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A Conceptualist Survey of Physical Theories

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The main thesis intended in this paper consists in that scientific knowledge of the physical world entails a conceptualization of it in a certain mode which is *relative* to, and dependent on, the theory assumed or constructed. Physical theories embody conceptual systems that at once make possible and limit our conceptualization of how the world is and our cognitive access to what happens in it. From a conceptual holism (Brown, 2007), we try to maintain that since we think of the world and understand what occurs in it by systems of concepts, they acquire major relevance to a philosophical stance about scientific knowledge. In a holistic sense, delimited, at least, by the system of concepts of a given theory, concepts have both a theoretical laden to scientific experience, according to the thesis of Hanson (1958), and an ontological laden to the world, which consists in that the statements that one can assert about the physical world, the entities, and systems that one can describe as well as the claims that one holds about the processes undergone by the physical systems are dependent on and relative to such conceptual system of such theory. Thus, the framework displayed here contrasts with the epistemological realist thesis in the sense that we cannot claim how the world is really but rather how we conceptualize it relative to our theory. In addition, we expose an epistemic concept of valid statement, relative to a theory, which becomes consistent and even complementary to the framework provided.

Keywords: relative, conceptual system, conceptual holism, connotation, validity, realism

Introduction

Some philosophers, such as Quine, Kuhn, and Putnam, have proposed relativist theses about science that are in confrontation with the realist conception of science maintained by Popper, Niiniluoto, Psillos, Devitt, and so many others, which resort to a philosophical absolutist view. There are many, to some extent, different formulations of realist theses, either epistemological or ontological, which could be homogenous. In contrast, the proposals of the former philosophers are quite different and perhaps what they share is only that their frameworks are relativist in character. There is not a single label to name their proposals. Terms that have been used are Quine's conceptual relativism, Kuhn's epistemological relativism, and Putnam's internal realism.

We intend here a view about contemporary physical theories that we label "conceptualism", which is in the order of ideas of the relativist frameworks of the prior philosophers.[1] Although relativism is a current general issue (Kusch, 2020), our proposal is just epistemological. We borrow key ideas from Quine and Kuhn, and somebody could find that our stance is somewhat cognate with that of Putnam.

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[1] "Conceptualism" is the term that Quine (1948/1953) uses to refer to the philosophical stance—in opposition to realism and nominalism—about the existence of universals or abstract entities with respect to the medieval controversy on such issue, which holds that there are universals, as abstract entities, but they are mind inventions. Our intended use of that term is, in some aspect, different but it is congenial with the previous in the sense that we hold that physical concepts are abstract in character, products of our mind.

We focus on epistemological questions about physical theories, and only at the final do we make some remarks on related ontological matters. Our main thesis intended here is that scientific knowledge of the physical world entails a conceptualization of it in a certain mode that is relative to, and dependent on, the theory assumed or constructed. Our epistemological theses contrast with those of scientific realism, but we will instead try to elaborate on the conceptualist view rather than refute the realist theses.

We emphasized that a physical theory contains a conceptual system which is a web of interconnected concepts—both kind concepts and quantitative concepts—linked by several sorts of relationship, through which one can *conceptualize* in certain modes the entities and processes in the domain of such theory, on base of which one claims to know those entities and processes. Hence, an appropriate notion of a conceptual system becomes a central pillar of the conceptualist view of scientific knowledge intended here. That notion will be proposed below from a local conceptual holism, that is, an approach according to which a web of interrelated concepts, owned by a physical theory, conforms a bounded whole by that theory—but possibly connected to concepts of related, presupposed, or complementary theories, if any, and even theories about the instruments used in the application of the theory in question.

The central concept in the classical debate realism/antirealism about science is that of truth as correspondence with the facts, which seems to be understood by philosophers on both sides of the debate in an absolutist sense. For example, Popper (1963) explicitly adopts what he calls the objective or absolute concept of truth whereas when Kuhn (1970) rejects the claims about true theories, he is thinking about that absolute sense of truth.

Putnam (1981) develops an internal realism as an alternative to the absolutist view which he calls metaphysical realism, proposing a concept of truth as what would be justified to assert under ideal epistemic conditions, and trying to improve a new version of realism that would be consistent with his relativistic approach.

On the other side, in the Kuhnian vein, Harold Brown (1979) elaborated two socio-historical concepts, labeled "knowledge_2" and "truth_2", to distinguish such concepts from the traditional ones, largely embraced by realist philosophers, which in his book are labeled "knowledge_1" and "truth_1". We think that this recourse is insufficient to separate different concepts; a terminological change would be better as we do below.

Besides, many philosophers write about true laws and theories without an explicit specification of what they understand by truth, but rather assuming that everybody knows what a true statement is. An exemplar case of this is Hempel's model of deductive nomological explanations since he stipulates as a condition for explanations that the statements that conform to the *explanans* must be true, implying that the scientific laws are true. Otherwise, for logical reasons, one cannot assert that the *explanandum* is true and, thus, does not explain anything (Hempel, 1966).

It can be said that the classical debate realism/antirealism is permeated to a large extent by that absolute concept of truth in such a way that precludes anyone from attempting to hold a concept of truth in a relativist sense. For that reason, we decline the concept of true theories in their traditional absolute sense in the field of philosophy of science.

Firstly, we briefly expose the main theses of conceptualism, which are epistemological in character. Secondly, we give a survey of the sorts of concepts that are characteristic of physics—namely, class and quantitative concepts—that would conform to the conceptual system of a theory. Also, very roughly, we examine the theory of conceptual systems due to Brown, which is somewhat linked with our proposal. To bring a place to a concept of valid statement, we consider and criticize Devlin's metaphysical thesis on a concept of truth about phenomenal worlds. Then, borrowing some key ideas from Kuhn, we develop a relativist concept of valid statement instead of the realist concept of true statement, which becomes consistent with and complementary to our main epistemological theses on physical theories. Finally, we make some general remarks on epistemological and ontological matters.

Conceptualist Theses

Let us now advance the main conceptualist thesis. As an epistemological stance, conceptualism maintains that our knowledge of the world, the way of thinking and understanding the domains of diverse physical theories, is *relative* to the theories that we assume or construct; our scientific knowledge is especially relative to the conceptual systems contained in such sorts of theories. To talk about scientific knowledge of the physical world amounts to saying that the theories that bear such knowledge have been validated by scientists via observations and experiments, in other words, they have found that those theories hold in the intended applications within their domains.

A bit more specific, the conceptualism supports the claim that it is only from, and through, the framework of a theory that one obtains a *conceptualization* of how the world is, in a certain mode. In this way, our purported scientific knowledge of the world, our *understanding* of the entities and processes with which we get cognitive interactions via experimental devices in a given physical field, is relative to, and dependent on, the theoretical framework in consideration.

If we say that physical theories such as classical mechanics, electromagnetism, quantum mechanics, relativity, and so on, are theories that bear our contemporary scientific knowledge of the physical world, we entail that the physicists have validated those theories; that is to say, that they have found by experimental means that the laws of such theories hold in their respective domains of application. A conceptualist thesis consists in that the purported knowledge contained in those theories is relative to their theoretical frameworks, and that the mode we cognize the entities, systems, and processes of those physical domains depend on, particularly, the conceptual systems embraced in the theories in consideration. Thus, we claim that to know something connotes conceptualizing it in a certain mode relative to a theory.

As an epistemological view of physical theories, conceptualism does not maintain any ontological thesis about how the physical world is. The theories suitable to sustain claims about how the world is are precisely physical theories.[2] Conceptualism, like other philosophical views of scientific knowledge—as empiricism, realism, instrumentalism, and conventionalism—is a metatheory whose subject matter is precisely the scientific theories. However, it could be a task of conceptualism to establish the criterion of the ontological commitments of such theories. Quine (1948/1953) has already provided such a criterion; the underlying central idea of his criterion, expressed by the slogan "to be is to be the value of a variable", can be paraphrased as follows: What there is does not depend on any conceptual scheme; however, what we say that there is depends on the conceptual scheme adopted.

Physical theories comprise, besides lawlike statements, conceptual systems that allow the physicists to make claims about what there is in the domain of applications of such theories; for example, elementary particles,

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[2] Indeed, one finds in the history of philosophy numerous conceptions or views of the "world". An exemplary case is Hegel's philosophical system. Nevertheless, the Hegelian philosophy, like many other philosophical systems of metaphysical character, is an absolutist *weltanschauung*, which does not intend to describe, explain, nor predict the processes that happen in the world, the world that is the subject matter of the diverse theories in the field of physics. Hence, those views are irrelevant to our issue here.

fission and fusion processes and, even, diverse sorts of aleatory processes. To claim that there are things like those in the physical world, it becomes unavoidable to apply a physical theory containing an appropriate conceptual system; otherwise, everybody is unable to affirm anything about the field of atomic physics. Our point concerning this is that the claims that one can make about the entities and processes in any physical field are relative to the theory supposed or constructed; in general, the ontological assertions that everyone can say about the physical world depend on, and are relative to, one theory or another.

All the former theses, certainly, relativist in character, are proposed against the absolutist view that permeates most of the contemporary debate between realist and antirealist philosophers about science, particularly, physics.

On Systems of Concepts

To embody our conceptualist view of physical theories, it becomes now convenient to display *grosso modo* a survey of the sort of conceptual system that is suitable to such theories.[3] Concerning theories of mathematical physics, we can distinguish two types of concepts: class (or kind) concepts and quantitative (or metric) concepts (Hempel, 1952). A physical theory contains a web of both types of concepts, which are linked among them by several different sorts of relationships. Let us call such web a "conceptual system" or, indistinctively, "system of concepts". Every physical theory has its system of concepts; some of them are peculiar and exclusive to it, whereas other related theories could share other concepts. If we, for a moment, think about a physical theory as a system of laws, we could say that the system of concepts original of a given theory is integrated into its systems of laws.

Class and quantitative concepts provide physicists with an appropriate conceptual arsenal for describing states of physical systems as well as changes of states or processes that such systems undergo, which is required to understand what there is and what happens in the physical world.

CONNOTATION is the general relation between concepts which we shall employ here.[4] More as a terminological convention than as a conceptual definition, we will say that a given concept connotes another concept when the former entails the latter—but not implies as Brown (2007) claims which is a logical relation that holds between statements, not between concepts.[5]

Examples of class concepts are MOON, PLANET, and STAR, whereas MASS, ENERGY, and GRAVITY are instances of quantitative concepts. These examples suggest that, as a function of the physical theories in consideration, concepts expressed by the same terms could be quite different, which involves the issue of conceptual change, whereas other concepts would be peculiar and exclusive of a particular theory, which involves the issue of conceptual innovation—issues which are the main subject matter in Brown (2007).

However, these issues are not of our concern here. What is, first of all, more important for us are the sorts of relationships that can be among (1) class concepts, (2) quantitative concepts, and (3) class concepts and quantitative concepts. Yet, we shall assume the concept of denotation to be able to talk about extra-conceptual entities—particularly, physical entities and magnitudes—using appropriate concepts.

Concerning (1) we point out the connotation relation along with, in an underlined manner, the subsumption

[3] We borrow some material from Brown (2007).
[4] We shall use versatile letters to designate concepts instead of terms or words.
[5] In logical contexts, the terms "entail" and "imply" are used undistinguished but they are not synonymous. In other contexts, these terms can express different concepts.

relation that is fulfilled between a pair of concepts when the class of entities denoted by a concept is a subclass of the class denoted by the other concept. Thus, CONNOTATION is obtained between concepts whereas SUBSUMPTION is obtained between classes denoted by concepts (for example, WHALE connotes MAMMAL whereas the class denoted by the former concept is subsumed under the class denoted by the latter concept). Mainly, the subsumption relation allows us to make classifications of large sets of entities under study or, even, an entire taxonomy of the universe under study by a theory (as is the case of the standard model of elementary particles), through the connotations that are obtained among the kind concepts (taxon) involved, which besides of establishing the subsuming relations indicate other relations such as that of exclusion and compatibility.

Concerning (2), the relations among quantitative concepts, we point out the connotations that could occur between a pair of concepts of this sort and the relation between a quantitative concept and the magnitude that it denotes. In addition, we shall emphasize a quite special connection of nomic character that is obtained when some quantitative concepts occur in a physical equation as are the cases of PRESSURE, TEMPERATURE, and VOLUME as well as FORCE, MASS, and ACCELERATION. A nomic relation among certain quantitative concepts holds, then, when there is an equation that is formulated in terms of them. This sort of nomic relation among quantitative concepts, and the measurements of the magnitudes denoted by them, allow physicists, first at all, to calculate, with the aid of mathematics, predictions and try to validate them via observations and experiments.

Last but not least, regarding (3), the relations between class concepts and quantitative concepts, we can say that often class concepts are characterized in terms of quantitative concepts. Moreover, based on that and via an analysis of Russell (1905), we can show a very important matter concerning the ontological commitment of a theory: that the denotative function that, generally, is attributed to the class terms can be transferred to its quantitative concepts.

Russell's analysis of singular descriptions provides a procedure to establish the ontological commitments of conceptual schemes, as Quine (1948/1953) has made explicit. In the present context, the statements to elucidate are of the form: "The kind of x is F", where the domain of the variable x is a set of entities postulated by a given theory, and F is a class term of its lexicon. The statement, as an illustration, "The kind of x is electron" could be paraphrased as "For all x, the kind of x is electron only if the mass of x equals 9.109558×10^{-31} kg, the charge of x is $-1.602192 \times 10^{-19}$ C, and the spin of x is $\pm 1/2$". This description delimits the class of entities which kind is the electron. Every entity that fulfills that description belongs to the class denoted by ELECTRON. Of course, the former analysis can be generalized to other kind terms, or class concepts, such as those of "proton", "positron", and so on, as well as to kind terms like "hydrogen", "helium", and so forth. If this is right, we can say that the denotative role that plays the class concepts, which amounts to the ontological laden of those concepts, is transferred to the quantitative concepts and variables universally quantified via such sort of descriptions.

In a holistic sense, delimited, at least, by the system of concepts of a given theory, concepts have both a theoretical laden to scientific experience, according to the thesis of Hanson (1958), and an ontological laden to the world. If we realize that we think of the world and understand what happens in it via concepts, the prior has a major relevance to a philosophical stance about scientific knowledge.

Brown's Theory of Conceptual Systems

To emphasize some features of the previous proposal on systems of concepts in physics we will contrast it with the theory of conceptual systems due to Harold Brown, giving a very brief sketch of this important theory in this context. First of all, Brown's theory is a general theory of concepts with a large scope including concepts of ordinary knowledge, scientific theories, and even philosophy—in difference to our proposal which is restricted to theories of mathematical physics.

Brown borrows the holistic approach to scientific language from Feyerabend and Kuhn. He writes that:

> They denied the existence of a theory-independent observation language. Instead, they argued, a theoretical language gets its meaning from the internal structure of the theory, independently of any association with experience. Meaning then flows from theory to observation, not in the reverse direction. (2007, p. 18)

Two features of the former viewpoint are stressed by Brown. First, concepts are members of systems of concepts, in such a way that the conceptual content is determined only by relations among these concepts. Second, the local character of the holism of those philosophers, in the sense that a system of concepts is peculiar and limited to a specific scientific subject matter (Brown, 2001, p. 129), in contrast to Quine's global holism (1951/1953). We agree with this, and we assume a local holistic view of conceptual systems that, following Brown, we shall call "conceptual holism".

Brown provides three dimensions that determine the content of scientific concepts: (1) the implications among the concepts in a system; (2) the central role of scientific concepts in describing extra-conceptual items;[6] (3) the function that concepts play in our thinking (2001, p. 130). Some years later, Brown improved his theory of conceptual systems, as he calls it, to a large extent. We want to consider only his more general thesis about concepts from a holistic approach, which is somewhat connected with the former three dimensions of conceptual content. We find the thesis that implication is the main relationship between concepts:

> TC [his theory of conceptual systems] holds that all concepts occur as members of conceptual systems in which concepts are related to each other by implications. In addition, concepts are included in a system because they play some specific role or sets of roles in our thinking and action. (2007, p. 230)

Remarking that these two features apply to all concepts, Brown formulated three questions, involved in his TC, which enable us to understand a given concept: "a) What are its relations to other concepts? b) How it is related to an extra-systemic subject? c) Why have we included this concept in our repertoire?" (2007, p. 231)

We will not give direct answers to those questions but rather we shall make some remarks, *grosso modo*, concerning them. In contrast to Brown's general thesis that the main relationship among concepts is implication, we sustain that the main relationship among concepts is that of connotation because, in his logical sense, concepts do not imply each other. Since the times of Carnap and Popper, logical implication has been the dominant concept in the theses and discussions in the field of philosophy of science, but not all relations between concepts and propositions can be analyzed in, or reduced to, terms of logical implication. It does not make much sense to say, in general, that the concept of X implies the concept of Y (v. gr., ICE implies COLD); indeed, it makes more sense to say that X connotes Y (ICE connotes COLD), which appeals to the concepts that concept X entails. Thus, our answer to Question (a), which is connected with Dimension (1) above, consists that connotation, instead of implication, is the relationship that in general is obtained among concepts.

Concerning Question (b), and Dimension (2), we have a bold-faced response. We indicated, on the one hand, that class or kind concepts denote classes or sets of entities and, we add now, that based on that one can *individualize* an entity as a member of a certain class which involves that it is an individual of a certain kind. In

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[6] "Item" is used by Brown "as a neutral term to cover entities, processes, events, or whatever else we may encounter or postulate in the course of our investigations" (2001, Note 1, p. 139).

addition, this type of concept allows us to make classifications or taxonomies of physical entities postulated by diverse theories. On the other hand, the role of describing entities, or systems, is rather in charge of quantitative concepts. Based on that type of concept, one is able both to describe the state of a physical system in a given time and to describe its transformation or evolution in a later time.

Concerning Dimension (3), we stress that class and quantitative concepts together fulfill the function, at least, that allows one to calculate the predictions of the laws of a theory. At the same time, both types of concepts provide the material for developing a framework to conceptualize and to think about how the world is and, eventually, to understand what happens in it; that is, what sorts of processes undergo the physical systems in the domain of a given theory, *relative* to the system of concepts that are integrated into the system of laws of that theory.

We want to point out a question that arises concerning conceptual systems. Brown provides a concept of concept of psychological character from cognitive science. He claims that: “Concepts are mental entities that represent some items of interest” (2001, p. 129). Moreover, “Concept [the concept of concept] may be considered a psychological concept since it occurs in the system of concepts we use for describing certain aspects of our psychology” (2007, p. 222) Thus, Brown claims that the status of concepts is that of mental entities and that concepts, in general, are representations of some extra-mental items.

We disagree with these theses for the following reasons. First, the status of concepts must be considered as social, and public, in contrast to an individual, private, mental status. Although people may share the concept of Pegasus as a winged horse, and each one may associate a subjective representation to it, we must not conflate them and claim that PEGASUS is a mental representation of Pegasus. Certainly, we may have concepts of inexistent entities, like ether, phlogistic, angels, and demons, but, again, it is a mistake to confuse such concepts with the mental representations that we could have, if any, of those inexistent entities. Still, not all people have mental representations of many entities whose existence has been validated by scientists, entities like quarks, neutrinos, or magnitudes like entropy, and electric charge, to which scientists have provided concepts and means to detect, observe, and measure the entities and magnitudes denoted by them. Thus, one cannot claim that to have a concept of an item amounts to having a mental representation of it. We think based on concepts, not on subjective representations.

The point is that Brown’s account of concepts as mental representations is subjective, and psychological, and prevents any plausible account of how we can communicate to and understand each other using concepts. We do not aim to define CONCEPT. What we may say is that CONCEPT connote ABSTRACTION as well as that CONCEPTUALIZES connote THINKING, and UNDERSTANDING. Thus, CONCEPTUALIZATION involves abstract thinking and understanding. A conceptual system is a means to conceptualize a scientific subject matter, and linguistic resources can communicate the conceptualization that one could obtain of it.

Truth on Phenomenal Worlds

We pointed out that in the classical debate between realism and antirealism, the central issue is the concept of factual truth concerning scientific statements. There are a great number of alternative formulations of realist theses, let us for the present purpose take the following, which is short and clear:

> I will understand scientific realism in what I take to be a classical sense. According to scientific realism, the aim of science is to discover the truth about the objective reality which we inhabit. […] Truth is to be understood in a non-epistemic correspondence sense. It is the way things stand in the mind-independent, objective world that makes scientific claims about

> the world true or false. When a claim about the world is true, it is because it corresponds to the way the world actually is. (Sankey, 2018, p. 72)

Realist philosophers subscribe to the former theses about truth, as correspondence to the world facts, and about the things, subject matter of scientific theories, that exist in a mind-independent world.[7] Recognizing that, in accord with his view of the methodology of science, the laws of scientific theories cannot be established as true statements, Popper proposed the surrogate concept of verisimilitude, or truthlike, as an approximation to truth, to replace such concept of truth. From the attempts by Popper (1972) until those due to Niiniluoto (1997) and Psillos (1999), the intended concepts of verisimilitude and truthlike have found insuperable technical problems.

As we said, the concept of truth that Kuhn rejects is that realist concept (1970, Postscript). Some Kuhnian philosophers have proposed a concept of truth that they consider not only compatible with but also improves Kuhn's view of science, in particular, his thesis about the incommensurability of paradigms, and the related problem of world change. Regarding this problem, Hoyningen-Huene provides a Kantian interpretation of the image of world change:

> In his book, *Reconstructing Scientific Revolutions* [1993], Hoyningen-Huene argues that Kuhn's metaphysical stance is in fact a dynamic Kantian position, which is based on a distinction between an unknowledge "world-in-itself" and a "phenomenal world" that is jointly constituted out of inputs from "the world-in-itself" and the conceptual contribution of the human subject. Where Kuhn differs from Kant is in allowing the human conceptual contribution to vary with change of theory. (Sankey & Hoyningen-Huene, 2001, p. xvii)

On a Kantian interpretation of Kuhn's philosophy, to which Kuhn itself sometimes expresses sympathy (see, 1991), Hoyningen-Huene says that the world that changes when a scientific revolution takes place is the phenomenal world in which scientists live but not the world-in-itself (1993, p. 32). This is, certainly, a metaphysical thesis that would be unjustified because as Devitt (2001) emphasized, Hoyningen-Huene does nothing to support the Kantian core of his proposal. In this way, to agree with Hoyningen-Huene's interpretation of Kuhn's view of science, one must accept the whole of Kant's metaphysics, and that is a high cost just for trying to resolve the question of world change which some philosophers consider merely a metaphor, as Sankey does (2020, p. 382).

Hoyningen-Huene's thesis has as antecedent a distinction between an absolute *a priori*, that of Kant's philosophy, and a relative *a priori* concerning the principles of diverse theories, due to Reichenbach (1965). In contrast to Kant's *a priori*, which is fixed, universal, and necessary, Reichenbach's relative *a priori* is variable, local, and contingent. This concept does not indeed have an *a priori* character because it is only *a priori* in a weak sense, that sense which connotes beforehand, that is, that experience requires a given theoretical framework in advance to take place, which does not justify a postulation of an ineffable world. In Hoyningen-Huene's interpretation of Kuhn's philosophy of science, instead of the Kantian absolute categories, there are Kuhn's paradigm lexicons, which provide the conceptual contribution for cognitive experience.

It becomes pertinent, in this context, to mention that Hacking (1993) proposes a plausible nominalist solution to Kuhn's problem of world change, to which Kuhn (1993) disagrees, without such metaphysical commitment to an unknowable world-in-itself.

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[7] There are several new forms of realism, such as structural realism, perspectival realism, and projective realism, which are beyond the scope of this paper. However, for a critical analysis of Giere's perspectival realism, see Rolleri (2022).

Let us now take into consideration Devlin's account of a relativist concept of truth, which follows Hoyningen-Huene's Kantian interpretation of Kuhn's philosophy, drawing the sense of a phenomenal world as that world that changes during a revolutionary transformation in science. Devlin (2015) finds an internal contradiction in Kuhn's philosophy of science since Kuhn says that science does achieve knowledge of nature and, at the same time, he rejects the concept of truth. About the following Kuhn's words:

> My goal is double. On the one hand, I aim to justify that science is cognitive, that its product is knowledge of nature, and the criteria it uses in evaluating beliefs are in that sense epistemic. But on the other, I aim to deny all meaning to claims that successive scientific beliefs become more and more probable or better and better approximations to the truth and simultaneously to suggest that the subject of truth claims cannot be a relation between beliefs and a putatively mind-independent or "external world". (Kuhn, 1993, pp. 329-330)

Devlin points out a problem that he calls the problem of inconsistency, between both previous goals: "Kuhn cannot consistently maintain, on the one hand, that science achieves knowledge of nature, and on the other, that science does not converge towards truth. Kuhn's double-goal is, thus, inconsistent, since truth is a necessary condition of knowledge" (2015, p. 161).

There are three key concepts involved in the prior inconsistency, those of knowledge, truth, and nature or natural world. To remove that internal contradiction, Devlin opts for replacing the concept of the world, more precisely, the concept of the world which is involved in the realistic concept of truth, to which the previous Sankey's quotation alludes. Devlin's proposal consists of replacing the concept of the natural, physical world, which is assumed by the realist philosophers, with a concept of a phenomenal world. In this manner, there is no question about the cognitive access to such a world because it is, by definition, the world that we experience. This allows, according to Devlin, to reformulate the theory of truth as a correspondence to the phenomenal world—a world of phenomena, not of facts—which he calls the phenomenal-world correspondence theory (2015, p. 164). He maintains, then, that it is possible to say consistently that science achieves knowledge of the world, where knowledge entails truth concerning the phenomenal world—which eliminates the original Kuhn's objections about scientific claims of an independent world because of a lack of cognitive access to such world that would allow us to say how it is in a theory-independent way.

Still, that concept of truth by Devlin is relativist in character because our cognitive access to the phenomena of such a world comes from the perspective of a given theory, which means that our knowledge is not theory-independent, as Kuhn required.

It is worth noticing that the putative inconsistency between Kuhn's theses arises from, as Devlin rightly emphasized, the concept of knowledge that entails that of truth. Another alternative to resolve the tension in Kuhn's philosophy of science between the theses that science is cognitive and its product is knowledge of the natural world, on the one hand, and that there is not a theory-independent way to access such world, on the other, consists in, as we intend to support, replacing the traditional concept of truth for the concept of validity, in a manner that allows us to eliminate the very concept of truth—thereby to reject either the realist theory of truth and Devlin's phenomenal-world correspondence theory. In contrast to Devlin's metaphysical alternative, we intend a naturalist alternative that fits better with the labor of scientists, not with traditional philosophy.

On a Relativist Concept of Valid Statement

Concerning fundamental laws of physics, which have an abstract and idealized character, Kuhn maintains that basic laws, the "symbolic generalizations", like Newton's second law, are law-sketches or law-schemes instead of law-statements, which are not candidates for truth values (1970, p. 188). Apart from fundamental laws, Kuhn gives us, we deem, a clue to think about a relative concept of a true statement, or valid statement as we will propose, in the field of physics which is consistent with the epistemological theses of conceptualism and it could even complement them. Originally, he rejected all the possibilities of thinking of scientific theories as true views of how the world is. From an antirealistic stance, compatible with instrumentalism, Kuhn argues against the Popperian notions of approximation to the truth and progress that the idea of a match of the ontology postulated by a theory and what is "really there" is an illusion (1970, p. 206). Twenty years later he makes place to the possibility of evaluating some scientific statements as true, or better; let us say, as valid, as follows:

> On this view, as I wish to employ it, the essential function of the concept of truth is to require choice between acceptance and rejection of a statement or a theory in the face of evidence shared by all. […] Instead, the evaluation of a putatively scientific statement should be conceived as comprising two seldom-separate parts. First, determine the status of the statement: is it a candidate for true/false? To this question, as you'll shortly see, the answer is lexicon-dependent. And second, supposing a positive answer to the first, is the statement rationally assertable? To that question, given a lexicon, the answer is properly found by something like the normal rules of evidence. (1991, p. 9)

This proposal for considering either a statement as a candidate to be true or false and for considering relevant evidence is relative to the lexicon of the language of a scientific group, as Kuhn explains:

> In discussions between members of communities with differently structured lexicons, assertability and evidence play the same role for both only in areas (there are always a great many) where the lexicons are congruent. Where the lexicons of the parties to discourse differ, a given string of words will sometimes make different statements for each. A statement may be a candidate for truth/falsity with one lexicon without having that status in the others. And even when it does, the two statements will be not the same: though identically phrased, strong evidence for one need not be evidence for the other. (1991, p. 9)

Kuhn gives us a simple example that shows the way that statements of different theoretical frameworks, or systems of concepts, with the same intended domain of application or subject matter are lexicon-dependent:

> In a similar vein, I've elsewhere pointed out that the content of the Copernican statement, "planets travel around the sun", cannot be expressed in a statement that invokes the celestial taxonomy of the Ptolemaic statement, "planets travel around the earth". The difference between the two statements is not simply of fact. The term "planet" appears as a kind term in both, and the two kinds overlap in membership without either's containing all the celestial bodies contained in the other. (1991, p. 5)[8]

In this case about the Ptolemean and Copernican systems of the universe, there are statements of one framework that lack sense in the other framework because the involved class concept of planet has changed as well as its denotation—this is part of Kuhn's thesis about local incommensurability of alternative paradigms (Kuhn, 1983).

If that is right, and recognizing the theory-ladenness of scientific observation (Hanson, 1958), which entails a theory-dependence of the evidence that one could attain from scientific experience, we claim that to say that a physical statement is *valid* amounts to saying that a group of physicists, that share certain theory, deem it as that because what the statement asserts matches to the relevant evidence obtained by them.[9] The former concept of *valid statement*, which seems appropriate to the scientific practice of physicists, involves a relation of match that

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[8] Kuhn refers to "What are Scientific Revolutions?".

[9] Indeed, this concept of valid statement has social and historical parameters since theories are products of the work of scientific communities during historical periods of a scientific discipline.

is established by some groups of scientists at a given time based on some available evidence that they consider suitable to the conceptual vocabulary, or system of concepts, of a theory. Even so, the relevant evidence is obtained by physicists via interactions with physical systems, through appropriate instruments, in contexts of measurements, observations, and experiments—thus there is not a lack of objectivity. However, according to the realist concept of true statement, understood in a non-epistemic sense, the relation of correspondence between a given statement and a fact exists on its own, in virtue of which somebody could be able to discover it and then say that the statement is true; anyway, to say such assertion, the realist requires to have some sort of experience of such fact, based on which he could demand objectivity.

Hence, both the realist and the conceptualist require an appropriate experience with the fact, phenomenon, or process in question to be in a proper epistemic position to assert that a given statement, with scientific character, is true or valid, respectively. And if the former claims objectivity on his attribution of truth to the statements that he asserts, with the same right the latter may claim the same concerning the validity of the statements that he asserts. But this does not authorize the realist to claim a sort of, so to speak, ontological objectivity, which would reside on a presumed correspondence of what a statement asserts and what really is there—what some philosophers call "the objective facts". The sort of objectivity in question consists of an intersubjective agreement among a group of scientists (moreover, nowadays among the international scientific community pertinent), which is attained by sharing evidence that validates the physical statement in consideration. Against a realist concept of ontological objectivity with respect to facts, we have proposed that a theory involves an ontological-ladenness in virtue of its system of concepts, which impedes us from speaking of facts as they are by themselves.

Thus, it is plausible to think that the conceptualist philosophers demand that the sort of objectivity that they require resides in that the physical statements in consideration assert something about a feature of the world that could be validated through scientific methods such as observation and experimentation, that the evidence obtained would fit the statements and all that could be performed intersubjectively by a group of physicists. But, besides, the evidence gives ground to the group of physicists for accepting such statement as valid because it is in accord with their world view, in particular, with the way that such a feature of the world is conceptualized from the theory adopted.

Last but not least, let us point out that there are statements that assert the existence of certain kinds of entities, systems, magnitudes as well as processes, i.e., existential statements which are expressed in the conceptual vocabulary, or system of concepts, of a given theory. Physicists have been able, in many cases, to design and perform observations and experiments to test existential statements, and based on the evidence in favor obtained, they consider that such statements hold, and so accept the existence of such things (for the case of neutrinos, see Shapere, 1982; Brown, 1987). The existential statements contain kind or class terms of the conceptual system of a theory, which intend to denote some classes of entities and sets of systems; thus they mostly bear the ontological commitment of that theory, which can be transferred to quantitative concepts via a Russellian analysis, as we saw. This means that also the existential assertions are relative to, and dependent on, the theory assumed or constructed.

Let us now consider the thesis about the independent existence of the world. The present conceptualist construal of science, although has a relativist character, does not assume or imply that the world, which comprises the diverse domains of contemporary physical theories, is somewhat dependent on those theories. It is a categorical mistake, or something like that, to say that the physical world is theory-dependent just because a theory provides a conceptual contribution, in virtue of its conceptual system, which allows us to attain comprehension of the world relative to such theory. This misunderstanding is expressed by the following neutral remark by the realist philosophers Sankey and Hoyningen-Huene: “The realist holds that the entities to which the terms of a theory refer exist independently of the theory […] Some anti-realist philosophers hold that the world and the objects it contains are constituted, either in whole or in part, by our theories, concepts or language” (2001, p. xvi). What depends on our theories, and their conceptual systems, is the understanding of the world that we can obtain and claim to have, which means the mode we conceptualize the entities and processes that our theories postulate exist in the world, but not the existence of the world.

The world exists on its own, our scientific knowledge of it is our invention, which provides us with ways to conceptualize the world. Our main disagreement with scientific realism consists in that it is not allowed to us, although our theories have been validated, to claim that we know how the world is in a way that is independent of the conceptual contribution of our theories. However, this is an epistemological disagreement, not an ontological one. What is relative to the physical theories is our conceptualization of the world, the way that we understand it, which does not imply any dependence on the existence of the world. This is our central thesis, which is epistemological in character and does not imply that the existence of the world is in some way dependent on the scientific knowledge, of the mode as we conceptualize it, relative to one theory or another.

Final Remarks

In general, a scientific theory postulates an ontology in the physical world, i.e., it postulates that certain kinds of entities exist and that some sorts of processes happen on such entities. Besides the theory, which is embedded in the global conception of the world of a theoretical framework, a paradigm contains a system of concepts, that is, certain own concepts, both class and quantitative concepts, which are proper and novel of it, as well as some own nomic statements or laws formulated in terms of these concepts that also are proper and original of it—theories such as classical mechanics, quantum theory, and relativity. Physicists make assertions about the proposed processes through a description of the (states of) systems conformed with the postulated entities applying to some statements which are derived from the theoretical laws, using mathematical tools, and conceptual procedures such as des-idealization, concretization, specialization, and approximative application (Rolleri, 2013). In that way, the statements that one can assert about the physical world, the entities, and systems that one can describe as well as the claims that one holds about the processes undergone by the physical systems are dependent on, and relative to, the lexicon or conceptual vocabulary, using Kuhn’s expression, of the theory adopted or elaborated.

The present relativist approach to physical theories has two background theses: the thesis of the theory-ladenness of observation, which asserts that all scientific observations, all physical experiments, are not exempt from theory, and the thesis of local conceptual holism, which affirms that a theory embodies a system of concepts whose members are interrelated conforming a whole. The conceptualism that we intend to develop, as an alternative to realism, stands on such theses. The systems of concepts included in the contemporary physical theories make at once possible and limit our conceptualization of how the world is, as well as our cognitive access to what happens in it. This last claim involves that conceptualism gives priority to conceptual systems over scientific experience, regarding the conceptual contribution of such systems to our experience of the processes that occur in the physical world. But we do not want to minimize the crucial, indispensable, role that scientific experience plays in our acquisition of cognizance, rather we want only to confer the right place to conceptual systems in the cognitive processes involved in scientific observation and experimentation.

The previous proposal of a concept of valid statement relative to a system of concepts inserted in a physical theory has, certainly, a Kuhnian vein. However, we think it is somewhat independent of Kuhn's philosophy of science, particularly of his theses about incommensurable paradigms and world change. We introduce it in the context of an indirect inquiry into Kuhn's relativism, but it could be incorporated into the conceptualist survey that we delineated here. What is crucial to such a concept is a relativist view of physical knowledge, in contrast to the absolutist view characteristic of scientific realism.

Even if relativist, the conceptualism proposed, does not refute itself because their theses are not reflexive, that is to say, as other epistemological stances, conceptualism is a metatheory whose objects of study are precisely the physical theories, and thus what it claims does not apply to itself.

References

Brown, H. I. (1979). *Perception, theory and commitment. The new philosophy of science*. Chicago: Chicago University Press.

Brown, H. I. (1987). *Observation and objectivity*. Oxford: Oxford University Press.

Brown, H. I. (2001). Incommensurability and reality. In P. Hoyningen-Huene and H. Sankey (Eds.), *Incommensurability and related matters* (Vol. 216, pp. 123-142). Boston: Boston Studies in The Philosophy of Science.

Brown, H. I. (2007). *Conceptual systems*. New York: Routledge Studies in The Philosophy of Science.

Devitt, M. (2001). Incommensurability and the priority of metaphysics. In P. Hoyningen-Huene and H. Sankey (Eds.), *Incommensurability and related matter* (Vol. 216, pp. 143-157). Boston: Boston Studies in The Philosophy of Science.

Devlin, W. J. (2015). An analysis of truth in Kuhn's philosophical enterprise. In W. J. Devlin and A. Bokulich (Eds.), *Kuhn's structure of scientific revolutions—50 years on* (Vol. 311, pp. 153-166). Boston: Boston Studies in the Philosophy and History of Science.

Hacking, I. (1993). Working in a new world. In P. Horwich (Ed.), *World change: Thomas Kuhn and the nature of science* (pp. 275-310). Cambridge: MIT Press.

Hanson, N. R. (1958). *Patterns of discovery*. Cambridge: Cambridge University Press.

Hempel, C. G. (1952). *Fundamentals of concept formation in empirical science.* Chicago: Chicago University Press.

Hempel, C. G. (1966). *Philosophy of natural science*. Hoboken: Prentice Hall.

Hoyningen-Huene, P. (1993). *Reconstructing scientific revolutions: Thomas S. Kuhn's philosophy of science.* Chicago: Chicago University Press.

Kuhn, T. S. (1970). *The structure of scientific revolutions* (2a ed.). Chicago: University of Chicago Press.

Kuhn, T. S. (1983). Commensurability, comparability, communicability. In P. D. Asquith and T. Nickles (Eds.). *Philosophy of Science Association 1982* (Vol. 2, pp. 669-688). Chicago: Chicago University Press.

Kuhn, T. S. (1991). The road since structure. In A. Fine, M. Forbes, and L. Wessels (Eds.), *Philosophy of Science Association 1990* (Vol. 2, pp. 3-13). Chicago: Chicago University Press.

Kuhn, T. S. (1993). Afterwords. In P. Horwich (Ed.), *World change: Thomas Kuhn and the nature of science* (pp. 311-341). Cambridge: MIT Press.

Kusch, M. (Ed.). (2020). *The Routledge handbook of philosophy of relativism*. New York: Routledge.

Niiniluoto I. (1999). *Critical scientific realism*. Oxford: Oxford University Press.

Popper, K. R. (1963). Truth, rationality, and the growth of scientific knowledge. In *Conjectures and refutations* (pp. 215-248). New York: Routledge & Kegan Paul.

Popper, K. R. (1972). *Objective knowledge*. Oxford: Clarendon Press.

Psillos, S. (1999). *Scientific realism: How science tracks truth*. New York: Routledge.

Putnam, H. (1981). *Reason, truth and history*. Cambridge: Cambridge University Press.

Quine, W. V. O. (1948/1953). On what there is. In *From a logical point of view* (pp. 1-19). Cambridge: Harvard University Press.

Quine, W. V. O. (1951/1953). Two dogmas of empiricism. In *From a logical point of view* (pp. 20-46). Cambridge: Harvard University Press.

Reichenbach, H. (1965). *The theory of relativity and a priori knowledge*. Oakland: University of California Press.

Rolleri, J. L. (2013). Idealized Laws and Explanatory Models. *Teorema*, XXXII/*2*, 5-27.

Rolleri, J. L. (2022). Models, Representation and Truth: On Giere ́s Perspectival Realism. *Open Journal of Philosophy*, *12*, 474-488.

Russell, B. (1905). On denoting. *Mind, 14*, 479-493.

Sankey, H., & Hoyningen-Huene, P. (2001). Introduction. In P. Hoyningen-Huene and H. Sankey (Eds.), *Incommensurability and related matter* (pp. vii-xxxiv). Boston: Boston Studies in The Philosophy of Science.

Sankey, H. (2018). Kuhn, relativism and realism. In J. Saatsi (Ed.), *The Routledge handbook of scientific realism* (Vol. 216, pp. 72-83). New York: Routledge.

Sankey, H. (2020). The relativistic legacy of Kuhn and Feyerabend. In M. Kusch (Ed.), *The Routledge handbook of philosophy of relativism* (pp. 379-387). New York: Routledge.

Shapere, D. (1982). The concept of observation in science and philosophy. *Philosophy of Science, 49*, 485-525.