

# The linguistic-cultural nature of scientific truth<sup>1</sup>

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## Abstract

While we typically think of culture as defined by geography or ethnicity (e.g., American culture, Mayan culture), the term also applies to the practices and expectations of smaller groups of people. Though embedded in the larger culture surrounding them, such subcultures have their own sets of rules like those that scientists do.

Philosophy of science has as its main object of study the scientific activity. A way in which we have tried to explain these scientific practices is from the actual ontological commitments that scientists do through their scientific theories. Certainly, we know scientific theories through some specific scientific language, which is, in its turn, a subset of the natural language developed by a particular culture.

This study is conducted to explore and evaluate some of the most important epistemological consequences of these ontological commitments, specially the so-called 'truth-commitment' and its relation with a linguistic-cultural framework.

There is an interesting debate between advocates and opponents of scientific realistic view of the natural world. Some lines of scientific realism argumentation assure that:

(i) Mature scientific theories are approximately true.

(ii) There are entities and organisms in the world that correspond with the ontology presupposed by the best scientific theories within a specific domain of scientific research and

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(iii) The new acceptable scientific theories should explain why past theories were successful predecessors (Colyvan 2008, Cocchiarella 2007 & Laudan 1981).

Contrary, anti- realist positions ensure against the realist's true - claim that is a semantic commitment - that the purpose of scientific theories to found the truth it is simple an unattainable goal, especially if the kind of truth they are looking for is a corresponding relation between scientific theories and the ontology of the world. Anti-realist positions held that this relation could be circular and unknowable.

I do believe that there is a deep confusion between the way in which we accede to the knowledge of the constitutive structures, entities and organisms of the world (which is an epistemological matter) and the way these structures, entities and organisms are (which is an ontological matter). It seems that there is a bridge between the epistemological and ontological aspect in need for conceptual clarification. I do propose that the type of link between the two extremes have to be linguistic in nature.

Historically, epistemological reasons caused the rejection of the realistic world of properties, powers and disposition postulated by ancient Greek culture through one of its most important thinkers, Aristotle (*c.f. Metaphysics* 9.8, 1049 b5-10 & *Physics* 3.2, 201 b33-35). The main problem was that the observation of natural phenomena did not point unambiguously to the supposed causal connections that they sought as an explanation of these phenomena.

Indeed, to suppose that a way to explain a phenomenon or natural event could be through *its causes*, it is already an intellectual commitment responding to a particular way of seeing the world, a commitment that had its roots in the formation of the Greek scientific culture. Aristotle proposed four different types of cause and four corresponding types of explanation. A *material cause*, which it is the stuff something is made of; a *formal cause*, which is the idea or pattern somebody follows to do something; an *efficient cause*, which is the one that made the thing and finally, the *final cause* which is the aim or goal of the stuff.

The problematization of these causal connections proposed to account for our knowledge of the natural world, are at the bottom, among other things, of the development of classical epistemology. The natural approach to the problem of knowledge began with the naive idea that we are justified in believing that the world's objects we perceive as trees, rocks, rivers and so on, exist independently of the mind and our conceptual and cultural frameworks.<sup>2</sup> It was believed that through the evidence of our senses, that is the direct and immediate evidence of sensory stimulation, and an exact observation and description of any object in question, we would get closer and closer to objective knowledge of things. In this way, any description of an object as it is in itself would precede any possible explanation and interpretation of it.

This natural approach to knowledge became a philosophical problem since the

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<sup>2</sup> Of course there are not just 'objects' in the world, there are also facts, states of affairs, conditions, situations, events, sequences of objects, sets, etc.

British Empiricism of Francis Bacon (1561-1626), John Locke (1632-1704) and David Hume (1711-1776). The objectivist view of knowledge argued that our senses are able to provide empirical data more or less reliable with respect to how the objects really are. Some of these objectivist theories postulated, besides, that the truth could be obtained through this epistemic-linguistic relation to reality. Many concepts have been proposed to articulate this relationship, one of them is the concept of 'correspondence', but there are others such as *conformity*, *consistency*, *agreement*, *meaning*, *truth-copy* and others. These objectivist positions argue that a scientific proposition is true *if and only if* corresponds with the real facts, conceived as independent of our theoretical and linguistic frameworks.

On the other hand, the subjective view of knowledge, which reached one of its extreme positions with George Berkeley (1685-1753) said that nothing exists outside the mind that perceives the world and the language with which we communicate our ideas and knowledge. The existence of a thing consists precisely in being perceived as odors and sounds, for example. However, to affirm this opens the possibility to have as many worlds as cultures are in the world, this is, as languages we have developed to grab the world. Some anti-realist conceptions deny the objectivity of knowledge arguing that the views and patterns of thought and languages, among them scientific theories, are subjective (at least inter-subjective, this is, generated between and inside of a specific scientific community inserted into a particular culture).

The Berkeleian notion that postulate the not existence of things outside the human language-mind, it is a position that emphasize an epistemological character over an ontological one. While Berkeley accepts that things do in fact exist, the only way to know of its existence is, at least for human understanding, through the impressions printed in our thinking. The theory of knowledge of Berkeley is one of the most important antecedents of the idealist epistemological theory from Immanuel Kant (1724-1804).

In the *Critique of Pure Reason* Kant said that notions of time and space are forms of the phenomena of external sense, i.e. they are subjective sensitive conditions under which it is possible for human beings to have external intuitions. Wondering what are the objects themselves, separate from the receptivity of our sensibility, is an unanswerable question for Kant, since we can only know things through the way of perceiving them – here language has a decisive importance -, but never the things in themselves. In fact, from this point of view, there would be no difference between ‘the way things are in themselves’ from ‘things as they are for an epistemic subject’. Kant believed that the objects of scientific knowledge and theoretical models are ideal. Such objects are artificial constructs that, even though they may be independent of particular men, are not independent of human activity in general. Thus, in Kant's position, knowledge of the natural world is, in part, a construction of the human culture and mind.<sup>3</sup>

Now we will turn specifically to the case of scientific knowledge. This kind of knowledge is structured and communicated in a scientific language (mathematic, logic and the like), but also in a natural language through scientific propositions and concepts. In relation to this kind of propositions and scientific concepts, there are at least two essential differences in the way they can be understood:

- 1) One is ontological and is concerned with the description of how things are in reality.
- 2) The other is epistemological and relates to the way we know how things are.

In the ontological sense, a proposition is objectively true if the statement is independent of us. For example, the statement:

a) ‘Water is composed of two molecules of hydrogen and one of oxygen ’; it is an objective statement because its truth it pretends to state does not depend on us. This ontological objectivity is identified with reality. For this discussion, it is important to note that we, humans, are the ones that talk about water in scientific and cultural terms as

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<sup>3</sup> Despite being very interesting, in this paper I won't dwell on the analysis of the Kant's philosophy of science.

'hydrogen', 'oxygen' and 'molecule', but once we characterize the chemical components of water in this way, we cannot anymore to refer to these components in a different way or whimsically.

On the other hand, the statement:

b) 'Sugar is sweet' is clearly subjective because the truth which sets up depends of us and it is related to our cognitive capacities, our beliefs, our conceptual frameworks and our experimental background. Note that all these aspects are confined in a particular culture. Certainly, sugar molecular properties can exist even if no one exists on earth. That is, the 'sweetness' is a dispositional property of sugar, but there must be a human to know about the 'sweetness' of sugar, that is, somebody that recognizes this dispositional property.

My own proposal to settle down, in a way, this debate is to determine the epistemic weight that both positions – realists and not realists - grant to the theoretical and cultural dependence of our perception of nature. In order to do this, I will analyze if it is a mistake to go from the cultural-theoretical dependence of our 'representations' of the world to the theoretical dependence of the world 'itself'. First, I will briefly mention one philosophical tradition that has addressed the problem of scientific realism: the so called 'classical empiricism'. Secondly, I will discuss some of the main arguments of the so called 'scientific realism'. These arguments have been made to face some of the challenges against this posture. Finally, I will assess the strengths of both positions.

Classical Empiricism offers a theoretical characterization only of what is observable. It is important to note that inside this philosophical stance, scientific postulates may not be *entirely* true, except what they say about what is effective and empirically verifiable. When this empirical approach was represented by logical positivism, they added to it a theory of meaning and language. This linguistic turn deepened some problems relating to the possibility and natural necessity of scientific theories.

Today, this approach does not mean that scientific (and philosophical) concepts need to be explained only linguistically. Moreover, according to the logical positivists, statements that could be tested through mathematics, logic and empirical evidence, count as meaningful propositions and all other statements that do not meet these characteristics are just pseudo-statements or nonsenses.

Scientific Realism is a philosophical stance that sees the objects of knowledge as a given. These objects could be real structures that remain and operate independently of our knowledge, our experience and the conditions that allow us to access them. The first problem to characterize the main thesis of scientific realism it is that there are many versions of this philosophical position.<sup>4</sup> Here I will concentrate in three fundamental thesis defended at the interior of some forms of Scientific Realism:

T1. Mature scientific theories are approximately true.

Within a specific domain of scientific research, the most recent theories are closer to the truth than the oldest.

T2. Observational and theoretical terms such mature theories postulate, genuinely refer.

There are organisms and entities in the world that correspond to the ontology presupposed by the best theories at the interior of a specific domain of scientific research.

Therefore,

T3. Mature science is successful.<sup>5</sup>

Inside these lines of argumentation, there are two basic epistemic and ontological commitments. The ontological commitment tells us that the *objective reference* of some scientific concepts take us closer to the knowledge about the objects that actually exist in the world. The epistemological one tell us that since realism *is true*, two terms or concepts in two or more different theories may be referring to the knowledge of an object really

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<sup>4</sup> For example the so called 'entity realism' defended by Arjan Chakravartty or the 'structural realism' defended by Stathis Psillos. For a review of this and others types of realisms, see Psillos, 2009.

<sup>5</sup> For a revision of these and other thesis, see Laudan, 1981, pp. 20, 21 & 40.

existing in the world, so that these theories can be commensurable.

In relation to the ontological commitment, scientific realism holds that the empiricist stance leads to philosophical mistakes such as the use of the category of *experience* to define the world. To do this, it is argued, *is to give a general ontological function to a particular epistemological concept*. For example, the empirical perception we have of the red color, it does not make its ontological existence dependent on our experience. This empirical perception it is just a conceptual category – which is cultural dependent - we use to understand and define some feature of the reflection of light, process, which it is real, this is, ontologically existent.

The ontological claim of scientific realism said that what is given is the fact that the world has a certain structure that makes scientific knowledge possible, whether or not science is in fact, practiced. In other words, it is not the nature of science that imposes a particular pattern or order on the world, but is the world order which, under certain specified conditions, makes possible the development of those cultural activities we call 'science'. If this it is the case, does not follow by the fact that the nature of the world may be known from science, that the world's nature is determined by the epistemic-cultural structures of this knowledge (scientific theories, scientific laws, hypothesis, initial conditions, auxiliary assumptions, auxiliary hypotheses, scientific techniques, instrumentation and applications, etc.).<sup>6</sup>

At the interior of the anti-realist tradition about the world, there are two fundamentally different philosophical positions. The global criticism to the realist epistemology argues that we have no basis to claim for any proposition that it is true. The critical local realist epistemology, less stringent positions, argue that we are entitled to say that some propositions are true, but some others, with a special characteristic 'U', are not.

Recent literature on the subject, identifies this feature 'U' with unobservable entities,

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<sup>6</sup> Of course, scientific theories are constituted by many more elements as their sociological, heuristic and methodological commitments and values and the particular techniques for the design and resolution of problems and puzzles.



since often the reference to unobservable entities (and thus perhaps nonexistent) constitutes the best explanation of what is observable. It is true that scientific knowledge often refers to unobservable entities and process to explain what is observable. For example, the corpuscular theory of light from Newton was accepted without opposition for a while until the wave theory of light became the new dominant optic theory. However, this theory postulates theoretical entities not directly observable as the luminiferous ether. The Faraday's concept of the electric field provides another example. The electric field began as a vague concept that won precision when their relationships with other electromagnetic concepts became clearer by the equations formulated by Maxwell.

In general, anti-realist positions argue that some goals of science, as theoretical explanation and empirical prediction, may well be achieved without providing a literally true story of how the world is. According to this line of argumentation, when a scientific community proposes a theory, she does not mean that the theory it must be true, but something less pretentious, for example, empirical adequacy (*a la* Van Fraassen).

For further analysis, I will distinguish three arguments against the realist position of science. These arguments are developed from antirealist positions as Instrumentalism, Verificationism and Constructivism.

a) Explanations of the empirical success of scientific theories are shown not only by theories that are true or approximately true, since a theory that cannot be even approximately true, it could be empirically successful by adding auxiliary hypotheses.

b) Unless the alleged genuine reference of scientific concepts implies the success of the whole theory, the fact that some terms are successful hardly provides a convincing explanation for the success of that theory.

c) The theoretical science has been radically discontinuous, that is, different scientific views about the structure and organization of the world have often been discarded and replaced by other incompatible views. This shows that scientific theories

could be fallible.

As we can see, the scientific realist position must answer these questions before it can prove its own consistency. As we have already mentioned, the true factor defended by realists – which it is a semantic-cultural commitment - relates to the nature of the connection between scientific theories and the world. Realist theories of truth see this connection fundamentally as a correspondence relation; this is, as a relationship that exists independently of us.

However, it is a mistake to think that we can determine a unique correspondence between referring expressions and external objects, not because there are not, but because there are too many. Therefore, we could not select an exact correspondence between linguistic statements - which are culturally constituted - and things as it is supposed they are in the natural world, before our intellectual-cultural access to these alleged entities. In sum, things are dependent of our linguistic and conceptual cultural frameworks; and this implies that truth – at least the correspondence theory of truth - is not constrained to a unique correspondence given the polysemy of the natural languages of any culture in general and of the scientific language in particular.

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