macro tool of observation are in the same unicorn-world. The wave and the electron exist both at the same time, but in EDWs. In fact, the electron from one EW *corresponds* to the wave from another. The collapse of the wave represents the process through which the observer, using different tools of observation, makes the switch from one EW to another.

The EDWs perspective offers a simple explanation of the infamous property of non-locality. For instance, let us take the example of measuring the spin or polarization of two particles that both belong to EW_1. These particles that initially represent one system are later *separated*. According to the Copenhagen interpretation, the spin of particle 1 has no value until it is measured. Before measurement, there is a superposition of various states of that particle produced by the "unitary" evolution of the wave function that corresponds to that particle. The act of observing produces the collapse of the wave function and the observer sees the particle in one definite classical state. The measurement of the spin of the first particle (let us say, "up" state) that produced a collapse of the wave function has an instantaneous effect on the spin of the second particle ("down" state). Under the Copenhagen interpretation, this instantaneous effect represents action-at-a-distance or faster than light transmission that, according to Einstein's special theory of relativity, is not possible. Einstein and his colleagues claimed that quantum mechanics is incomplete because it does not take into account certain "hidden variables" of reality. On the other side, Bell's inequality assumes Einstein's condition of locality as true. The experiments that involve the measurement of correlated photons (their polarization is detected) show that Bell's inequality is violated. The consequence of these experiments is that the system of those two particles has a non-locality property. According to the EDWs perspective, those two particles are in EW_1 (the micro- or quantum-EW). I strongly emphasize here that the space of this EW is the whole of cosmic space! In this space, micro-particles interact/"observe" other micro-particles and nothing else. In EW_1, the property of the non-locality of those two particles does not exist.[15] The

[15] Hüttemann (2005) believes that the synchronic microexplanation (the explanation of a compound system in terms of its parts) fails just because of quantum entanglement. (p. 117) He mentions that "The impossibility of attaining a synchronic microexplanation in such cases is thus implied by the formalism of quantum mechanics." (p. 117) I highlight that the formalism of quantum mechanics was created for states and processes within the unicorn-world framework!

"non-locality" (that is in fact the continuity) is a property of a wave that belongs to EW_2. Again, I strongly underline that the space of this EW_2 is also the whole of cosmic space! The difference between two EDWs is given not by their spatio-temporal frameworks (that is the same with different metrics for all EDWs except the mind-EW) but by their entities and the interactions among them.

It is completely wrong to assign the property of non-locality to the relation between objects that belong to EW_1. All we can say is that the wave *corresponds* to the system of particles. Both Einstein *et al* and those supporting the Copenhagen interpretation were mistaken because they introduced epistemological properties (that belong only to EDWs) into the unicorn-world. Thus, the so-called "hidden variables" and non-locality or non-separability introduced to "save the phenomena" of the unicorn-world are empty concepts! Only the unicorn-world and a one-to-many relationship have forced us to even consider von Neumann's idea of classical logic's revision (a pseudo-alternative among others) for understanding Bohr's complementarity. (See above Friedman 2001, pp. 122–3) In their famous paper, Einstein, Podolsky and Rosen concluded that quantum mechanics is an "incomplete" description of reality. In mixing two EDWs, nothing can be "complete".

From an EWDs perspective, we can explain the "non-locality" of the microparticles. The main idea is that, following Einstein's idea above of the rigidity objects, we have to accept that the entities of each EW are "rigid", i.e., any entity − except the "I" − exists only at its "surface". Epistemologically different interactions represent the synthetisations of the manifolds into epistemologically different entities. However, the difference is that, in analyzing the macro-objects, we do not ignore the micro-forces because these two kinds of particles belong to EDWs. For instance, the planets, the waves and the microparticles are "rigid" objects. Their interactions determined their own existences only at their "surface"! The quantum states are all "rigid" objects. A quantum wave and a quantum particle are rigid entities. The "non-locality" of two electrons *corresponds* in fact to the "rigidity" of a wave. The rigidity means the indivisibility of the wave (that belong to the EW_2) and the fact that the wave is not composed of (but corresponds to) various microparticles (that belong to the EW_1). The movement of an electron corresponds to the movement of the wave. In the EW_1, action upon one electron does not act simultaneously on the other electron, because in any EW there is no signal that passes the speed of light. But acting on an electron, we act on the corresponding waves, even if we do not observe this process. Only the "rigidity" (indivisibility) of the wave (that belongs to EW_2) means that the signal takes place simultaneously at both particles! However, I strongly emphasize that the EDWs are not "parallel worlds" or "many-worlds" or "multiverse" (quantum mechanics or hyperspace). The idea of the hyperverse is completely different to these notions from theoretical physics. (See point 4 below.)

For a better view of this problem, we can make an analogy. I mention that this analogy does not fit with the physical nature of the objects involved in it.[16] Imagine two persons, X and Y, using two electronic microscopes and each of them observing an electron from alternative ends of a long

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[16] In this analogy, we have to consider the stick as a rigid object and to ignore the microparticles and their forces. However, the nature of the stick and the wave are completely different. Contrary to the nature of the stick, a wave is not "composed" of organizationally different parts, nor does it correspond to epistemologically different entities. I hope this weak analogy can help the reader to understand the relationship between the wave and the particles.

stick at the same time. Evidently, they both observe only micro-particles but not the stick. A third person, Z, using another stick, pushes the first stick at one end.[17] Because of this movement, X and Y observe new motions of their electrons at the same time. They inform each other when this process takes place. The process is repeated many times. Thus X and Y decide that these particular motions of both electrons at the same time are not the result of coincidence. However, A believes that there are some hidden variables of the reality while B thinks of a kind of non-separability between those two electrons. For supporting his approach, B introduces the violation of Bell's inequality. Replacing the stick with a wave, we have the classical case of the violation of Bell's inequality that, according to Penrose, proved the quantum *entanglements* between physically separated particles. (Penrose 2004, p. 584) The wave (that belongs to EW_2), as an indivisible, "rigid" entity, corresponds to those two electrons (that belong to EW_1). Actions on a part of the wave act simultaneously on the whole wave. The entanglement between two separated particles corresponds to the *individuality, or unity* or "*rigidity*" of the wave.

What is the relation between general theory of relativity and quantum mechanics from the EDWs perspective? It seems that the EDWs perspective can reveal that quantum mechanics (describing those three fundamental forces acting on the microscopic scale) and general theory of relativity (describing gravitational force among large-scale objects/structures like planets, galaxies, etc.) are incompatible. Gravity is caused by massive objects that warp the surrounding space. Thus, gravity

[17] Instead of using a second stick, being at the middle of the first stick the third person can rotate it. The first two persons would observe at the same time a change in the position of the orbits of both electrons.

is a property of space. The search for gravitons, the microparticles that cause the gravity, is meaningless from an EDWs perspective. If we ignore the constitutive principles of both theories (that reflect, for us, the form of the epistemologically different interactions among the epistemologically different entities), we can think that the mass of a planet is the sum of the corresponding micro-particles' masses, and then we can *think* that the gravity of the planet corresponds to the sum of all gravities produced by all those micro-particles (or by gravitons). Nevertheless, we would use empty notions in Kantian sense.[18] More than this, we cannot even think that a wave is the sum of "its" microparticles. As we saw above, in an EW, a wave is indivisible. Each theory has different constitutive principles that "secure its empirical content" (Friedman). (Or Bohr's principle of complementarity secures the empirical content of two EDWs.) In this case, the constitutive principles of each theory (or Bohr's principle of complementarity) *individuate* epistemologically different entities (waves, micro- and macro-objects) that belong to EDWs. Each planet constitutively interacts with other planets; in the other EW, each electron constitutively interacts with other micro-particles. Trying to relate general theory of relativity and quantum mechanics (that means to put planets and electrons in the same EW) is impossible because the constitutive principles corresponding to each theory are totally different and each

[18] Nevertheless, in the Kantian framework this concept would be an abstract concept without any "empirical meaningfulness". I use Hanna's expression. Explaining the difference between objective validity and objective reality in Kant's philosophy, Hanna comments on A239/B298-9 and A248/B305, writing that "empty concepts cannot be meaningfully applied by us either to noumenal objects or to objects of our sensory intuition, and in that sense they are ''impossible'' – that is, impossible to *use*." (Hanna 2001, pp. 90-1) The "spontaneity" of a planet corresponds to an amalgam of microparticles but is not "composed" of those microparticles.

theory explains its own EW.[19] It is also true that, because of Bohr's principle of complementarity, we cannot consider that the microparticles and the waves belong to the same EW.

Einstein transformed an empirical law into a constitutive principle. From *our* point of view, the conditions of observation are elevated to the status of constitutive principles. However, they are constitutive because they help us in *revealing* the already existing *EDWs*. Within the *hyperverse*, the conditions of observation are replaced by conditions of constitutive interaction among entities that belong to EDWs. For Carnap, Goodman, Quine and Putnam (and analytic philosophy, in general) the question "What really exists?" has no sense, it is a pseudo-question.[20] Putnam assumes that the existence of the "thing-in-itself" requires a view from an "Archimedean point" that is a view corresponding to an ideal or impersonal knowledge. However, he claims that realism – which assumes basically one unique world – is not incompatible with conceptual relativism. (Putnam 1987, p. 17)

In support of my approach, in this section I will continue analyzing certain notions and alternatives from physics. I want

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[19] Maudlin (1996) examines in detail why the theory of everything (the grand unified theory-electroweak force unified with strong nuclear force- unified with gravity) is a myth. "The electroweak force is to be unified with the strong nuclear force by a *grand unified theory* (GUT), and then, in the final step, the GUT will somehow be unified with gravity in a *theory of everything* (TOE). This image of the future course of physical theory has become so pervasive as to rank almost as dogma." (p. 129) Without presenting any of his arguments, I insert here Maudlin's conclusion: "At this point, there is little hard evidence for the kind of structure postulated by the GUTs and even less for the TOEs." (p. 143)

[20] Ironically, both Kant's accusation of dogmatism in using empty concepts and Einstein's reason (and Reichenbach's) for rejecting Poincare's conventionalism are available for them too.

to show, in detail, that working within the unicorn-world, the physicists have not been able to explain certain "spooky" problems or "mysteries" in quantum mechanics in the last 100 years.[21] With the existence of EDWs, we can clarify or reject these "mysteries" and (thought) experiments from quantum mechanics. However, I leave the specialists from (philosophy of) physics to construct, from an EDWs perspective, a new framework to quantum mechanics and its relationship with Einstein's theory of relativity, and other notions from physics and cosmology.

(1) Young's experiment and Wheelers' delayed-choice experiment (1980)

We have to remember that before, during and after our measurements of the whole experiment what there is is the hyperverse and not the unicorn-world. In the hyperverse, there are always waves and particles. Wave and particle are in EDWs. Our observation depends on our tool of observation from that moment. We can now understand the interference pattern of waves "produced" by electrons. Within the unicorn-world, we could not understand why we observe interference on a screen if we fire electrons. In fact, even if we fire electrons (that belong to one EW) to the double-slit apparatus in Young's two-slit experiment), the screen measures the interference of two waves (that belong to another EW). However, when one slit is closed, the screen measures only the electrons but not the wave. In this case, the very troubling question in quantum mechanics of the last century, "Does this electron know whether the other slit is open or closed?" is a pseudo-question. In fact, the wave passes through both "slits"

[21] Regarding the "quantum mysteries", see the article "100 years of quantum mysteries" by Tegmark and Wheeler (2001).

and the electron through only one "slit".[22] There is only a correspondence between the wave and the electron.

J. A. Wheeler, the famous theoretical physicist, embraces Hume's scepticism. Davies says of Wheeler that "He summed up his position with a typical Wheelerism: 'There is no law other than the law there is no law.'" (Davies 2004, p. 6; 2006, p. 267) From one viewpoint, this law can be applied to the universe, the unicorn-world, but not to each EW. As a reply to Hume's scepticism, we can say that for us the existence (over time) of epistemologically different entities in EWDs presupposes the existence of epistemologically different laws (interactions). If we deny the existence of all these laws, we deny our own existence. However, from another viewpoint, Wheeler is correct. He denies the existence of Platonic eternal laws of the "universe". These laws are the result of the congealing of the universe after the Big Bang. More than this, the laws are not fixed (exactly the same) for ever for all various forms of the world.[23] (Davies 2006, p. 267) In this sense, one of Wheeler's main concepts is the *mutability* of laws.

Following Wheeler, Davies emphasizes the role of the experimenter (observer) in determining the nature of quantum reality in Young's experiment. Davies asks "When, exactly, did nature 'decide' to opt for wave or particle?" (Davies, 2006) "Nature" does not decide only because we are the observers and "nature", i.e., the unicorn-world, does not exist! Although available for the majority of physicists, Davies' inquiry is

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[22] Evidently, the notion of "slit" is used here only from a pragmatic reason. For instance, an electron does not pass through a slit but through an amalgam of microparticles that *corresponds* to that slit.

[23] "Law without law. … It is preposterous to think of the laws of physics as installed by a Swiss watchmaker to endure from everlasting to everlasting when we know that the universe began with a big bang. The laws must have come into being." (Wheeler 1979 in Dyson 2004, p. 73)

possible only within the unicorn-world. Someone can talk about the "decision of nature" only when nature is the unicorn-world!

The main idea of Wheelers' delayed-choice experiment is that the past depends on the future. (Greene 2004, p. 186) In the split-beam experiment a new photon detector is inserted immediately after the beam splitter. (p. 187) When the new detector is switched off the photons produce interference patterns on a photographic screen. When the new detector is switched on, it indicates which path each photon travels. "Such 'which-path' information, as it's called, compels the photon to act like a particle, so the wavelike interference pattern is no longer generated." (pp. 187-8) If the distance between the beam splitter and the new detector is much larger, "the new weirdness comes from the fact that the which-path measurement takes place long *after* the photon had to 'decide' at the beam splitter whether to act as a wave and travel both paths or to act as a particle and travel only one." (Greene 2004, p. 188) The "anomaly" seems to be that the which-path measurement influences the past, i.e., the status of whatever entity passed through the beam splitter. Again, within the unicorn-world, we can find many anomalies! It is quite natural to consider that the wave and the particle cannot both be at the same place at the same time. In fact, the photon does not "decide" its situation before passing the slit at all! Depending on our conditions of measurement, we can observe either the wave or the particle that exists in the EDWs before our observations take place.

Davies presents Wheeler's experiment in its original format. After the two slits, there is a "Venetian blind" followed by a pair of telescopes, each directed at one of these slits. In Davies' words, the conclusion of the experiment is as follows:

> The experimenter can delay the choice – wave or particles – right up to the moment the photon arrives at the Venetian blind. The mystery

> we then have to confront is *when* the photon adopted the form – wave or particle – chosen by the experimenter. How could a photon know, in advance of the measurement, whether the blind would be opened by the experimenter or not? Does it defer a decision – wave or particle – right up until the experimenter makes the choice? That can't be quite right, because if the photon is a particle it passes through only one slit, whereas if it is a wave it passes through both. (pp. 278–9)

Within the unicorn-world, the majority of scientists have been disturbed by such questions. To explain this strange situation, Davies considers that

> ... we have to regard the photon as in some sense less than real in the absence of an observation. I don't wish to give the impression that the photon doesn't exist at earlier times; the point is that, in the absence of an actual observation or measurement process, its state – which can be precisely specified by quantum mechanics – does not define a wave or particle nature or even a "bit of both". The particle/wave designations come only in the context of an actual experiment. (p. 280)

More than this, he emphasizes that the action of the experimenter influences the past.

It has been compulsory for researchers from the field of physics to believe that the which-path measurement influences the past. However, there are no such influences at all, but only a mixture of measurements that take place within EDWs: the EW of the wave and that of the particle. Within the unicorn-world, Davies is right in writing that before our observation, we cannot "define a wave or particle nature or even a 'bit of both'" (p. 280) and "we have to regard the photon as in some sense less than real in the absence of an observation". Again, within one unique world, we cannot define and accept the existence of both entities, the wave and the particle. This idea is related to parallel universes or multiverse.

In order to avoid such kind of "possibility" the proponents of the multiverse introduced the notion of "parallel universes". Deutsch believes that single-particle interference experiments illustrate that the multiverse (i.e., parallel universes) exists. (Deutsch 1997, p. 96) To explain Young's experiment, Deutsch introduces the distinction between "tangible or real" and "shadow" photons[24] that exist in parallel universes. These "shadow" photons are "affected by tangible particles only through interference phenomena". (p. 405) In what sense? In the split-beam experiment, before the single photon enters the interferometer, the photon and its "shadow" travel the same path, so the universes are identical. However, after the tangible photon passes through a special mirror, the "initially identical universes become differentiated". (p. 205) Then each photon (one tangible and one shadow from parallel universes) bounces off the next ordinary mirror and finally both photons simultaneously reach the semi-silvered mirror. So, "... the detection of interference between any two universes requires an interaction to take place between all the particles whose position and other attributes are not identical in the two universes." (p. 49)

I want to emphasize that we have to avoid confusing EDWs with parallel universes. To explain the split-beam experiment, we do not need any "shadow" particles belonging to parallel universes. We can see that Deutsch (and other physicists who follow Everett) are working within the unicorn-world even if they "create" many worlds or parallel universes. For Deutsch, these parallel universes exist at the same time in the unicorn-world. As we saw above, we explained this experiment considering that the wave and the particle belong to EDWs not to parallel universes.

[24] Deutsch considers that all the other micro-particles (electrons, neutrons, etc.) have "shadow" micro-particles that exist in parallel universes.

Wheeler extended this delayed-choice experiment to the whole universe. Almost like a science-fiction story, Wheeler's main idea is that we, as "*participators* in shaping physical reality", influence the past that created us![25] There is a loop of cosmos→life→mind→cosmos. (Davies, p. 281 or Greene 2004) He believes that "only a universe containing observer-participators could exist – a version of the strong anthropic principle."[26] (Davies, 291) Regarding wave-particle duality, Wheeler considers that the human observer "*participates* in deciding whether light is made up of waves or particles". (Davies 2004, p. 9) From an EDWs perspective, we replace "observing" with "interacting" and can say that an EW exists only where there are epistemological-ontological interactions. As observers or participants, we are just particular entities among others from the same EW and nothing else. We just observe entities from other EDWs and this is the reason why Wheeler's anthropic principle becomes meaningless.

(2) Feynman's "sum over histories" framework

This notion supposed that, in two slits experiment, it is possible that an electron travels through both slits before reaching the screen. Therefore, we have to take into account all the possible histories for any individual electron.

[25] "Observer-participancy in turn gives what we call tangible reality to the universe… Of all strange features of the universe, none are stranger than these: time is transcendent, laws are mutable, and observer-participancy matters." (Wheeler 1979 in Dyson 2004, p. 73)

[26] "Wheeler would make all physical law dependent on the participation of observers." (Dyson 2004, p. 72) Following Bohr, Wheeler is very close to Kant's paradigm! However, I consider that all physical laws depend on the "participations" (interactions, in EDWs' framework) of epistemologically different entities, not only on the participation of human observers. We are just a class of entities among epistemologically different entities!

"Feynman showed that each such history would contribute to the probability that their common outcome would be realized, and if these contributions were correctly added together, the result would agree with the total probability predicted by quantum mechanics." (Greene 2004, p. 180) Again, because of the unicorn-world, Feynman can introduce a radical notion, the "sum over histories", against the classical view. The beam-splitter experiment supports such an abstract, mathematical, picture of "reality".[27] It is understandable that if a beam of light is spilt into two beams and then, with the help of two mirrors, the beams are detected by a single detector, we can see the interference of those beams. When an individual photon is fired toward the splitter, the result is the same. But the photon cannot be split as it is possible for a wave. Then what produces the interference? Borrowing this property of splitting from waves, some physicists introduced different notions. We saw above that, decades after Feynman, Deutsch uses an empty notion of "shadow electrons" to explain the interference. For Feynman, we need to combine those two possible histories "in determining the probability that a photon will hit the screen at one particular point or another." (Green, p. 181) In fact, each particle from EW1 has a corresponding wave in another epistemological world EW2. When the apparatus fired the photon, we measured that particle from EW1 that corresponds to "its" wave from EW2. The screen measures the interference of the wave in EW2 that corresponds to the particle from EW1. At every time a particle has a corresponding wave but they are in EDWs.

[27] "Although we have described the merging of possible histories in the context of only a couple of specific examples, this way of thinking about quantum mechanics is general." (Greene, p. 181)

(3) Heisenberg's uncertainty principle

This notion is constructed within the unicorn-world. It tells us that we cannot measure the position and the velocity of a particle at the same time. "Uncertainty is built into the wave structure of quantum mechanics and exists whether or not we carry out some clumsy measurement."[28] (Greene, p. 99) More exactly, I think that this principle is based on the relationship between a wave and a particle and therefore there is a mixture between two EDWs. Measuring the location of an electron depends on the magnitude of "its" wave function. For instance, if a wave has a uniform succession of peaks and troughs then the particle has a definite velocity. Nevertheless, its position is completely undetermined. The probability of a particle's position is to be anywhere. From an EDWs perspective, there is a mixture between two EDWs. The particle and the wave are in EDWs and this is the reason we need to use probability calculus for relating the correspondence between the wave and the particle. From this viewpoint, the EDWs perspective is quite close to Bohm's theory that follows the earlier "pilot wave" interpretation of De Broglie. Putnam mentions that this approach is the classical example of hidden variable theory. (Putnam 2005, p. 622) Within this approach, particles have definite positions and momenta at all times. The particles have continuous trajectories determined by a "velocity field" and the initial positions and momenta of the particles are distributed randomly. We can identify the positions of these particles only using quantum mechanical probability. (Putnam, p. 622) In his paper from the 1960's, (the paper from 2005 is a new version of this old article), quoting his teacher, Reichenbach (1944), Putnam indicates some "causal anomalies" (Bohm's potential)

[28] Embracing a deterministic universe view, Einstein claims that "I can't believe that God plays dice." (Tegmark and Wheeler 2001, p. 71)

in Bohm's theory. (pp. 622–3) Because these causal anomalies (the non-locality) really occur, Putnam considers in his paper from 2005 that these anomalies cannot be rejected. Bohm introduced "potential" or "field" to explain the non-locality. In Maudlin's interpretation, this notion can be a kind of *mathematical representative of non-locality*, so we do not have any reason to reject this theory. (Putnam, p. 623) As we saw above, from an EDWs perspective, Bohm's "potential" that represents the non-locality of particles from EW_1 is in fact given by the wave that belongs to EW_2. Bohm is right in considering that the particles have positions and momenta all the time and continuous trajectories. As we will see below, the superposition of the wave and the particles in the unicorn-world has created this non-locality.

(4) Schrödinger's cat, decoherence and the multiverse approach

Bohr believed that the laws of the micro-cosmos and the macro-cosmos are different because the sizes of their entities are different.[29] (Greene 2004, p. 2003) In this context, Greene's question is "Where exactly is this border?" Placing both kinds of micro and macro-particles within the same world, you cannot answer to this question. However, decoherence is the "bridge between the quantum physics of the small and the classical of the not-small by suppressing interference – that is, by diminishing sharply the core difference between quantum and classical probabilities." (Greene 2004, p. 209) The initiator of decoherence is Zeh (1970) followed by Joos, Zurek, etc. Before

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[29] I change "Bohr's view that quantum mechanics and classical physics are complementray aspects of nature" (Dyson 20004, p. 76) into the claim that quantum mechanics and classical physics are descriptions of the EDWs just because "nature" does not exist!

our observation, there is a superposition of various states for a particle (let us say, the spin of a particle is "up" and "down" simultaneously). So there is a quantum uncertainty regarding the spin of that particle.

Tegmark and Wheeler explain how "the quantum gets classical". (Tegmark and Wheeler 2001, p. 73) In their example I replace the quantum card with a microparticle, its spin being either "up" or "down". Quantum uncertainty is given by the superposition of the position of two states ("up" and "down") of a particle and their corresponding wave. Schrödinger's equation predicts this coherent superposition that is mathematically illustrated by a density matrix. The wave function of the particle corresponds to a density matrix with four peaks (two peaks indicate 50% probability of the particle to be either "up" or "down", the other two peaks indicate the interference of these two states). In this state, "[t]he quantum state is still coherent". (Tegmark and Wheeler 2001, p. 73) According to Tegmark and Wheeler, quantum uncertainty is different from the uncertainty of classical probability, for instance a coin toss. The density matrix of a coin toss has only the first two peaks that represent the fact that the coin is *either* "tails" *or* "heads", but we have not looked at it yet. There are no peaks for the interference process. The tiniest interaction with the environment transforms the coherent density matrix into the "classical" density matrix with only two peaks that represent either "tails" or "heads". The interference pattern of those two states (”up" or "down") or the "coherent" state accomplishes decoherence. "The Schrödinger equation controls the entire process." (p. 73) The standard interpretation is that the measurement process means an interaction between the observer and the observed particle. At this moment, the person cannot perceive this superposition because the interference pattern accomplishes decoherence. The things that we encounter in our daily life are not isolated but they interact with other entities. For example, the book that I read now is struck by photons and air molecules. Those micro-particles disturb the "coherence" of the big objects' wavefunction and thus interference effects are not possible. (Greene 2004, p. 210) "Once environmental decoherence blurs a wavefunction, the exotic nature of quantum probabilities melts into the more familiar probabilities of day-to-day." (p. 210) Because of decoherence, Schrödinger's cat cannot be both dead and live! However, Greene and other physicists are not content with this alternative, their question being "how one outcome 'wins' and where the many other possibilities 'go' when that actually happens." (Greene 2004, p. 212) Since the debate between Newton and Leibniz, the question "What really exists, the particle or the wave?" has not received a decisive answer. And this situation has been quite normal because of the unicorn-world framework.

From an EDWs perspective, I strongly emphasize that the "superposition" of various states of a particle before measurement is a mistake created by extending the "superposition" of wave and particle. Putnam reminds us that Schrödinger's equation shows us a state given by the "vector sum" or "superposition" of a vector that represents both states of a particle (in my example, "up and "down") mathematically expressed by an abstract space called "Hilbert space".

> And Problem One is what are we to make of a state which is a superposition of two states like this, two states in which a macro-observable has different values? ... If we never observe such a state, why don't we? All interpretations of quantum mechanics are required to give an answer to that question. (Putnam 2005, p. 620)

Because the wave and the particle belong to EDWs, there is no superposition of them and, consequently, no superposition of various states of that particle. Working within the unicorn-world, the physicists in the 1920's created the "unobservable" superposition of two states of a particle before our observation.[30] Putnam relates the above Problem One with Problem Two, "the problem of Einstein's bed", the existence of superposition of states in which macro-observables have different values. Einstein's words are: "Look, I don't believe that when I am not in my bedroom my bed spreads out all over the room, and whenever I open the door and come in it jumps into the corner." (Einstein in Putnam, p. 624) It means that Einstein rejected Von Neumann's "collapse" hypothesis.

In this context, we return to Young's experiment. From my perspective, we do not have any superposition of two states of a particle. Nevertheless, there is a superposition of two waves. In Young's experiment, the wave crosses those two slits and produces the interference of two waves. As we saw at point (1), these two waves belong to the EW_2. The screen "measures" the interference of the two waves. The particle that corresponds to the wave before the two-slit screen enters only through one slit, but not both. There is no interference of two particles, since we have only one particle. There are no "shadow" particles or superposition of two states of a particle at all. The density matrix of a "coherent superposition" after the double-slits screen can represent the superposition of the two waves but not the superposition of two states of a particle. In the Copenhagen interpretation, the measurement produces the collapses of the wave function in violation of the Schrödinger equation. (Tegmark and Wheeler 2001, p. 71) In both Bohm's and "many worlds" interpretations there is no collapse: the state evolves

[30] As we saw above, within Copenhagen interpretation and from other physicists like Wheeler, the role of the observer became essential in explaining the quantum world. The observer creates the "world". From an EDWs perspective, this role is rejected.

following the Schrödinger equation. From my perspective, there is no collapse of the wave function, either, but the wave and the particle belong to EDWs and not to parallel universes (for tangible and "shadow" particles).

Let me analyze in detail one recent article written by Zeh about the nature of the wave function. (Zeh 2004) This analysis can be extended to the majority of the papers from quantum mechanics. Following Wheeler ("it" means a physical reality and "bit" is a kind of information – (Zeh 2004)), the title of his article offers us the topic: "[T]he wave function: it or bit?" Because of the unicorn-world, in Wheeler's framework we can see an amazing turn in physics (that is usually characteristic to some philosophers): the use of metaphor. Wheeler is forced to introduce a metaphorical dualism: physical reality and information. This metaphor is just to avoid the contradiction created by the existence of two entities within the same world and the same spatio-temporal framework. Zeh has no other alternative.

The introduction of Zeh's paper consists of very short "historical remarks about the wave function". (Zeh 2004, pp. 104–6) The inventor of wave function, Schrödinger, believed that it described electrons.[31] Born introduced the probability interpretation that became, under de Broglie's duality of wave and particle, the association of the wave with a particle. Pauli, following Heisenberg's uncertainty relations, proposed the wave function as a "probability amplitude" for the

[31] "What was this quantity, the 'wave function', that Schrödinger's equation described? This central puzzle remains a potent and controversial issue to this day... Wave functions could describe combinations of different states, so-called superpositions. For example, an electron could be in a superposition of several different locations." (Tegmark and Wheeler 2001, p. 71) We saw that this "superposition" of several locations of an electron is created by human imagination based on the superposition of waves that are recorded by the screen in Young's two-slits experiment.

positions or momenta of the particle. Zeh supports Pauli's idea that "the appearance of a definite position of an electron during an observation is a *creation* outside the laws of nature". (Pauli in Zeh, pp. 104-5, Zeh's translation and italics)[32] After mentioning Bohr and Wigner, Zeh denies Ulfbeck and Aage Bohr's approach from 2001. These two authors consider that when the wave hits the counter of the measurement apparatus, the wave function "loses its meaning". (Zeh, p. 105) Accepting the decoherence process, Zeh contests this affirmation, replacing it with "[T]he quantum state changes rather than losing its meaning". (Zeh, p. 105)

From an EDWs perspective, in both cases the authors are forced to reduce the existence of wave or particle to one quantum state either through losing its meaning or changing its state (decoherence). The short story finishes with Bohm's perspective (both electron and wave exist) and Bell's approach (the global wave function has to be regarded as real). The "entanglement" (according to Schrödinger, "the greatest mystery of quantum theory" – Zeh, p. 106) presupposes the "superposition" of different quantum states. There are two classical examples of superposition: the spin of a particle can be spin-up and spin-down at the same time, and the superposition is of wave and corpuscle. Zeh mentions that in the 1920s and 1930s none of the great physicists rejected the idea that "reality must be local (that is, defined in space and time)". "It is this requirement that led Niels Bohr to abandon microscopic reality entirely (while he preserved this concept for the apparently classical realm of events)."[33] (Zeh, p. 106)

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[32] Heisenberg has similarly claimed that "the particle trajectory is created by our act of observing it." (Heisenberg in Zeh, p. 105)

[33] As I already mentioned in Chapter 3, Bohr's embraced Kant's framework of the noumen-phenomen distinction.

About the superposition of wave and electron Zeh wrote that

> *General* one-particle wave functions can themselves be understood as superpositions of all possible “particle” positions (space points). They define “real” physical properties, such as energy, momentum, or angular momentum, only as a whole.

Zeh emphasizes that such superpositions have been confirmed “to *exist*” by various experiments (superconducting quantum interference devices, mesoscopic Schrödinger cats, Bose condensates, superposition of a macrosopic current running in opposite directions and microscopic elements for a quantum computer. “All these superpositions occur and act as individual physical states. Hence their components ‘exist’ simultaneously.” (Zeh, p. 108)

Essential for the EDWs perspective is the following idea of Zeh’s. As we saw above, entanglement presupposes superposition. However, superposition requires nonlocal states. Zeh stresses the distinction between *kinematical* nonlocality (nonlocal states) and *dynamical* nonlocality (“Einstein’s spooky action at a distance” or superluminal actions). (p. 109) Zeh considers that most physicists assume nonlocal states as *dynamical* nonlocality.

> In contrast, nonlocal entanglement must already “exist” before any crucially related local but spatially separated events would occur. For example, in so-called quantum teleportation experiments, a nonlocal state would have to be carefully prepared initially – so nothing has to be *ported* any more. After this preparation, a global state “exists but is not there” (Joos and Zeh 1985). Or in similar words: the real physical state is *ou topos* (at no place) – although this situation is *not utopic* according to quantum theory. A generic quantum state is not simply *composed* of local properties (such as an extended object or a spatial field). (Zeh, pp. 109–110)

Let me analyze this paragraph from an EDWs perspective. Zeh is correct in claiming that this property must already "exist" before any spatially separated events take place. (Or in quantum teleportation "nothing has to be ported".) However, within the unicorn-world, Zeh cannot really explain the nonlocal entanglement. He simply appeals to Greek words "*ou topos*" to explain a real physical state! It is not clear at all what this expression means. Maybe there are many worlds or more probably there is a superposition of the wave and particles. Even if entanglement (or "quantum correlations", Zeh p. 110) presupposes superposition, within the unicorn-world, superposition cannot be explained even if "quantum correlations" were equivalent to my "correspondence". From an EDWs perspective, "superposition" is not a real superposition; it means that the wave and the particles belong to EDWs and we identify the correspondence between them to be within the same spatio-temporal framework. Indeed, the nonlocality is a kinematical state between two particles and not a dynamical state that requires "Einstein's spooky action at a distance". However, this kinematical state of the wave cannot be fully explained within the unicorn-world. Only the correspondence between the wave and the particle can explain the kinematical state, the non-locality. The whole wave is not "simply composed of local properties" (such as an extended object or spatial field) but it *corresponds* to those local properties (let us say those two electrons). As I mentioned above, the quantum wave is not divisible like an extended object or a classical wave. This property (the *correspondence* between the wave and the particles) explains the infamous non-locality of particles. I recall again that, according to Bohr's principle of complementarity, we cannot observe the particle and the wave at the same time. We can translate this idea to mean that the particles cannot "observe" the wave, and vice-versa, because they belong to

EDWs. The wave – as a "global state" –"exists" not in *ou topos* but in a particular EW.

To avoid the mentioned contradiction, Zeh considers that the wave decoheres into a particle. Within the unicorn-world we cannot relate the nonlocality with the wave because the wave collapses, but the nonlocality, as a global property, remains between the particles! In other words, the nonlocality has no place – because the wave collapses or decoheres into particles – but exists! The problem is that the superpositions

> have not been confirmed thus far in the macroscopic realm, a Heisenberg cut[34] for the application of the collapse may be placed anywhere between the counter (where decoherence first occurs in the observational chain) and the observer – although it would eventually have to be experimentally confirmed. (p.113)

The question is where does the collapse take place? Zeh believes that without any empirical evidence, we cannot determine where a collapse really occurs. From an EDWs perspective, we can clearly understand that there is no empirical evidence for where a collapse occurs because there is no such collapse. The superposition is the correspondence between wave and particles that belong to EDWs. The title of the last section from Zeh's article "[t]hat itsy bitsy wave function" and the following first paragraph both reflect the power of the unicorn-world in physics: "Reality became a problem in quantum theory when physicists desperately tried to understand whether the electron and the photon 'really' are particle or waves (in space)." Zeh concludes that he has argued in his paper not for particles or for spatial waves, but for "Everett's (nonlocal) universal wave functional", a consistent

[34] "Heisenberg's" cut means the separation between the observer and the observed entity. (my footnote)

kinematical concept (proposed by Wheeler 1957) that describes the reality. (p. 118) However, he mentions that this approach implies a multitude of separately observed quasi-classical universes in one huge superposition.

For me, the "itsy bitsy wave function" is a notion that reflects the history of the last 70 years of quantum mechanics. Again, from an EDWs perspective, the wave and the particles do not belong to the various multiverses in one superposition but to EDWs. The last paragraph of Zeh's paper is "However, you turn it: *In the beginning was the wave function.* We may have to declare victory of the Schrödinger over the Heisenberg picture." (p. 119)[35] I can say: *In the beginning was the unicorn-world*. However, no beginning of the unicorn-world exists!

Another step in defending my approach is to point out a few ideas from a recent article written by Dyson (2004). Dyson suggests that DeWitt (1992) explains the notion of decoherence in quantum cosmology very clearly: "massiveness" and not "complexity" is the key to decoherence. (Dyson 2004, p. 77) Schrödinger's cat, as a massive object, accomplishes decoherence. From an EDWs perspective, DeWitt is evidently correct regarding "massiveness". However, the "massiveness" is represented by macro-objects that belong to an EDW rather than microparticles and we do not have any decoherence. This massiveness shows us that we have to "ignore" (in a much stronger spirit than Einstein that is by introducing the EDWs) the microparticles even if macro-objects have organizationally different parts.

Dyson introduces four thought-experiments that support his conclusion that "quantum mechanics cannot be a complete description of nature". (Dyson 2004, p. 74) Based on two of his thought-experiments, Dyson considers that the distinction

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[35] As I mentioned above, Penrose asserts the same thing.

between classical (that include microparticles) and quantum (waves) notions is reflected by the distinction between past and future. (Dyson 2004, p. 83) The past cannot be described using quantum-mechanical notions but only classical terms. He quotes Bragg: "Everything in the future is a wave, everything in the past is a particle." (p. 83) Therefore, quantum mechanics is a small part of science that describes a part of nature. More than this, Dyson contradicts the Copenhagen interpretation which declares that the "role of the observer" causes an

> … abrupt "reduction of the wave-packet" so that the state of the system appears to jump discontinuously at the instant it is observed. This picture of the observer interrupting the course of natural events is unnecessary and misleading. What really happens is that the quantum-mechanical description of an event ceases to be meaningful as the observer changes the point of reference from before the event to after it. We do not need a human observer to make quantum mechanics work. All we need is a point of reference, to separate past from future, to separate what has happened from what may happen, to separate facts from probabilities. (p. 84)

So the "role of the observer" is "solely to make the distinction between past and future." (p. 83) From an EDWs perspective, the role of the observer is not to make the distinction between past and future but the distinction between EDWs! Dyson introduces time as a single solution to avoid the ontological role of the observer. However, he has this solution because he works within the unicorn-world. In fact, the observer, changing the conditions of observation ("point of reference"), observes EDWs. In this case, Dyson's distinction between past (facts) and future (probabilities) is useless.

In support of the EDWs perspective is Dyson's hypothesis of denying the existence of gravitons from the end of his article. (Dyson 2004, pp. 88–9) The majority of physicists accept that the gravitational field must be a quantum field with associated gravitons. Dyson remarks that there are no arguments (empirical or theoretical – or even thought-experiments) that support this idea. The detectors can detect only classical gravitational waves produced by massive entities. If we do not have even a thought-experiment for supporting quantum gravity, then the gravitational field is a "pure classical field" and gravitons do not exist. This hypothesis promotes my approach. Gravity is produced by massive objects and if we *think* that either a planet is "composed" of microparticles then we have "microgravity" or there are "gravitons" that produce the gravity. However, these notions of "microgravity" and "gravitons" are empty notions![36] Gravity exists only in one EW, the world of macro-objects. Without any object, space has no curvature[37] but we can observe the curvature only as produced by macro-objects. It is "impossible" for us to introduce curvature at the quantum level. I return again to Hanna's comments on Kant's paragraphs (A239/B298-9 and A248/B305): "… empty concepts cannot be meaningfully applied by us either to noumenal objects or to objects of our sensory intuition, and in that sense they are 'impossible' – that is, impossible to *use*." (Hanna 2001, pp. 90–1) I emphasize that even if they are thinkable, it is impossible for us to use these notions!

I want to stress again that there can be confusion between the EDWs and many-worlds or multiverse or parallel universes from the field of quantum mechanics. The "many worlds"

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[36] Maybe the same situation is for "Higgs particles" that are search for explaining the mass of any particle. I suggest that we can explain the mass of any particle by applying the status of any non-living epistemological entity (see 6.10). The epistemologically different entities are constituted by the corresponding epistemologically different interactions. Thus, each non-living entity exists only at its "surface".

[37] "Cosmic microwave backgroung observations show that space has almost no curvature." (Tegmark 2004)

approach or "multiverse" or "parallel" approach (created by Everett (1957), and followed by Zeh, Zurek, Deutsch (see point (1) above) and Tegmark seems to be the closest alternative to the EDWs perspective. The many-worlds interpretation was created by Everett as an alternative to the collapse of the wave function into a particle during the measurement (Copenhagen interpretation). According to Tegmark and Wheeler (2001), Schrödinger's equation predicts that the person seeing a particle will "enter" a superposition of two possible states. (p. 72) There are two parts of the total wave function (of person plus the particle) that work completely independently in two parallel worlds.

I emphasize again that many-worlds interpretation and EDWs perspective are completely different. I mention once more that the idea of the superposition of two waves and that of the pseudo-"superposition" of the wave and the particle led the physicists to the idea of the "superposition" of various states of a particle before measurement. From an EDWs perspective, because the wave and the particle belong to EDWs, there is no superposition of various states for a particle. Thus, there is a totally different relationship between the parallel universes ("many-worlds" or "multiverse") and the EDWs. The parallel universes ontologically exist in the unicorn-world simultaneously, while EDWs epistemologically exist in the hyperverse.[38] The number of parallel worlds can be huge[39], the number of EDWs is very limited given by the epistemologically

[38] Davies dedicates one chapter in his book (2006) to the multiverse alternative in quantum mechanics. He mentions some problems for this interpretation: "many scientists hate the multiverse idea", this theory cannot be tested and it imposes the duplicate problem and the idea of the "fake universe".

[39] "I repeat, on the Many Worlds interpretation, there will be 2^30 Einstein-'histories – parallel worlds'; science fiction is literally right!" (Putnam 2005, p. 630)

different interactions and the corresponding entities. Everett tried to solve the problem of superposition as a reply to that Copenhagen interpretation about the "wave function that 'collapses' into a definite classical outcome wherever the observation was made, with probabilities given by the wave function." (Tegmark 2004, p. 473) For Everett, this "controversial collapse postulate was unnecessary". (Tegmark, p. 473) In fact, quantum theory alone predicted that one classical real scene would split into the superposition of many. Interesting for EDWs perspective is Tegmark's remark that Everett could not solve two essential questions:

1) Why we do not perceive macrosuperposition and

2) "What physical mechanism picks out approximately classical states (with each object in only one place, etc.) as special bewilderingly large Hilbert space?" (Tegmark 2004, p. 474) Decoherence answers both questions. But as we saw above, decoherence is a false notion within the unicorn-world. The "cat" is not both dead and alive before our observation. The scientists needed such decoherence only because of the unicorn-world. They consider that the superpositions are available only for insolated systems. When such systems have a contact with other entities (a photo or molecules) the split in the parallel universes of those superpositions takes place. Surprisingly, Tegmark wrote that "Decoherence is now quite uncontroversial and has been experimentally measured in a wide range of circumstance." (p. 474) Is he correct?

The general view about the articles written by scientists that I have analyzed here is that physicists accept various (sometimes contradictory) alternatives (with odd notions) in explaining "weird" phenomena. At the end of their article (2001), Tegmark and Wheeler introduced the results of an informal pool at a conference on quantum computation at the Isaac Newton Institute (Cambridge, July 1999). Out of 90 physicists, 8 accepted wave-function collapse, 30 preferred "many-worlds or consistent histories (with no collapse)" and 50 accepted "none of the above or undecided"! "Rampant linguistic confusion may contribute to that large number. It is not uncommon for two physicists who say that they subscribe to the Copenhagen interpretation, for example, to find themselves disagreeing about what they mean."(p. 75)[40] Tegmark and Wheeler mention that quantum theory "is probably just a piece in a larger puzzle". Theories from physics can be organized in a family tree. At the top of the tree, we can see general relativity and quantum field theory. However, "[p]hysicists know something is missing at the top of the tree, because we lack a consistent theory that includes both gravity and quantum mechanics, yet the universe contains both phenomena." Therefore, the "ultimate goal of physics" is to find the "theory of everything" that "would have to contain no concepts at all". (p. 75) As we saw above, the theory of everything has a "meaning" only within the unicorn-world.

As a summary of my analysis from the EDWs perspective, I claim that the persistence of this "peculiar" picture of quantum mechanics for 100 years is due to the extension, within the unicorn-world, of the correct idea of a waves' superposition to the pseudo-"superpositions" of (1) waves and particles and (2) several states of a particle. Working within the unicorn-world

[40] Along the same lines, see Putnam's example with his friend a "world-famous physicist". (Putnam 2005, 619) Putnam tried to convince his friend that there is a problem in quantum mechanics. Before several talks with Putnam, the physicist accepted the Copenhagen interepretation. After the talks, the physicist accepted the problem. Fourteen years later, at a conference he said: "There is no Copenhagen interpretation of quantum mechanics. Bohr brainwashed a generation of physicists." (p. 619) From my viewpoint, Bohr is not more guilty than other physicists. The acceptance by everybody of the unicorn-world paradigm has represented the huge mistake that has "brainwashed" scientists and philosophers for such a long time!

paradigm, scientists and philosophers have obviously been forced to create such weird notions.

6.10. The status of the non-living epistemologically different entities

For a complete alternative to the mind-body problem, I needed to naturalize the "I" or to anthropomorphize the "it" just because of the evolution of the "universe" that means, from an EDWs perspective, the creation of new and disappearance of old epistemologically different entities. If we work under the Big-Bang theory, we accept that the evolution of the "universe" happened somewhere between 12–14 billion years ago (more exactly, 13.7 billions years ago). Evidently, in the first billions of years there were no living entities. Excluding religious arguments, we have to accept that living entities are the results of the evolution of non-living entities and processes. In my book, I followed an analytic analysis: I examined first the "I", then living entities and finally non-living entities, i.e., the "it". We saw in different chapters, the status of the "I" and of any living entity. In this chapter, I tried to apply the EDWs perspective to micro- and macro-EWs. I analyzed certain philosophical theories about the "world" and then the relationship between Einstein's theory of relativity and quantum mechanics. I end this chapter with a few words about the status of non-living entities.

As I said in 3.4, the epistemologically different entities determine their epistemologically different interactions and the epistemologically different interactions constitute their epistemologically different entities. From this judgment, we can deduce that any external epistemological entity and epistemological interaction can be defined only from an external viewpoint in relation to other entities from the same EW: any external object exists only at the "surface" because of the interactions with other entities from the same EW. As we saw in 6.9, working within the quantum computations framework, Deutsch extends the notion of knowledge to physical things. (Davies 2006, pp. 254–6) According to the principle of knowledge, the "I" is knowledge (a cumulus of "bits"), but we cannot say that a physical entity is a cumulus of bits, as Deutsch or Zeh considered. In fact, they follow Wheeler's principle of "it from bit", which means the emergence of the particle from information. (Davies 2004; 2006) As we saw in 5.1, there is no emergence of this kind but only an entity "emerges" from organizationally different parts. As we saw in 6.8, ignoring microphysical forces, Einstein adopted a perspective on the relationship between geometry and practically rigid bodies. Within the framework of general theory of relativity, we can say that each planet has its own "constitutive viewpoint of interactions" with other planets and the same thing is available in the other EW for quantum mechanics, micro-particles and waves. Science and philosophy missed exactly this element of the "constitutive viewpoint of interactions" for epistemologically different classes of objects that constitutes EDWs. Using different conditions of observation and thus being able to observe epistemologically different classes of objects (like micro-particles and planets), we made the mistake of locating them in the same world, the unicorn-world. It is necessary once again to mount a Copernican revolution but this time for all classes of entities: we are not the only "observers" and therefore the unicorn-world does not exist. Each class of entities has its own EW. An epistemological entity observes/interacts only with the members that belong to the same EW.

For Kant, the analogies (the "principles of objects") realize the transcendentalization of ontology into "immanent thinking". (See 2.3) From an EDWs perspective, the "principles of objects" are given by the "immanent" epistemologically different interactions and we have an "immanent" hyperontology. If "ontology" deals with the nature of things that belong to the unicorn-world, hyperotology deals with the nature of epistemologically different entities. Kant's analogies reflect the unity of nature, and all phenomena (the determination of objects and processes) must lie in one nature. (A216/B263) For each epistemological entity, only the members of its EW exist and nothing else. Each EW has its unity (given by its entities and their interactions) and unicity and its entities only correspond to entities from other EDWs. The spatio-temporal framework of all EDWs (except the "I") is the same. Epistemologically, we can reinterpret the Kantian expression of "nature as object of experience". Each EW is epistemologically (theoretically) "constructed" through Friedman's constitutive *a priori* principles that represent the possibility of epistemologically different interactions. Because of these constructions, all EDWs (except the "I") are the "epistemologically different objects of experience" for the "I". Thus, following Kant (see Parvu 2004, p. 401 in 2.4) and Friedman's philosophical meta-paradigm or meta-framework, each EW is an integral object of possible experience. The unity of each EW implies the unity of its epistemological entities and their relationships. Epistemologically, the constitutive *a priori* principles are the conditions of possible epistemologically different experiences. For Kant, as exponents (or operators) of synthetic unity, the categories "act as a surrogate for space and time in the field of appearances by bringing sensation-reality of appearances to synthetic unity, and thereby endow space and time with objective validity." (Waxman 1995, p. 848) Data apprehended perceptions "become something for me". (p. 853) (See 2.4) Hyperontologically, the epistemologically different interactions (that are the "structural functions" or "operators", Parvu 2004 in 2.3) *constitute* not only the epistemologically different entities but also the space and time of each EW. As we saw in 2.3, for Kant the functions of categories are the result of transcendental apperception that has the function of synthesis. (A401) If we replace the epistemological notion of "apperception" with a hyperontological notion, the "epistemologically different interactions", and the "categories" with Friedman's "constitutive a priori principles", then (A401) can be re-written:

> Epistemologically different interactions are themselves the ontological ground of the epistemological possibility of the constitutive *a priori* principles, which on their part represent nothing but the synthesis of epistemologically different entities, in so far as these entities have unity in interactions.[41]

The epistemologically different interactions are the Kantian "operators" that realize the synthesis of the manifold of epistemologically different entities for constituting the epistemologically different experience. Because of these interactions, each epistemological entity interacts only with the entities from the same EW. The planets, the microparticles and the waves exist as epistemologically different entities in their corresponding EDWs. In Kantian terms, the other entities become "something for an entity". For instance, due to their interactions, an electron becomes something for another electron but not for a planet. Or a planet becomes something for another planet but not for an electron. The non-Euclidian space created by the mass of planets exists for planets, waves and trajectories

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[41] I recall that the interactions are constitutive for the entities and the entities determine the interactions, so we can rewrite this passage replacing "interactions" with "entities". I mention that, in this manner, we can rewrite many paragraphs from Kant's CPR.

of microparticles. Nevertheless, in a Leibnizian style, the EDWs are given by their epistemologically different entities and their interactions, not by the space among their entities. An electron, even if its trajectory is curved by a planet, does not interact with (does not "observe") the planet that curves the space but with a collection of microparticles that *corresponds* to that planet.

The EDWs perspective is against any reductionism either from philosophy of mind (see Chapter 4) or physics. Nevertheless, I emphasize that within the unicorn-world, an antireductionist approach cannot be supported from an ontological viewpoint! Regarding reductionism in physics (everything can be reduced to elementary particles), I examine from my perspective some ideas of Anderson (1972) and Morrison (2006).[42] One of the most important and oldest articles against the reductionism from physics is Anderson's article "More is different". The surprising thing is that, in that period, Anderson (a physicist) constructed an ingenious argument against reductionist thesis in a very short paper.[43] He claims that the reductionist hypothesis does not imply any kind of "constructivist" hypothesis:

> The ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe. In fact, the more the elementary particle physicists tell us about the nature of the fundamental laws, the less relevance they seem to have to the very real problems of the rest of science, much less to those of society. (Anderson 1972, p. 393)[44]

[42] I am highly indebted to Ilie Parvu for recommending me these articles.

[43] According to Hüttemann, on the same line of antireductionist view, there are Maudlin (1998), Redhead (1990) and Kronz and Tiehen (2002). (Hüttemann 2005) This antireductionism view is supported by quantum entanglement. (Hüttemann 2005, p. 114)

[44] Morrison explains this paragraph in the first part of her paper. (Morrison 2006, p. 878)

Evidently, Anderson works under the unicorn-world umbrella, but his ideas are very close to the EDWs perspective. For Anderson, scale and complexity are the parameters that show that the constructionist hypothesis does not work everywhere. Morrison works within the same framework: "the world has different levels of complexity that cannot be fully explained or understood by reducing them to one set of theories, laws, or basic entities." (Morrison 2006, p. 876) From an EDWs perspective, both of Anderson's parameters indicate to us either something related to the epistemological-onotological threshold (another EW) or to the organizational threshold (the same EW). However, within the unicorn-world he uses "empty concepts" such as "levels". At each "level" of complexity, there are new properties that produce new behavior that is "fundamental in its nature as any other." (p. 393) This idea is similar to the principle of objective reality of the EDWs perpsepctive. But "levels" has to be replaces by EDWs. Obviously, it is completely wrong to consider these notions as being similar.

Anderson considers that matter has different "levels of complexity", from molecules (the simplest one – the ammonia molecules and hydrogen phosphide, PH_3, (double then ammonia), then sugar (40 atoms) and crystals and other more complex levels. From an EDWs perspective, we have to examine what it means to pass from one "level" of complexity to another. Morrison indicates that a nonrelativistic Schrodinger equation cannot be solved when the number exceeds around ten! "This is not due to a lack of calculational power rather it is a catastrophe of dimension (Laughlin and Pines 2000)." (Morrison 2006, p. 879) Even if some approximate calculations for a large system are possible, the researchers cannot derive or predict parameters that appear in the Hamiltonian for the Schrodinger equation by direct calculation. (*idem*) On the same line as Anderson, Morrison assumes that theoretical principles such as symmetry breaking and localization can help us to explain the behavior of certain kinds of phenomena that are independent of "the content of microphysical theories". (p. 880) From an EDWs perspective, this line of analysis reflects either an epistemological threshold or an organizational one. All entities are in the same EW if our observation involves only an organizational threshold. However, each entity interacts at its surface with other entities. Earlier than Fodor, Anderson considers that there are various sciences; each of them deals with different a level and at each level "entirely new laws, concepts, and generalizations are necessary, requiring inspiration and creativity just as great as in the previous one. Psychology is not applied biology, nor is biology applied chemistry." (p. 393) In fact, two years later (1974), Fodor introduces his notion of "taxonomy" within a framework that is quite similar to Anderson's model. (See 5.7)

For Anderson, the main idea is that the theory of "broken symmetry" shows us the failure of reductionism. Broken symmetry takes place at $N \rightarrow \infty$ of large systems (that is the macroscopic "scale"); matter is a state in which the microscopic symmetries and equations of motion are "in a sense violated". (p. 365) According to Anderson, instead of symmetry, we can found other characteristics proper to macroscopic objects like long-wave vibrations, (sound waves), the unusual macroscopic conduction phenomena of the superconductor or the rigidity of crystal lattices (the most solid matter). We can clearly notice here the difference between two EDWs from a scientific (physics) viewpoint! Explaining Anderson's example of crystal lattice, Morrison indicates that crystallization takes place only in sufficiently large and complex systems (Anderson's "complex aggregates"). Morrison assumes that principles like symmetry breaking and localization are absolutely necessary for predicting and explaining the behavior of phenomena from condensed matter physics and the energy domain. (p. 877) The symmetric crystalline state reflects the "emergent property of broken symmetry" because the atoms are more symmetric than the crystalline state.[45] (p. 880)

Morrison investigates the ontological and epistemological emergence in physics that is, I believe, a similar notion to those from the philosophy of mind/cognitive science. Even if the domains are different, the notions are very similar. In fact, regarding the notion of emergence and supervenience, Morrison mentions Kim, a well known philosopher from the philosophy of mind (see chapter 4). Within the unicorn-world, it is quite normal for the researchers from such different domains to appeal to the same "empty" or fuzzy notions.

From my perspective, let us analyze a paragraph from Anderson's article:

> There is, of course, no question of the system's really violating, as opposed to breaking the symmetry of space and time, but because its parts find it energetically more favorable to maintain certain fixed relationships with each other, the symmetry allows only the body as a whole to respond to external forces. This leads to a "rigidity", which is also an apt description of superconductivity and superfluidity in spite of their apparent "fluid" behavior. (p. 395)

It is so evident that this paragraph (and the whole of Anderson's article) supports the EDWs perspective so much! The idea that the symmetry of space and time "allows only the body as a whole to respond to external forces" that leads to a "rigidity" reflects exactly the existence of EDWs! Showing some cases of macroscopic material bodies in which broken symmetry takes place, Anderson concludes that "the whole

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[45] Superconductivity is another example of showing the stability and predictability given by a theoretical principle like broken symmetry. (Anderson 1972, p. 395 or Morrison 2006, pp. 880–1)

becomes not only more than, but very different from, the sum of its parts." (p. 395) Working within the unicorn-world, not only the philosophers (Chalmers, see 4.1) but even the physicists (for instance, Zeh, see 6.9) appeal to eccentric and totally empty notions such as "information". Applying his perspective to living entities (from cells and DNA to human beings), Anderson also introduces the notion of "information". Between crystallinity and information strings, there is a new "stage"; the functional structure. There is a hierarchy of broken symmetry that reflects the hierarchy of sciences (or "special sciences", Fodor's notion that is better known in philosophy).

> Surely, there are more levels of organization between human ethology and DNA than there are between DNA and quantum electrodynamics, and each level can require a whole new conceptual structure. (p. 396)

I emphasize that Anderson uses many concepts that fit with my perspective. He missed only the rejection of the unicorn-world and its replacement with EDWs! For Morrison, reductionism is related to the theory of everything and cannot explain "fundamental features of our scientific world picture". (Morrison 2006, p. 882) She also has hierarchical view of the world, emphasizing the emergent phenomena that arise out of their constituent parts but cannot be "reduced to, explained by, or predicted from these constituents". (p. 882) From an EDWs perspective, it is fundamental to realize that emergent phenomena and their constituents exist in the same EW or in EDWs. It depends on what threshold is involved in forming the entities, either an organizational or an epistemological threshold. Moreover, we have to take into account the transformation of the "I" into the "it" because here it is about physical systems. Related to these ideas, Morrison points out the ideas of two authors: Humphreys considers that "the constituent parts are thought to no longer exist once the emergent property has formed, while for Teller the emergent property is thought to simply 'transcendent' the parts from which it arises." (Morrison 2006, p. 883) Morrison sustains the opposite idea: "the emergent phenomenon typically disappears when the system is taken apart." (p. 883) She offers the existence of phonon as an argument for supporting her idea: as a property of the crystalline state, the phonon does not exist for an isolated atom but only for the crystal as a whole.[46] (p. 883) From an EDWs perspective, we can now understand these opposite viewpoints: it depends on which EW each of these thinkers wants to preserve! To support her idea and explain the emergent phenomena, Morrison introduces the difference between *kinds* and *states* of matter. (p. 885) In physics, to make the difference between essences and natural kinds, it is necessary to use the reversible adiabatic map. (p. 885) The criterion for individuation is quantum phase transition. For entities with a small number of particles, the adiabatic principle guarantees a map one-to-one between ground state and the low-lying excitations. (Laughlin 1999 in Morrison 2006, p. 885) If the system has thermodynamically a large number of particles, "a small change to the equations of motion can result in a violent rearrangement of the ground state and low-lying excitations, and a corresponding breakdown of the one-to-one mapping." (p. 885) The difference is about phases of matter, not kinds. "Two states are the same phase of matter if they can be slowly transformed into each other without encountering a quantum phase transition and different if they cannot." (*idem*) We can realize that, working within the unicorn-world, Morrison is forced to introduce this notion, "phase of matter". Nevertheless, she follows Anderson when she believes that, at different scales, phenomena can obey different

[46] Morrison indicates that this situation is similar for superfluidity. (p. 883)

"fundamentals". What does "phenomena at different scales" mean within the unicorn-world? From an EDWs perspective, I notice, again, that it is either about an organizational threshold for entities that belong to the same EW or about an epistemological-ontological threshold for entities from the EDWs. In addition, regarding the organizational threshold, I need to introduce an essential element, the "it". For instance, even within one EW, a table cannot observe/interact with its legs. Only a person can make this separation in their mind. As we already know, the table exists only at its surface! A full understanding of the EDWs perspective is strongly related to the comprehension of the difference between the organizational and epistemological-ontological thresholds. These notions "different scales" and "levels of complexity" are quite empty notions when an epistemological-ontological threshold is involved. Nevertheless, we can use these notions when we have only an organizational threshold.

Offering more actual arguments for Anderson's framework, Morrison concludes that reductionism (related to the "theory of everything") cannot explain all the emergent phenomena. Fundamental physics is not given by fundamental theories (reductionism), but each level has its own fundamental entities and laws. (Morrison 2006, p. 886) From an EDWs perspective, the same thing that I wrote about Anderson is also applicable to Morrison. She misses the rejection of the unicorn-world.

In this context, I need to analyze here the relationship between these notions, the "ontological relativity" (Quine, Goodman, Putnam, and others, see 6.2-6.8) and the EDWs perspective. In sections 6.2 to 6.8, I analyzed the ontological relativity and showed that the view of those that support this approach is quite close to Carnap's linguistic or conceptual framework. In fact, within the unicorn-world, they cannot even think of another alternative! Different scales and levels of complexity are strongly related to the "pluralist ontology" view. What exactly is the relationship between "plurality of ontology" and the EDWs perspective? To answer this question, I examine a few ideas from Teller's article (2004), but I emphasize that this analysis is available, in general, for the majority of articles from philosophy of science. The reason is, evidently, that everybody works within the unicorn-world paradigm.

Teller wrote this paper as a reply to Sklar (2003) who rejects the plurality of ontology and embraces a "universal ontology" explained by a theory that deals with the so-called "fundamental particles".[47] Obviously, this notion involves the "theory of everything". (For more details, see section 5 from Teller, 2004.) Sklar is convinced that "foundational physical theories" offer "a universal description of how everything is". (Teller 2004, p. 428) This idea is exactly opposite to Anderson's perspective! Examining Sklar's argument, Teller asks "Why should we endorse the ontologies of atomic and quark theory, but not, for example of the liquid drop model of the nucleus or the continuous fluids of hydrodynamics?" Sklar thinks that the former are "'on the road' to our desired ultimate theory" and the later is just a "weak model" for characterizing the reality. (Sklar 2003, p. 431 in Teller p. 431) In the second part of his paper, Tellers argues that both the ontology of quantum field theory and the continuum ontology of

[47] Within the unicorn-world, there is a strong debate between reductionists and antireductionists. For instance, as another example of reductionism (adopting a micro-explanations view), Hüttemann considers that in solid state physics there are many examples of explaining the behaviour of compound system (crystals, liquids, and metals) in terms of their constituents. "It can be explained in terms of the behavior of the molecules, ions, etc., that the systems consist of. Quantum mechanics provides the means for reductionist explanations in this sense." (Hüttemann 2005, p. 115)

hydrodynamics involve similar idealizations and thus neither of these theories explains the real world. For Teller, "a pluralist ontology provides a much richer understanding of the world than any univocal alternative." (p. 441)

From an EDWS perspective, it is interesting to remark that Teller's framework is still the unicorn-world one. Teller knows that, in this framework, it is not possible to fit one world with a real pluralist ontology. Therefore, his pluralist ontology is given us by scientific theories and all these theories are idealizations and "strictly speaking" false. (p. 446) It seems that his view is somewhere between "approximate" realism, instrumentalism or anti-realism approaches. Significant for me is Teller's verdict about what scientific theories are: within the unicorn-world, he is forced to move from "useful fictions" to "informative fictions" and then to "veridical fictions" or better "fallible veracities". (pp. 445–6) He concludes that "it is only through idealizations, and what I have just suggested we can think of as their alter-egos – inexact truths – that we have access to the world." (p. 447) Scientific theories are, indeed, more or less idealizations, but with such theories, we have access to the EDWs, not to the unicorn-world. Only within the unicorn-world, scientific theories become much more "idealizations" or "approximations".

On the same line, Humpreys considers that we "need a hierarchy of levels". (Humpreys 1997) If we can reduce molecular chemistry to particle physics, however "such relations are more murkier in the case of physics and psychology." (p. 4) Humpreys is aware that the arguments that I debated in Chapter 4 about mental causation "can be generalized to apply to a hierarchically ordered set of properties, each level of which is distinct from every other level."[48] (p. 3) He emphasizes that if

[48] Humpreys indicates an article of Yablo (1992).

"the exclusion argument does generalize to such hierarchies" and if we consider that chemical and biological events and properties are on higher levels than those from physics, then "no chemical or biological event could ever causally influence a physical event, and if both arguments so generalize, then nonreductive physicalism leads to inconsistencies when applied to the general realm of the natural sciences too." (p. 3) In this situation, the only alternative would be that only "the most basic physical properties can be causally efficacious". However, as everybody knows there are no physical explanations that are "grounded in causes". Humphreys' argument against reductionism is quite complicated and I will not give any details about it. I only mention that, working within the unicorn-world, he introduces certain complicated epicycles (generalizing exclusion and downward causation arguments but trying to avoid supervenience) but at the end of his paper he recognizes that "*certain metaphysical questions cannot be answered (yet) because we do not know enough*". (p. 16, his italics) Based on this principle, he concludes that we have to be patient if we want to prove whether mental phenomena are emergent properties or not. (p. 16) Within the unicorn-world, Humpreys has no other alternative to this problem!

I conclude that, from an EDWs perspective, the disputes among philosophers from philosophy of science regarding the relationship between scientific theories and "world" are very similar to those from the philosophy of mind: the duel is endless because the fight takes place in a surrealist surrounding, the unicorn-world. This is the reason we can realize that in this area there are so many "empty concepts" like conceptual frameworks, instrumentalism, (scientific) realism, antirealism, and so on.

Returning to Kant, we can speak about the Kantian synthetic unity of any epistemological entity only from their external viewpoint. The Kantian synthesis process in forming an object is possible only from an external viewpoint of a human being. In my case, this synthesis processes for an object is represented by the external interactions of that object with other objects. Otherwise, exactly like in Kant's philosophy, that object does not exist in any EW! In this sense, in the EDWs perspective, a human being (as a physical entity) has the same role of "participator" (Wheeler) in macro-EW as any epistemological entity in its EW. No more or less. External or internal epistemologically different entities and interactions (the laws) do not have any internal or intrinsic properties! It is meaningless to talk about the "essence" of either micro or macro physical objects.[49] Micro-forces are among micro-particles that belong to the micro-EW and therefore such forces do not exist in the macro-EW. We know that, in general, macroscopic objects have organizational different parts but these parts are not "intrinsic" properties. Every epistemological entity and its organizational different parts have only external properties and follow only external epistemologically different interactions (laws). Even the internal mental representations and internal feelings – that are parts of the "I" – have no internal status. They are elements of knowledge that are semantic and presuppose implicit knowledge but, being syntactic, each epistemological entity or each "it" has its own individuality due to the interactions with other entities from the same EW. If the "I" exists (internal processes of observation of mental representations and internal feelings that represent explicit and implicit knowledge and correspond to the internal mechanisms and their interactions that belong to macro-EW), the "it" exists only as external interactions. The consequence of this framework is that micro- and macro-particles belong to

[49] Even within the unicorn-world and in that time, Kant was perfectly right to "kill" metaphysics!

EDWs.[50] It is meaningless to search for the relationship between Einstein's theory of relativity and quantum mechanics. Each such theory contains certain Kantian "constitutive principles" that represent the "formal conditions of scientific experience" (see 2.5) or the conditions of *possibility* of interactions between objects of experience. They are, in Friedman's terms, the constitutively *a priori* elements (mathematical principles utilized for constructing the theory and fundamental principles or mechanical part). (Friedman 2001, p. 71 – see 6.9) These principles represent the formality of epistemologically different interactions (the epistemologically different laws) or the "constitutive viewpoints of interactions" constitute or synthesize the epistemologically different entities. As we saw above, each scientific theory has a constitutional framework that individuates the corresponding empirical entities. In the macro-EW, each planet constitutively interacts with other planets; in micro-EW, each electron constitutively interacts with other micro-particles.

As we saw in see 2.5, Kant mentioned that "space, represented as *object* (as we are required to do in geometry) … contains a *combination* of the manifold, given according to the form of sensibility, in an intuitive representation, so the *form of intuition* gives only a manifold, the *formal intuition* gives unity of representation." (B161a) From an EDWs perspective, some entities and the space between them can be an object in other

[50] A scientific example that reflects this idea is Einstein's adoption of a perspective on the relationship between this necessary geometry and the entities as "practically rigid bodies" that ignores microphysical forces. (Friedman 2001, p. 114) The frame of reference for both theories is given by space, time, and motion but the theories refer to the same entities even if we can individuate empirical objects and their relationship only through such constitutional frameworks. In fact, the spatiotemporal structures of these theories are different mainly regarding their metric.

EW. For instance, some electrons and protons and the space between them can correspond to a table in the macro-EW. From the EDWs perspective, Kant's expression "the nature as object of experience" would reflect the change of the conditions of observation of an observer.[51] The difference between epistemologically different entities is given by the threshold, but this time this notion has an ontological meaning (within the hyperontology framework). An epistemological entity cannot observe other epistemologically different entities that belong to EDWs because of the threshold. Evidently, an external epistemological entity cannot pass any threshold. In special circumstances, an epistemological entity can disappear in an EW but it cannot move into another EW. A new epistemological entity (like a planet) can appear (or disappear) in an EW just because a corresponding amalgam of micro-entities from another EW are related together (or separated) by certain epistemological interactions. Finally, I assert that the differences between the "it" and the "I" are: a) they belong to EDWs; b) they have an external vs. an internal status of existence and c) the evolution in special conditions for appearance of the "I" (and living entities) have evolved from "it"s.

Working within the unicorn-world, the major mistakes have been either (a) the mixtures of various judgments with notions that describe epistemologically different entities that belong to EDWs, or (b) the elaborations of judgments that relate uncontained concepts (the mixture of notions that describe

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[51] We can say the same thing about the galaxies and the space beteen them. Dark matter and energy would be the same thing as the space between the electrons and protons. I believe that we can understand the expansion of the galaxies only if we apply the EDWs and transform the galaxies and the space between them into another, yet unknow, EW. In this way, we have to think of a new force from a new EW that produces the expansion of galaxies. Dark energy and dark matter are just pseudo-notions within the unicorn-world.

epistemologically different entities or epistemologically different phenomena that belong to EDWs). Thus, some contradictions about the existence of various entities have dominated science and philosophy in the last century as to what really exists within the unicorn-world – macro-particles or/and micro-particles, waves or/and corpuscles, mind or/and brain. In order to avoid using these judgments that have no objective reality, we have to change our framework, i.e., to replace the unicorn-world with the EDWs.

Conclusion

In this book, I showed that because of the unicorn-world framework, the mind-brain problem and related problems are pseudo-problems, and all approaches that try to solve these problems are just complicated Ptolemaic epicycles. All actual notions from philosophy of mind/cognitive science that are used for such pseudo-problems are pseudo-notions. Moreover, there are not only pseudo-concepts and pseudo-theories but also particular pseudo-sciences like cognitive neuroscience.

The unicorn-world framework has dominated philosophy and science in general even after the appearance of quantum mechanics in the first decades of previous century. Great thinkers like Descartes, Spinoza, Hume, Berkeley, Kant, Einstein, Bohr, and Carnap could not construct an accurate perspective of the "world" just because the world does not exist. Even if they elaborated their theories within the unicorn-world, I could insert some isolated elements from their approaches into the structure of the EDWs perspective. Nevertheless, I emphasize again that the EDWs perspective is in general a kind of extension of Kant's transcendental idealism, an extension that reject the existence of the unicorn-world. We saw in Chapter 6 that in the last century the majority of philosophers gave up on Kantian constitutive elements (mainly intuitions) in explaining the "world", focusing on relativizing Kantian categories and principles. With the EDWs perspective, I extend Kant's conditions of experience (pure intuitions of space and time plus the categories) to different conditions of observation and then to different conditions of interaction. In this way I "return to Kant", i.e., to his *constitutive* elements and I extend his approach by replacing the Kantian one-to-one relationship with a many-to-hyperone (epistemologically different constitutive interactions-to-hyperverse). Constituting the epistemologically different entities, the epistemologically different interactions offers them an existential status and thus essential contradictions and problems from science and philosophy are discarded. All micro- and macro-particles, waves and corpuscles, minds and brains exist but in the EDWs. Those much-wanted interactions between micro-particles (comprehended by quantum mechanical theory) and macro-particles (characterized by Einstein's theory of relativity) or between mind and brain exist only in the unicorn-world not in hyperverse! In this sense, I discard ambiguous notions such as levels, emergence, supervenience, and mental causation. Moreover, I reject quantum properties like complementarity and superposition or entanglement, nonlocality and nonseparability or decoherence by showing that the particles and the waves belong to the EDWs. Only by putting together the mind and brain or waves and the particles in the "uni-verse" (or the unicorn-world, a "normal" paradigm since ancient times) could there appear such "anomalous" or "spooky" (Einstein) features. Tegmark enumerates the bizarre phenomena that appear whenever we depart from events on the human scale: "at high speeds (time slows down), on small scales (quantum particles can be at several places at once), on large scales (black holes), at low temperatures (liquid helium can flow upward), at high temperature (colliding particles can change identity), etc." (Tegmark 2004, p. 489) In fact, at least in some cases, there are EDWs and not the unicorn-world with all such "bizarre" or "fuzzy" phenomena. Working, as everybody within the unicorn-world, Dyson is right in saying that "philosophy, like quantum mechanics, is always a little fuzzy". (Dyson 2004, p. 74) In reality, many eternal philosophical problems and some "mysteries" of quantum mechanics are the consequences of human thinking within the unicorn-world paradigm. As we saw in Chapters 3 and 6, we can avoid all these problems if we accept all six principles and reject the "unicorn-world" paradigm, the strong distinction between "ontology" and "epistemology" and the pseudo-distinction between the "I" and "its" mental representations.

After Copernicus, Darwin and Freud's revolutions against myths in human thinking, we have to reject yet another myth: the "world" does not exist and we are not the only observers. We are not a special kind of "participator" in the "universe" that can influence the past and construct it. (Wheeler) We are this kind of "participator" only in creating the "unicorn-world". Therefore, it is necessary once again to mount a Copernican revolution for discarding our "special" status. All epistemologically different entities (including human beings) have the same status of "participating" within the EDWs. The extension of Kantian transcendentalism takes place through replacing the "unicorn-world" with the EDWs and extending "observation" to "interaction" and the "I" to the "it".

Peter Woit, a mathematical physicist at Columbia University, wrote a recent book on "t*he failure of string theory and the continuing challenge to unify the laws of physics*" (this is the subtitle of his book, Woit 2006).[1] Without having any contact with reality, physicists and mathematicians try to replace our common reality that has four dimensions (three spaces and time) with a "reality" having ten or eleven dimensions. Woit considers that string theory has nothing in common with reality;

[1] See also his article (Woit 2007) on the same topic.

it is constructed only using mathematical tools. From the EDWs perspective, we can see that trying to unify all four physical forces within the unicorn-world means to create science-fiction stories. It is quite amazing that so many incredibly clever scientists can make such mistakes. Given this, how can we judge the philosophers' mistakes of working under the paradigm of the unicorn-world and being unable to solve various philosophical problems like the mind-body problem but proposing so many alternatives during several centuries? There are two reasons for this situation: human imagination and the recognition of failure. Human imagination is very strong in elaborating theories and approaches and researchers cannot very readily accept the failure of their work. Regarding the first element, we have to remember that Einstein said that imagination is more important than knowledge. However, as ever, we need to bring the imagination under control. Like at other times in the history of human thought, we have to install some limits to human imagination in both science and philosophy. Imposing such limits does not mean to return to something similar to the movement of logical positivism at the beginning of the 20th Century as a reaction against the "moldy" metaphysics of the end of the 19th Century. In elaborating scientific theories and philosophical approaches, we have to combine our imagination with our knowledge, but we have to continuously keep in touch with the corresponding EDWs. Regarding the second element, we need to be able to recognize the failure of our scientific theories or philosophical approaches produced by our imagination. Let me quote a paragraph from Daniel Friedan to be found in Woit's book:

> Recognizing failure is a useful part of the scientific strategy. Only when failure is recognized can dead ends be abandoned and useable pieces of failed programs be recycled. Aside from possible utility,

> there is a responsibility to recognize failure. Recognizing failure is an essential part of the scientific ethos. Complete scientific failure must be recognized eventually. (Ch. 12, n.16) (Woit 2006, p. 259)

And Woit continues:

> The failure of the superstring theory program must be recognized and lessons learned from this failure before there can be much hope of moving forward. As long as the leadership of the particle theory community refuses to face up to what has happened and continues to train young theorists to work on a failed project, there is little likelihood of new ideas finding fertile ground in which to grow. Without a dramatic change in the way theorists choose what topics to address, they will continue to be as unproductive as they have been for two decades, waiting for some new experimental result finally to arrive.

I believe that it is now time to change the old paradigm, the unicorn-world paradigm, with a new one, the EDWs paradigm, not only in philosophy but also in science. Woit quotes a famous mathematician Michael Atiyah ("Atiyah is one of the greatest mathematicians of the second half of the twentieth century..." – Woit 2006, p. 265) who gave a talk "The interaction between geometry and physics" at a conference at Harvard University on "The unity of mathematics" in September 2003.

> If we end up with a coherent and consistent unified theory of the universe, involving extremely complicated mathematics, do we believe that this represents 'reality'? Do we believe that the laws of nature are laid down using the elaborate algebraic machinery that is now emerging in string theory? Or is it possible that nature's laws are much deeper, simple yet subtle, and that the mathematical description we use is simply the best we can do with the tools we have? In other words, perhaps we have not yet found the right language or framework to see the ultimate simplicity of nature. (Atiyah 2003 in Woit 2006, p. 265)

Indeed, in both science and philosophy, it is necessary to find a new framework and this is, I believe, the EDWs perspective. More than this, such a new framework of science and philosophy entails a new framework of thinking in general, because the "world" has dominated our life since our species first began to think. This is the most difficult thing to change especially for those who are already too much incarcerated in an old paradigm of thinking! It is neither, as Atiyah mentioned above, about the simplicity of nature nor about the multiplicity of the multiverse, but about the EDWs. "Nature" is not simple but subtle in being not the unicorn-world but the EDWs. My approach is not only negative in rejecting so many things in philosophy and science but also positive in proposing the requisite new framework, the EDWs perspective. My message is mainly for young philosophers and scientists who prefer not to waist their time researching under the umbrella of the unicorn-world.

I strongly emphasize that the conclusion of this book is that the perspective of the observer or EDWs perspective, with its six principles, turns many problems in the philosophy of mind/cognitive science into pseudo-problems. In fact, in the history of human thought, the same pseudo-framework, this "unicorn-world" view, has produced many errors: we can see today much more complicated Ptolemaic epicycles (that reflect the power of human imagination with its positive and negative characteristics) for many pseudo-problems. The unicorn-world is the oldest and most dogmatic paradigm in the history of human thinking and its replacement with the EDWs perspective may bother many people in both science and philosophy. Following Friedman, (with his meta-paradigms) we can now return, with the EDWs perspective, to the long forgotten image of philosophy that once guided science. Alternatively, if we insist upon applying Occam's razor (since it is easier for some of us to think of one world rather than many EDWs), then the futile process of fabricating very knotty Ptolemaic epicycles for pseudo-problems, such as the mind-body problem, the nature of the "world", the relationship between microscopic and macroscopic entities, "levels of reality" or superstring theory, will continue.

References

Allison, E. Henry: 1983, *Kant's Transcendental Idealism, an Interpretation and Defence*, New Haven, Yale University Press

Anderson, P. W.: 1972, "More is different", *American Association for the Advancement of Science* 177, pp. 393–396

Anderson, P. W. and Stein, D.: 1987, "Broken symmetry, emergent properties, dissipative structures, life", in Eugene F. Yates (ed.), *Self-Organizing System: The Emergence of Order*, Plenum Press, New York

Aydede, Murat, "The language of thought hypothesis", *The Stanford Encyclopedia of Philosophy (Fall 2004 Edition)*, Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/fall2004/entries/language-thought/

Baars, J. Bernard: 1988, *A Cognitive Theory of Consciousness*, Cambridge, MA: Cambridge University Press

Baas Niels and Emmeche Claus: 1997, "On emergence and explanation", in *SFI working paper*, Santa Fe Institute, New Mexico

Barrow, D. John, Davies, C. W. Paul, Harper, L. Charles: 2004, *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity,* Cambridge University Press

Bechtel, William: 1998, "Representations and cognitive explanations: Assessing the dynamicist's challenge in cognitive science", *Cognitive Science* 22(3), pp. 295–318

Bechtel, William and Abrahamsen, Adele: 2002, Connectionism and the Mind – Parallel Processing, Dynamics, and Evolution in Networks, (second edition) Blackwell Publishers

Beer, Rodney: 1995, "Computational and Dynamical Languages for Autonomous Agents", in R. Port and T. van Gelder (eds.), *Mind as Motion: Explorations in the Dynamics of Cognition*, MIT Press, Cambridge, MA

Bickle, John: 1998, *Psychoneuronal Reduction: The New Wave*, Cambridge, MA: MIT Press

Black, B. Ira: 1991, *Information in the Brain: A Molecular Perspective*, MIT Press, Cambridge, MA

Block, Ned: 2003, "Do causal powers drain away?", *Philosophy and Phenomenological Research,* vol. 67, no. 1, pp. 110–127

Bohr, Niels: 1949, "Discussion with Einstein on epistemological problems in atomic physics", in Paul Schilpp (ed.) *Albert Einstein: Philosopher-Scientist*, pp. 201–241 Evanston, I11: Library of Living Philosophers, Cambridge University Press, *Neils Bohr's report of conversations with Einstein and Einstein's reply*

Brook, Andrew: 1994, *Kant and the Mind*, Cambridge and New York:Cambridge University Press

Brooks, A. Rodney: 1991, "Intelligence without representation", *Artificial Intelligence* 47, pp. 139–159

Caianiello, R. Eduardo: 1987, "A thermodynamic approach to self-organizing systems", in Eugene F. Yates (ed.), *Self-Organizing System: The Emergence of Order*, Plenum Press, New York

Carnap, Rudolf: 1928, *The Logical Structure of the World; pseudoproblems in philosophy.* Translated by Rolf A. George, Berkeley, Univ. of California Press, 1967

Carnap, Rudolf: 1950, "Empiricism, semantics, and ontology" reprinted from review *International du Philosophie*, iv (1950), pp. 20–40 in Richard M. Rorty (ed.), *The Linguist Turn*, The University of Chicago Press, 1967

Casti, L. John: 1997, *Would-Be Worlds*, John Wiley and Son Inc.

Casti, L. John: 1995, *Complexification*, Abacus — A Division of Little, Brown and Company

Chalmers, J. David: 1995, Facing Up the Problem of Consciousness, *Journal of Consciousness Studies* 2, pp. 200–219

Chalmers, J. David: 2003, "Consciousness and its place in nature", in S. Stich and T. Wartfield (eds.), *Blackwell Guide to the Philosophy of Mind*, Blackwell

Chalmers J. David: 2006, "Strong and weak emergence", in: Clayton P and Davies P (eds.) *The Re-emergence of Emergence*, Oxford University Press

Chalmers, J. David (forthcoming). "Ontological anti-realism", in D. J. Chalmers, D. Manley & R. Wasserman (eds.), *Metametaphysics: New Essays on the Foundations of Ontology*. Oxford University Press, at http://consc.net/chalmers/

Churchland M. Paul: 1989, "Knowing qualia: A reply to Jackson", in *A Neurocomputational Perspective*, Cambridge, MA, MIT Press reprinted in (1998)

Churchland, M. Paul: 1993/1998, *Matter and Consciousness*, revised edition, A Bradford Book MIT Press

Churchland, M. Paul: 1995, *The Engine of the Reason, the Seat of the Soul*, A Broadford Book, The MIT Press

Churchland, M. Paul: 1998, "Conceptual similarity across sensory and neural diversity: the Fodor-Lepore Challenge answered", *The Journal of Philosophy* 95, no. 1

Churchland, S. Patricia: 1996, "Toward a neurobiology of the mind", in Patricia S. Churchland and Rudolfo Llinas (eds.), *The Mind-Brain Continuum: Sensory Processes*, MIT Press, Cambridge, MA

Churchland, M. Paul and Churchland, Patricia S.: 1990, "Intertheoretic Reduction: a Neuroscientist's Field Guide", *The Neuroscience* 2, pp. 249-56 reprinted in R. Warner and T. Szubka (eds.), *The Mind-Body Problem*, Blackwell Publishing Inc, 1993

Churchland, M. Paul and Churchland, P. Patricia: 1997, "Recent work on consciousness: philosophical, theoretical, and empirical" in Churchland M. Paul and Churchland Patricia S.: 1998, *On the Contrary. Critical Essays, 1987–1997*, A Bradford Book, The MIT Press

Churchland, M. Paul and Churchland, Patricia S.: 1998, *On the Contrary. Critical Essays, 1987–1997*, A Bradford Book, The MIT Press

Clark, Andy: 1997a, *Being There: Putting Brain, Body and World Together Again*, MIT Press, Cambridge, MA

Clark, Andy: 1997b, "The dynamical challenge", *Cognitive Science* 21(4), pp. 461–481

Clark, Andy: 1997c, "From text to process−Connectionism's contribution to the future of cognitive science", in David Martel Johnson and Cristina E. Erling, *The Future of Cognitive Revolution*, Oxford University Press

Clark, Andy: 2001, *Mindware – An Introduction to the Philosophy of Cognitive Science*, New York, Oxoford, Oxford University Press

Crane, Tim: 2001, "The significance of emergence", in Barry Loewer and Grant Gillett (eds.), *Physicalism and its Discontents*, Cambridge University Press

Crick, Francis and Koch, Christof: 1997, "Towards a neurobiological theory of consciousness", in N. Block, O. Flanagan and G. Guzeldere (eds.), *The Nature of Consciousness*, Cambridge, MA: MIT Press, pp. 277–292

Crick, Francis and Koch, Christof: 2003, "A framework for consciousness", *Nature*

Cottingham, J.: 1986, *Descartes*, Blackwell, New York

Damasio, R. Antonio: 1988, "Time-locked multiregional retroactivation: a system proposal for the neural substrates of recall and recognition", *Cognition*, no. 33, pp. 25–62

Damasio, R. Antonio, and Damasio, Hanna: 1996, "Making images and creating subjectivity", in Patricia S. Churchland and Rodolfo Llinas (eds.), *The Mind-Brain Continuum: Sensory Processes*, MIT Press, Cambridge, MA

Davies, C. Paul: 2004, "John Archibald Wheeler and the clash of ideas", in D. Barrow, John Davies, C. W. Paul, Harper, L. Charles: 2004, *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity,* Cambridge University Press

Davies, C. Paul: 2006, *The Goldilocks Enigma*, Allen Lane an imprint of Penguin Books

Descartes, René: 1994, *A Discourse on Method; Meditations on First Philosophy, Principles of Philosophy*, translated by J. Veitch, Everyman

Descartes, René: 1984, *The Philosophical Writings of Descartes*, translation by John Cottingham, Robert Stoothoff, and Dugald Murdoch with an introduction by John Cottingham, Cambridge; New York: Cambridge University Press, 1984–1991

Descartes, René: 1954, *Philosophical Writings, a Selection*, translated and edited by Elisabeth Anscombe and Peter Thomas Geach; with an introduction by Alexandre Koyre

Davidson, Donald: 1970, "Mental events", in Davidson Donald, *Essays on Actions and Events*, Oxford University Press 1980

Davidson, Donald: 1972, "Philosophy of Psychology", in Davidson Donald, *Essays on Actions and Events*, Oxford University Press 1980

Davidson, Donald: 1974. "On the very idea of a conceptual scheme", in *Inquiries into Truth and Interpretation*, Oxford: Oxford University Press, 2001, Oxford Scholarship Online. Oxford University Press

Deutsch, David: 1997, *The Fabric of Reality*, Publisher Allen Lane, The Penguin Press

Diaz, J-L: 2000, "Mind – body unity, dual aspect, and the emergence of consciousness", *Philosophical Psychology*, vol. 13, no. 3, pp. 393–403(11)

Dyson, J. Freeman: 2004, "Thought-experiments in honour of John Archibald Wheeler", in D. John Barrow, C. W. Paul Davies, L. Charles Harper: 2004, *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity,* Cambridge University Press

Edelman, M. Gerald: 1992, *Bright Air, Brilliant Fire*, New York, Basic Books

Edelman M. Gerald and Giulio Tononi G.: 2000, *Universe of Consciousness: How Matter Becomes Imagination*, Basic Books

Elman L. Jeff, Bates A. Elisabeth, Johnson H. Mark, Karmiloff-Smith A., Parisi D. and Plunkett, Kim: 1996, *Rethinking Innateness. A Connectionist Perspective on Development*, MIT Press

Emmeche C., Køppe S., and Stjernfelt, F.: 2000, "Levels, emergence, and three versions of downward causation", in: Andersen P. B., Emmeche C., Finnemann N. O., and Christiansen P. V. (eds.) *Downward Causation. Minds, Bodies and Matter*, Aarhus University Press

Fisher, W. Kurt and R. T. Bidell: 1998, "Dynamic development of psychological structures in action and thought", in W. Damon (chief-ed.), *Handbook of Child Psychology*, Fifth edition, Vol. 1: *Theoretical Models of Human Development*, R. M. Lerner (vol. ed.), John Wiley & Sons, Inc.

Fodor, A. Jerry: 1974, "Special sciences or the disunity of science as a working hypothesis", Synthese 28, pp. 77–115, reprinted paper

Fodor, A. Jerry: 1981, "The mind-body problem", in *Scientific American* 244, no. 1, pp. 114-23 reprinted in: R. Warner and M. T. Szubka (eds.), *The Mind-Body Problem,* Blackwell Publishing Inc, 1993

Fodor, A. Jerry & Pylyshyn, W. Zenon: 1988, "Connectionism and cognitive architecture", *Cognition* 28, pp. 3–71

Fowler, F. Colin: 1999, *Descartes On the human Soul: Philosophy and the demands of Christian Doctrine*, Kluwer Academic Publishers, Dordrecht, Boston, London

Friedman, Michael: 1992, *Kant and Exact Sciences*, Cambridge, Mass., Harvard University Press

Friedman, Michael: 1999, *Reconsidering Logical Positivism*, Cambridge: Cambridge University Press

Friedman, Michael: 2000, "Transcendental philosophy and a priori knowledge: A neo-Kantian perspective", in Paul Boghossian and Christopher Peacocke, (eds.), *New Essays on the A Priori*, Clarendon Press

Friedman, Michael: 2001, *Dynamics of Reasoning*, CSLI Publications, Standford, California

Gardner, Sebastian: 1999, *Kant and the Critique of Pure Reason*, London, New York: Routledge

Gaukroger, Stephen: 2002, *Descartes' system of natural philosophy*, Cambridge University Press, New York

Georgopoulos, P. Apostolos: 1988, "Neural integration of movement: The role of motor cortex in reaching", FASEB Journal, no. 2

Globus G. Gordon: 1992, "A noncomputational theory", *Journal of Cognitive Neuroscience,* 4

Globus, G. Gordon: 1995, *The Postmodern Brain*, John Benjamins

Gödel, Kurt: "Is mathematics syntax of language" in Kurt Gödel, *Complete Works*, (ed.) Solomon Feferman (ed.-in-chief), Oxford University Press, 1995

Goldfarb, Warren: 1995, "Comments on Gödel's article 'Is mathematics syntax of language'" in Kurt Gödel, *Complete Works*, Solomon Feferman (ed.-in-chief), Oxford University Press, 1995

Goldfarb, Warren: 1995, "Introductory note to 1953/9 to K. Gödel, 'Is mathematics syntax of language?'" in S. Feferman (ed. in chief), *K. Gödel – Collected Works*, vol. II, Oxford University Press.

Goodman, Nelson: 1951, *The structure of appearance*, III ed., D. Reidel Publishing Company

Goodman, Nelson: 1978, "The way the world is", in "*Problems and Projects*", T. Bobbs-Merrill Company, Inc.

Goodman, Nelson and Elgin, C. Z.: 1988, "Interpretation and identity. Can the work survive the world?", in N. Goodman and C. Z. Elgin:

Reconceptions in Philosophy and other Arts and Sciences, Indianapolis: Hackett Pub. Co.

Grantham, A. Todd: 2004, Conceptualizing the (dis)unity of science, Philosophy of science 71, pp. 135–15

Greene, Brian: 2004, *The Fabric of Cosmos; Space, Time and the Texture of Reality*, Vintage Books, New York

Haken, Hermann: 2000, "From visual perception to decision making: A synergetic approach", in A. Carsetti, (ed.), *Functional Models of Cognition, Self-Organizing Dynamics and Semantic Structures in Cognitive Systems*, Kluwer Academic Publishers, Dordrecht

Hanna, Robert: 2001, *Kant and the Foundations of Analytic Philosophy*, Clarendon Press: Oxford University Press

Hardcastle, Valerie Gray and Stewart, C. Matthew: 2002, "What Do Brain Data Really Show?", Philosophy of Science 69, pp. S72–S82

Harre, Rom: 1986, *Varieties of realism*, Basil Blackwell

Johnson, H. Mark: 1997, *Developmental Cognitive Neuroscience*, Blackwell Publishers

Heil, John: 2004, Philosophy of Mind, second edition, Routledge, NY and London

Horst, Steven: "The computational theory of mind", *The Stanford Encyclopedia of Philosophy,(Fall 2005 Edition)*, Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/fall2005/entries/computational-mind/

Humpreys, Paul: 1997, "How properties emerge", *Philosophy of Science* 64, pp. 1–17

Hütterman, Andreas: 2005, "Explanation, emergence and quantum entanglement", *Philosophy of Science* 72, pp. 114–127

Kaiser, David: 1992, "More roots of complementarity: Kantian aspects and influences", *Stud. Hist. Phil. Sci.*, vol. 23, No. 2, pp. 213–239

Kalin, Ned: 1993, "The neurobiology of fear", *Scientific America* 268(5), pp. 54–60

Kant, Immanuel: *The Critique of Pure Reason*. Trans. N. K. Smith, New York, Modern Library, 1958

Kant, Immanuel: 1950, *Prolegomena to any future metaphysics*, with an introduction by L. W. Beck. Indianapolis: Bobbs-Merrill

Kanwisher, Nancy: 2001, "Neural events and perceptual awareness", *Cognition* 79, pp. 89–113

Karmiloff-Smith, Annette: 1994, "Prĕcis of beyond modularity: A developmental perspective on cognitive science", *Brain and Brain Sciences 17*, pp. 639–745

Kelso, J. A. Scott: 1995, *Dynamic Patterns*, MIT Press/Bradford Books, Cambridge, MA and London, U.K.

Keijzer, Fred: 1997, *The Generation of Behavior: On the Function of Representation in Organism-Environment-Dynamics*, Ph.D. thesis, University of Leiden

Kirsh, David: 1991, "Today the earwig, tomorrow man?", *Artificial Intelligence* 47, pp. 161–184

Kim, Jaegwon: 1998, *Mind in a physical world*, Cambridge, MA: MIT Press

Kim, Jaegwon: 2005, *Physicalism or something near enough*, Princeton University Press

Kim, Jaegwon: 2006, "Emergence: Core ideas and issues", *Synthese*

Klein, B. Stanley: 2004, "The cognitive neuroscience of knowing one's self", in Michael S. Gazzaniga. (ed.-in-chief) *The Cognitive Neurosciences*, 3rd ed., Cambridge, Mass.: MIT Press, c2004

Kossylyn, S. Michael: 1997, "Mental Imagery", in Michael S. Gazzaniga (ed.), *Conversation on Cognitive Science*, MIT Press, Cambridge, MA

Kossylyn, S. Michael and Keonig, O.: 1992, *Wet Mind- the New Cognitive Neuroscience*, The Free Press

Kosslyn, S. Michael and Smith, E. Eduard: 2001, "Higher cognitive functions – introduction", in Michael S. Gazzaniga, (ed.), *Cognitive Neuroscience,* second edition, MIT Press

LaBerge, David: 2002, "Networks of attention", in Michael S. Gazzaniga, (ed.), *Cognitive Neuroscience,* second edition, MIT Press, pp. 711–724

Levin J. "Functionalism", *The Stanford Encyclopedia of Philosophy* (2004 Edition), Edward N. Zalta (ed.), URL = http://plato.stanford.edu/entries/functionalism/

Llinas, Rodolfo and Pare, D.: 1996, "The brain as a closed system modulated by the senses", in Patricia S. Churchland and Rodolfo Llinas (eds.), *The Mind-Brain Continuum: Sensory Processes*, MIT Press, Cambridge, MA.

Lungarella Max and Sporns, Olaf: 2006, "Mapping information flow in sensorimotor networks", *Public Library of Science Computational Biology*, vol. 2 issue 10, pp. 1301–12

Lorenz, Konrad: 1941, "Kant's doctrine of the a priori in the light of contemporary biology", in H. Plotkin (ed.) *Learning, Development and Culture*, Chichester: John Wiley and Sons, 1982

Macrae, C. Neil, Heatherton, F. Todd, & Kelley, M. William: 2004, "A self less ordinary: The medial prefrontal cortex and you", in Michael S. Gazzaniga (ed.-in-chief), *The Cognitive Neurosciences*, 3rd ed., Cambridge, Mass.: MIT Press, c2004

Mandler, Jean: 1998, "Representation", in W. Damon (chief-ed.), *Handbook of Child Psychology*, Fifth edition, vol. 2: *Cognition, Perception, and Language*, Deanna Kuhn and Robert S. Siegler (vol. eds.), John Wiley, London

Marcus, F. Garry: 2001, *The Algebraic Mind – Integrating Connectionism and Cognitive Scien*ce, A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England

Marcus, Eric: (forthcoming) "Mental causation in a physical world", *Philosophical Studies*

Maudlin, Tim: 1996, "On the unification of physics", *The Journal of Philosophy* 93, no. 3, pp. 129–144

Maye, A., Hsieh C-h, Sugihara G., Brembs B.: 2007, Order in spontaneous behavior, PLoS ONE 2(5):e443.doi:10.1371/journal.pone.0000443

McCauley, N. R.: 1998, "Levels of explanation and cognitive architectures", in W. Bechtel and G. Graham (eds.), *A Companion to Cognitive Science*, Blackwell, Oxford

McClelland, L. James, Rumelhart E. David, and the PDP Research Group: 1986, *Parallel Distributed Processing: Explorations in the Microstructure of Cognition. Volume 2: Psychological and Biological Models*, MIT Press, Cambridge, MA.

McGinn, Colin: 1989, "Can we solve the mind-body problem?", *Mind,* 98, pp. 349-66, reprinted in R. Warner and T. Szubka (eds.), *The Mind-Body Problem*, Blackwell Publishing Inc, 1993

McGinn, Colin: 2001, "What is not like to be a brain", in P. van Loocke (ed.), *The Physical Nature of Consciousness*, J. Benjamins Publishing Company

McLeod Peter, Rolls T. Edmund, Plunkett Kim: 1997, *Introduction to Connectionism*, Oxford University Press

Merzenich, M. Michael and Christofor R. deCharms: 1996, "Neural representations, experience and change", in Rodolfo Llinas and Patricia S. Churchland (eds.), *The Mind-Brain Continuum: Sensory Processes*, MIT Press, Cambridge, MA.

Morisson, Margaret: 2006, "Emergence, reduction, and theoretical principle: rethinking fundamentalism", *Philosophy of Science* 73, pp. 876–887

Nagel, Thomas: 1974, "What is it like to be a bat?", *Philosophical Review* 4 LXXXIII: 435–450

Nagel, Thomas: 1993, "Consciousness and objective reality", in R. Warner and T. Szubka (eds.), *The Mind-Body Problem*, Blackwell Publishing Inc, 1993

O'Brian, L. F.: 1996, "Solipsism and self-reference", *European Journal of Philosophy* 4, pp. 175–194

O'Connor, Timothy and Wong, Hong-Yu: 2005, "The metaphysics of emergence", *Nous*, pp. 39–4

O'Connor, Timothy and Wong, Hong-Yu: 2005, "Emergent properties", in: Zalta E N (ed.), *The Stanford Encyclopedia of Philosophy* (Summer 2005 Edition), URL = http://plato.stanford.edu/archives/sum2005/entries/properties-emergent/

Parvu, Ilie: 2004, *Posibilitatea Experientei,* (in English *The Possibility of Experience*), Politeia-SNSPA

Place, T. Ullin: 1956, "Is consciousness a brain process?", *British Journal pf Psychology* in (eds.) Brian Beakley and Peter Ludlow, *The Philosophy of Mind*, A Bradford Book, The MIT Press

Place, T. Ullin: 1988, "Thirty years on-is consciousness still a brain process?", *Australasian Journal of Philosophy*, 66, 2, pp. 208–219

Penrose, Roger: 1997, *The Large, the Small and the Human Mind*, with A Shimony, N. Carthwright, and S. Hawking, ed. Malcom Lougair, Cambridge University Press

Penrose, Roger: 2004, *The Road to Reality. A complete Guide to the Laws of the Universe,* Jonathan Cape London

Piccinini, Gualtiero: 2006, "Computational explanation in neuroscience", Synthese

Pippin, B. Robert: 1997, *Idealism As Modernism – Hegelian Variations*, Cambirdge University Press

Pitt, David: "Mental Representation", *The Stanford Encyclopedia of Philosophy (Winter 2005 Edition)*, Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/win2005/entries/mental-representation/

Prigojine, Ilya: 1992, *De la Existenta la Devenire, Timp si complexitate in stiintele fizice*,

Editura Stiintifica, translation of *From Being to Becoming*, 1980, San Francisco

Prinz, J. Jesse: 2006, "Is the mind really modular" in Robert J. Stainton (ed.) Contemporary debates in cognitive science, Blackwell Publishing

Putnam, Hillary: 1987, *The Many Faces of Realism*, Open Court, La Salle, Illinois

Putnam, Hillary: 1990, "A defence of Internal realism", in *Realism with a Human Face*, (ed.) James Conant, Harvard University Press

Putnam, Hillary: 2005, "A philosopher looks at quantum mechanics (again)", *British Journal of Philosophy of Science* 56, pp. 615–634

Pylyshyn (2006), "Mental imagery" in *The Oxford Companion to the Mind, Second Edition*

Quine, V. O. Willard: 1951, "Two dogmas of empiricism", *Philosophical Review* 60, pp. 20–43

Quine, V. O. Willard: 1968, "Ontological relativity", *The Journal of Philosophy*, vol. LXV, No. 7, in Quine, W.V. in *Ontological Relativity and Other Essays*, New York: Columbia University Press, 1969

Quine, V. O. Willard: 1997, "Natural kinds", in *Relativized Ontology and other Essay*, New York: Columbia University Press, 1969

Ramachandran, S. Vilayanur and Sandra Blakeslee: 1998, *Phantoms in the Brain*, William Morrow and COMPANY, Inc. New York

Ramachandran, S. Vilayanur: 2003, "Synapses and the brain", at www.bbc.co.uk/radio4/reith2003/lecture2.shtml

Raichle, E. Marchus: 2006, "The brain's dark energy", *Neuroscience* vol. 314, pp. 1249–1250

Ramsey, William, "Eliminative materialism", *The Stanford Encyclopedia of Philosophy (Fall 2003 Edition)*, Edward N. Zalta (ed.), URL http://plato.stanford.edu/archives/fall2003/entries/materialism-eliminative/

Rockwell, Teed: 2003, “Eliminativism” in *Dictionary of Philosophy*, on web page: (ed.) Chris Eliasmith, http://philosophy.uwaterloo.ca/MindDict/

Robb, David and Heil, John: 2005, “Mental causation”, in Zalta E N (ed.), *The Stanford Encyclopedia of Philosophy* (Spring 2005 Edition), URL = http://plato.stanford.edu/archives/spr2005/entries/mental-causation/

Romanos, D. George: 1983, *Quine and Analytic Philosophy*, A Bradford Book, The MIT Press

Rolls, T. Edmund: 2001, “Representations in the brain”, *Synthese* 129, no. 2

Rumelhart, E. David, McClelland L. James, and the PDP Research Group: 1986, *Parallel Distributed Processing: Explorations in the Microstructure of Cognition. Volume 1: Foundations*, MIT Press, Cambridge, MA.

Searle, R. John: 1984, “Minds, brains, and programs” *Behavioral and Brain Sciences*, vol. 3, 1980 Cambridge University Press

Searle, R. John: 1991, “Response to the mind-body problem”, in E. Lepore and R. Van Gulick (eds.), *John Searle and His Critic*, Blackwell Publishing Inc.

Searle, R. John: 1992, *The Rediscovery of the Mind*, MIT Press

Searle, R. John: 1995, “Consciousness, the brain and the connection principle: a reply”, *Philosophy and Phenomenological Research* 55. pp. 217–232

Searle, R. John: 1999, “The Chinese room”, in Wilson, R. A. and F. Keil (eds.), *The MIT Encyclopedia of the Cognitive Sciences*, Cambridge: MIT Press

Skarda, A. Christine and Freeman, J. Walter: 1987, “How the brain make chaos in order to make sense of the world”, *Behavioral and Brain Sciences* 10, pp. 161–195

Slezak, Peter: 2002a, “The imagery debate: *Déja vu* all over again? Commentary on Zenon Pylyshyn”, *Behavioral and Brain Sciences*, Vol. 25, No. 2, April, pp. 209–210

Slezak, Peter: 2002b, “The tripartite model of representation”, *Philosophical Psychology*, Vol. 13, No. 3, pp. 239–270

Smart, J. J. C.: 1962, “Sensations and brain processes”, in V. C. Chappell (ed.) *The Philosophy of Mind*, Englewood

Smart, J. J. C.: "The identity theory of mind", *The Stanford Encyclopedia of Philosophy (Fall 2004 Edition)*, Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/fall2004/entries/mind-identity/

Smolensky, P.: 1988, "On the proper treatment of connectionism", *Brain and Behavioral Science* 11, pp. 1–74

Staff, W.: 2006, "Good information – It's not all about the brain", at http://www.terradaily.com/reports/Good_Information_It_Not_All_About_The_Brain_999.html

Scholz, J.: 2004, "Emergence in cognitive science: Clark's four proposals to the emergentists", *Publications of the Institute of Cognitive Science*, vol. 10, at www.cogsci.uni-osnabrueck.de/ PICS/PICSvol10_2004_Scholz.pdf

Silberstein, Michael and McGeever, John: 1999, "The search for ontological emergence", *The Philosophical Quarterly*, 49:145, pp. 182–200

Smolensky, Paul: 1988, "On the proper treatment of connectionism", *The Behavioral and Brain Sciences* 11, pp. 1-74

Stephen, Achim: 1998, "Varieties of emergence in artificial and natural systems Emergence", Institute fur Philosophie der Universitat

Stephen, Achim: 2002, "Emergentism, irreducibility and downward causation", *Grazer Philosophische Studien*, 65, pp. 77-93

Stubenberg, Leopold: "Neutral monism", *The Stanford Encyclopedia of Philosophy (Spring 2005 Edition)*, Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/spr2005/entries/neutral-monism/

Sporns, Olaf in "Good Information? It's Not All About The Brain", November 2006, http://www.sciencedaily.com/releases/2006/10/061027081145.htm

Tegmark, Max: 2004, "Parallel universes", in D. John Barrow, C. W. Paul Davies, L. Charles Harper: 2004, *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity,* Cambridge University Press

Tegmark, Max and Wheeler, John Archibald: February 2001, "100 years of quantum mysteries", *Scientific American*

Thelen, Esther and Smith, Linda: 1994, *A Dynamic Systems Approach to the Development of Cognition and Action*, MIT Press, Cambridge, MA

Thelen, Esther and Smith, Linda: 1998, "Dynamic system theories", in W. Damon (chief-ed.), *Handbook of Child Psychology*, Fifth edition, Vol. 1: *Theoretical Models of Human Development*, Richard M. Lerner (vol. ed.), John Wiley, London

Terhesiu, Dalia and Vacariu, Gabriel: 2002, "Brain, mind and the perspective of the observer", *Revue Roumaine de Philosophie*, 46, no. 1–2

Treisman, Anne: 1998a, "The binding problem", *Current Opinion in Neurobiology*

Treisman, Anne: 1998b, "Feature binding, attention, and object perception", *Phil. Trans. R. Soc. London*. B, 353, pp. 1295–1306

Vacariu, Gabriel: 2005, "Mind, brain and epistemologically different worlds", *Synthese* 147, pp. 515–548

Vacariu, Gabriel: 2007, "Kant, philosophy in the last 100 years and an epistemologically different worlds perspective", *Revue Roumaine de Philosophie*, 51, no. 1–2, pp. 143–176

Vacariu, Gabriel, Terhesiu, Dalia and Vacariu Mihai: 2001, "Toward a very idea of representation", *Synthese,* 129, no. 2

Van Geert, Paul: 1991, "A dynamic system model of cognitive and language growth", *Psychological Review* 98(1), 3–35

Van Geert, Paul: 1994, *Dynamic System of Development, Change between Complexity and Chaos*, Harvester Wheatsheaf, New York and London.

Van Gelder, Tim: 1995, "What might cognition be if not computation?", *Journal of Philosophy* 92, pp. 345–381

Van Gelder, Tim: 1999, "Defending the dynamical hypothesis", in W. Tschacher and J. P. Dauwalder (eds.), *Dynamics, Synergetics, Autonomous Agents: Nonlinear Systems Approaches to Cognitive Psychology and Cognitive Science*, World Scientific, Singapore.

Van Gelder, Tim and Port, F. Robert: 1995, "It's about time: A perspective to dynamical system approach to cognition", in R. Port and T. van Gelder (eds.), *Mind as Motion: Explorations in the Dynamics of Cognition*, MIT Press, Cambridge, MA

Warner, R.: 1993, "Introduction: The mind-body debate", in R. Warner and T. Szubka (eds.), *The Mind-Body Problem*, Blackwell Publishing Inc.

Van Gulick, Robert: 2001, "Reduction, emergence and other recent options on the mind/body problem – A philosophic overview", *Journal of Consciousness Studies*, 8, No. 9–10, pp. 1–34

Wahl, Russell: 1999, "How can what I perceive be true?", in T. Sorrell (ed), *Descartes* Aldershot, England, Brookfield, Vt.: Ashgate

Warner, Richard: 1993, "Introduction: The mind-body debate", in R. Warner and T. Szubka (eds.), *The Mind-Body Problem*, Blackwell Publishing Inc.

Waxman, Wayne: 1995, "Kant on the possibility of thought: universals without language", *Review of Metaphysics*, 48: 4, pp. 809–57

Webpage of *First International Conference on Self-Adaptive and Self-Organizing Systems* (Boston, Mass., USA, July 9–11, 2007): http://projects.csail.mit.edu/saso20

Wheeler, Michael and Clark, Andy: 1999, "Genic representation: reconciling content and causal complexity", *The British Journal for Philosophy of Science* 50(1), pp. 103–135

Wilson, Catherine: 1976, "The epistemological argument for mind-body distinctness", N*ous*, vol. X, 3–15, in John Cottingham, 1998, *Descartes*, Oxford, New York: Oxford University Press

Wilson, Catherine: 2002, "Descartes and the corporeal mind, – Some implication of the Regius affair", in S. Gaukroger and John Sutton (eds.), *Descartes's Natural Philosophy*, London, Routledge, 2000, pp. 659–679

Wittgenstein, Ludwig: 1961, *Tractatus Logico-Philosophicus*, transl. D. F Pears and B. F. MacGuinness, Lodon: Routledge & Kean Paul

Wraga and Kossylyn (2003), "Imagery" in *Encyclopedia of Cognitive Science*, Nature Publishing Group

Woit, Peter: 2006, *Not Even Wrong – The Failure of String Theory and the Continuing Challenge to Unify the Laws of Physics,* Jonathan Cape, London

Woit, Peter: 2007, "The problem with physics", *Cosmos* 16, pp. 48–56

Yalowitz, Steven: "Anomalous monism", *The Stanford Encyclopedia of Philosophy (Winter 2005 Edition)*, Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/win2005/entries/anomalous-monism/

Zeh, H. Dieter: 2004, "The wave function: it or bit?", in D. John Barrow, C. W. Paul Davies, L. Charles Harper: 2004, *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity,* Cambridge University Press

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