THE TRUTH AS A NON-REFERENCE: REALIST AND ANTIREALIST CONCEPTION OF REFERENCE

Sanja Ivic*

Summary: *1. Introduction. 2. The Success of Non-referring concepts: A Hermeneutical Aspect of Reference. 3. Conclusion.*

1. Introduction

This paper analyses the problem of reference in the theories of scientific realism and antirealism. It will be argued that realists and antirealists have different conceptions of truth as non-reference. The notion of reference in theories[1] of scientific realism has its origin mostly in the causal theory of reference.[2] The conception of reference held by antirealists' is derived from Fregean's descriptive theory of reference.[3] Both conceptions of reference do not succeed in explaining the success of scientific theories whose central terms do not refer.[4] Both realists and antirealists do not succeed in explaining the success of non-reference and its ability to transform our experience into reality. The notions of reference which realists and antirealists employ are too narrow and they do not embrace the refigurative aspect of reference (and non-reference). The conception of reference as refiguration is introduced by Paul Ricoeur in his *Time and Narrative*, Vol. 3 (1988). Ricoeur's conception of reference embraces a relation to reality in its broadest sense. Ricoeur's conception of reference as refiguration can be applied even to "non-existent" concepts in scientific theories and historical and fictional narratives. According to Ricoeur, those non-existent concepts have the power to transform and affect

* Institute for European Studies, Trg Nikole Pasica 11, Студентски трг, Beograd 11000, Serbia. E-mail: aurora1@yubc.net

[1] There are different versions of scientific realism. There are many domains to which realism can be applied: metaphysical, epistemic, semantic, ethical, etc. There are also strong and weak versions of scientific realism. However, all these forms of scientific realism are united in their claim that mind-independence reality exists.

[2] The proponents of the causal theory of reference argue that the reference of the name is fixed by a historical chain of uses of the name.

[3] According to this theory, proper names are defined by descriptions.

[4] This means that the object of reference is considered as "non-existent".

our praxis and experience. Refiguration includes the transformation of reality which is first prefigured in the consciousness of the author, then configured in the text and then, finally, transformed into the virtual experience of the reader, which leads to comprehension, Refiguration points to semantic and hermeneutic aspects of reference. Moreover, as it includes both ostensive and descriptive references, as well as non-ostensive and non-descriptive references,[5] the refigurative aspect of reference proves that the bridge between "real" and "unreal" is not unbridgeable. Therein, the refigurative aspect of reference is hermeneutic, since it is based on the presupposition that every reference is simultaneously a co-reference. The reader of scientific, historical, or literary text obtains not merely the sense of the work, but the reference through the sense as well.[6] Ricoeur maintains the notion of the power of fiction and non-referring terms transform one's experience and knowledge. By positing new possibilities of fiction, non-referring terms «make a transition between the experience that precedes the text and the experience that follows it».[7] Thus, reading is a vital experience, which includes three dimensions: the reader's capacity to create the meaning, the revelation of hidden aspects of the text through its reading, and the reader's quest for coherence. Ricoeur emphasizes language's capacity for reference, which is not exhausted by descriptive discourse. He argues that it is a prejudice to regard only scientifically described and empirically observed objects as being real. Subsequently, Ricoeur criticizes both the naïve concept of "reality" and the naïve concept of "unreality".

Both realist and antirealist conceptions of reference only take into account the epistemological and ontological[8] aspects of reference. However, there are still the hermeneutical aspects of reference, which realists and antirealists do not consider. This will become apparent through a closer examination of both concepts, and which will now be presented.

The reason the question of truth has been debated as of late in scientific realism and by its critics stems from the fact that scientific theories develop

[5] «For me, the world is an assembly of references opened up by every kind of text, descriptive or poetic, that we have read, understood, and loved. And to understand a text is to interpolate in the predicates of our situation all the indications that make a *Welt* out of an *Unwelt*. It is this enlarging of our horizon of existence, which permits us to speak of the reference opened up by the text or of the world opened by the referential claims of most texts» (P. Ricoeur, 1991, p. 331).

[6] Cfr. P. Ricoeur, 1984, p. 78.

[7] *Ibidem*, 1985, p. 73.

[8] However, these deal with ontological aspects in the narrowest sense. For a realist, when a term refers successfully, the object to which it refers exists. Nevertheless when a theoretical term fails to refer, this is because the object of reference does not exist. This point of view is considered an ontological aspect of reference. Both realist and antirealist neglect the symbolic and philosophical dimension of reference, which has been emphasized by Heidegger, Husserl, and Ricoeur.

over time; i.e., old theories are rejected and are then replaced with new ones. Scientific realism embraces the following two statements:

1) Theories in mature science are typically approximately true.

2) The central terms of these theories are typically genuinely referential.[9]

Analyses of the general nature of reference can at least be traced back to Frege. Making a distinction between *sense* (*Sinn*) and *reference* (*Bedeutung*), he argues that sense represents descriptive information, which characterizes a certain property, only if it picks its *Bedeutung* «in virtue of its being that object».[10] Thus, Frege's theory of sense and reference may be called a "descriptivist" theory. According to him, it is possible that two terms have a different sense, but still the same reference. Frege offers the example of Venus which was referred to as both "morning star" and "evening star". He argues that both terms have the same reference (Venus), but obviously a different sense. Another stance on the theory of reference is the causal theory of reference, often referred to in philosophy as "the new theory of reference". This theory of reference contrasts with the traditional descriptivist theory of reference, whose representatives include Kripke, Kaplan, Donnellan, Putnam, and others, and whose proponents, state that «'Scott' refers directly to Scott and does not express a sense expressible by such a definitive description as "the author of Waverley"».[11] Therein, proponents of the "new reference" reject Frege's descriptive theory of reference and argue that names are not contingent descriptions, although they are directly referential. They argue that terms refer by means of historical chains, while the proponents of the causal theory of reference criticise the descriptivist theory of reference. Their arguments can be summarized as follows: «If the descriptive theory of proper names is true, (i. e. proper names are defined by descriptions), then 'Venus is the evening star' should express a truth knowable *a priori*, (i.e., knowable merely by reflection upon the concepts involved). But it cannot be known *a priori* that Venus is the evening star; this is known as *a posteriori*, through observation of the empirical facts».[12]

According to Donnellan, some descriptions in natural language can be used referentially, or sometimes attributively. «For example, I may use 'the man in the corner who is drinking a martini' in a referential way to directly refer to that man (regardless of whether or not he is drinking a martini) and at a later

[9] M. Carrier, 1991, p. 23. Scientific realism does not only embrace these two statements. It includes other claims, such as: «the approximate truth of a scientific theory is sufficient explanation of its predicative success» (J. Leplin, 1984, p. 1), and «the theoretical claims of scientific theories are to be read literally, and so read are definitely true or false» (*ibidem*, p. 2) etc. The basic presupposition of the theories of scientific realism is that a mind-independent reality exists. However, the problem of reference in the theories of scientific realism shall be the focus of this paper.

[10] K.C. Klement, 2002, p. 60.

[11] Q. Smith, 1998, p. 3.

[12] *Ibidem*, p. 7.

occasion I may use it attributively to refer to whether x has the property of being the only man in the corner who is drinking a martini».[13] The problem of theory change in science postulates the problem of the meaning and reference of scientific terms. For instance, antirealists claim that the term "electron" changes its meaning and shifts when the theory changes. This would mean that antirealists mostly employ a Fregean descriptivist theory of reference. Antirealists perceive "sense" as descriptive information, which is also contingent. Scientific realism can preserve reference in the face of changing scientific theories (rejected theories are replaced by new ones) throughout history only through denial of the Fregean theory of reference of scientific terms. Therefore, realists mostly employ a causal theory of reference.[14]

The task of scientific realists is to provide a theory of reference that will maintain the consistency of reference of scientific terms amidst changing theories. According to realists, terms such as "electron", "atom", and "heat" have the same reference within differing theories. Realists argue that rejected theories refer to the same entities as new ones do. According to realists, scientific progress is cumulative; as they argue that the success of science shows that entities postulated by theories do exist, «the central terms of the best current theories are genuinely referential»,[15] these theories are only approximately true. Proponents of scientific realism argue that current scientific theories are literally true (or approximately true). One of the main arguments for scientific realism is Putnam's "no miracle argument" which states that if scientific theories were not true, then the success of science would be a miracle.

Conversely, antirealists emphasize the argument presented by Laudan of "pessimistic induction", the essence of which is Laudan's claim that there are many theories in the history of science which had at one time been empirically successful, but which were eventually discovered to be neither referential nor true. Such theories were then rejected and replaced by newer ones. According to antirealists, reference does not imply truth since empirical success does not warrant that such theories had been approximately true. They argue that if reference is necessary for truth, theories should not exist that are both successful and non-referential. Therein, Laudan's critique of a reference of scientific terms and the success of scientific realism is based on the argument for pessimistic induction. Laudan himself argues that the form of realism he discusses involves the following claims:

R1: Scientific theories are typically approximately true.

R2: Observational and theoretical terms within the theories of mature science genuinely refer.

[13] Q. Smith, 1998, pp. 138-139.

[14] Some of them (Kitcher, Psillos), however, try more to reconcile the causal theory of reference with historical records.

[15] J. Leplin, 1984, p. 1.

R3: «Successive theories in any mature science will be such that they preserve the theoretical relations and the apparent referents of earlier theories»[16]

R4: New, acceptable theories should explain why their predecessors were successful.[17]

Laudan clearly notes that Putnam and other realists argue that «the fact that statements about reference (R2, R3) or approximate truth (R1, R3) function in the explanation of a contingent state of affairs, establishes that notions of truth and reference have a causal explanatory role in epistemology».[18] Laudan attempts to examine the relation between truth, reference, and success, maintaining that the aim of his paper is to prove that these relations are not sound.[19] He therein provides a list of theories that had both been non-referential and successful:

- the crystalline spheres of ancient and medieval astronomy
- the humoral theory of medicine
- the effluvial theory of static electricity
- "catastrophist" geology, with its commitment to a universal (Noachian) deluge
- the phlogiston theory of chemistry
- the caloric theory of heat
- vital force theories of psychology
- electromagnetic aether
- optical aether
- the theory of circular inertia
- theories regarding spontaneous generation[20]

According to Laudan, the history of science proves that realist explanations for the success of science are flawed. He claims that one necessary condition for scientific theories to be true is for their terms genuinely to refer, providing the example that if there were no entities similar to atoms, «no atomic theory could be approximately true».[21] Laudan argues that according to realists, in regard to the reference of scientific theories, «the world probably consists of entities very much like those postulated by our most successful theories».[22] He tries to examine the realists' claim that «reference explains success», contending that the realist conception of reference is «highly complex and unsatisfactory in significant respects».[23] Laudan offers the example of the theories of aether from the 19th century which were successful, yet whose central terms were still non-referential. According to him, this is proof that successful theories whose central terms are non-referential can

[16] L. Laudan, 1981, pp. 20-21.
[17] Cfr. *ibidem*, 1981, p. 33.
[18] *Ibidem*, p. 22.
[19] *Ibidem*.
[20] *Ibidem*, p. 24.
[21] *Ibidem*.

exist; therefore, realists are not able to explain the success of science for this very reason.[24]

According to Laudan, the realist claim that referring theories are successful is false. Furthermore, Laudan maintains that his analysis of the central concepts of scientific theories is not merely limited to theories that are non-referential. Rather, he asserts that there are examples of past theories which had been both referential and successful, while still not being approximately true: «Consider, for instance, virtually all those geological theories prior to the 1960s that denied any lateral motion to the continents. Such theories were, by any standard, highly successful (and apparently referential), but would anyone today be prepared to say that their constituent theoretical claims – committed as they were laterally stable continents – are almost true?».[25] He also asserts that even a theory whose central terms refer are not always to be successful: «Consider, for instance, how many inadequate versions of the atomic theory there were in 2,000 years of atomic 'speculating' before a genuinely successful theory emerged. Consider how many unsuccessful versions there were of the wave theory of light before the 1820s, when a successful wave theory first emerged».[26] His conclusion is that even if a theory's central terms do refer, this does not warrant that the theory shall be ultimately successful. Furthermore, he maintains that if a theory is successful, it does not warrant that its central terms shall also refer.[27]

According to Laudan, realists assert that the terms of theories in "mature" science genuinely refer – meaning that at least some of the central concepts of successful scientific theories do refer. This claim is indeed consistent with the fact that certain other terms in scientific theories do not refer. However, Laudan emphasizes that realists still fail through use of this argument to explain the success of scientific theories whose terms are non-referential: «If the realist restricts himself to explaining only how 'mature' sciences work (and recall that very few sciences indeed are yet 'mature' as a realist sees it), then he will have completely failed in his ambition to explain why science in general is successful».[28]

However, in his analysis of the relationship between the reference and the success of scientific theories, Laudan does not explain how non-referring terms employed in scientific theories have been able to lead to success. He, in fact, does not analyse the problem of truth (success)[29] of science as a non-reference.

[24] Cfr. *ibidem*, p. 27. [25] *Ibidem*, p. 35. [26] *Ibidem*, p. 25.
[27] *Ibidem*, p. 47. [28] *Ibidem*, p. 34.
[29] The problem of non-referential scientific theories is not sufficiently explained by both realists and antirealists, which is why it is difficult to define in what manner they work and whether their success leads to scientific truth.

The same can be argued for other antirealists. The truth as a non-reference has been analysed by Paul Ricoeur, who contends that there can be no truth beyond possible verification according to a scientific approach to truth and reality, as well as that all verification is linked to the domain of facts. Thus, according to a scientific approach, literary fictional texts do not designate (refer), as they do not give information about facts and existing objects. Ricoeur instead argues that literary texts speak about the world, but do so in a descriptive way, explaining that non-ostensive references point to possible worlds: «The texts speak of possible worlds and of possible ways in orienting oneself within those worlds».[30] Ricoeur also argues that reference is opened by the text. The text projects the world outside itself (the fictive world). Subsequently, to understand the text means to extend one's experience and one's picture of the world through the comprehension of those imaginative variations created by the text. "Non-referring" concepts of scientific theories can be compared to "non-referring" concepts in literary texts. As their reference is opened by interpretation, they enlarge one's experience and reality in this manner.

Another antirealist approach to the reference of scientific terms can be found in the works of Kuhn and Feyerabend, the latter of whom equates the meaning of the term with the theory that contains it. The consequence of this approach is that the same term, while occurring in two different theories, does not have the same meaning. As Putnam in *Mind, Language, and Reality* reports, «According to Feyerabend, we do not, by the word 'temperature' mean what Galileo meant […]. The reason Feyerabend gives is that we have abandoned the proposition that 'the temperature shown by a thermometer is not dependent upon the chemical composition of the fluid used', which Feyerabend takes to be constitutive of the Galilean concept».[31] According to Putnam, what Galileo was referring to was «that intrinsic property of the body which the thermometer measures, and not the result of measurement».[32] Putnam argues that «as long as we continue to use the word 'temperature' to refer to the same physical magnitude, we will not say that the meaning of the word has changed even if we revise our beliefs many times about the exact laws obeyed by that magnitude, and no matter how sophisticated our instruments for measuring temperature may become».[33]

According to Kuhn, there is no convergence in knowledge. Instead, he argues that different paradigms represent different worlds and that the same term cannot have the same reference among different paradigms. This agrees with Feyerabend's point of view, who argues this point in his *Against Method* (1975). Nevertheless, this perspective is denied by proponents of scientific real-

[30] P. Ricoeur, 1991, p. 314. [31] H. Putnam, 1995, p. 122. [32] *Ibidem*.
[33] *Ibidem*, p. 128.

ism: «Let us suppose that they are right, and that electrons in Bohr's theory do not refer to what we now call electrons. Then it does not refer to anything we recognise in present theory. So if we use present theory to answer the question: Was Bohr referring when he used the term 'electron'? The answer has to be 'no', according to Kuhn and Feyerabend. Kuhn talks as if each theory does refer, namely, to its own world of entities – but that that is not true according to any scientific theory».[34] According to Feyerabend, if a theoretical description of electrons is different in two differing theories, then the term "electron" has two senses in each theory. Feyerabend claims then that such terms can have neither the same sense nor the same reference in two differing theories.[35] By employing the descriptive theory of reference, Kuhn and Feyerabend claim that there is no convergence in scientific knowledge and subsequently argue that some terms in rejected scientific theories are non-referential. Still, they do not try to answer the question of how such non-referential concepts and theories had been successful. According to Putnam, both Feyerabend and Kuhn argue that scientific terms are synonymous with descriptions and that they use descriptive theories of reference. Therefore, Putnam concludes that «this line of reasoning can be blocked by arguing that scientific terms are not synonymous with descriptions».[36] He illustrates this point through the example that although there is nothing in the world that corresponds to Bohr's description of the electron, «there are particles which approximately fit Bohr's description».[37] Leplin emphasizes that entities which Bohr called "electrons" did indeed refer: «We can answer Kuhn by saying that there are entities – in fact the entities we now call 'electrons' – that behave like Bohr's electrons in many ways [...]. We should in these circumstances, take Bohr to have been referring to what we call 'electrons'».[38]

According to realists, the terms of a mature, successful theory refer. Nonetheless, they argue that rejected theories (once considered successful) refer to the same concepts as those current do. Thus, Dalton's electrons had been the same as Bohr's were, wherein «the failure of these older views is only due to telling the wrong story about the right objects, i.e. to ascribing the wrong properties and features to correctly identified entities».[39] Realists stress that improving a theory, and thus scientific success, would not be possible if theoretical change implied the changing of theoretical terms and subject matter. Reference is the foundation of explaining the success of science. On the other hand, Laudan states that «the realist sense of reference is a rather liberal one, according to which the terms in a theory may be genuinely referring even if many of the claims the theory makes about entities to which it refers are false.

[34] H. Putnam, 1984, p. 144.
[35] Cfr. P. Feyerabend, 1975.
[36] H. Putnam, 1984, p. 145.
[37] *Ibidem*.
[38] *Ibidem*.
[39] M. Carrier, 1991, p. 24.

Provided that there are entities which 'approximately fit' a theory's description of them, Putnam's charitable account of reference allows us to say that the terms of a theory genuinely refer. On this account, [...] Bohr's 'electron', Newton's 'mass', Mendel's 'gene', and Dalton's 'atom' are all referring terms, while 'phlogiston' and 'aether' are not».[40]

However, improving a theory while retaining its theoretical objects is possible only if theoretical change does not also automatically change the theory's subject matter. Whereas a theory's truth implies genuine reference to the theoretical entities, genuine reference does not imply truth. The realist reply to Laudan's argument is that the reference of scientific terms is not equated with a description which fixes the reference of the term. However, this does not necessarily mean that the term is equated with the description. On the other hand, Hardin and Rosenberg argue that the reference of a theoretical term is fixed by the description of the causal role of the entities to which the term refers. In this way, the reference is fixed by means of its description of the causal role. According to Hardin and Rosenberg, the terms of even those theories that have been rejected in the history of science, did refer: «For example, because we regard the electromagnetic field as playing the causal role attributed by the aether in earlier physical theories, the realist may hold [...] that 'aether' referred to the electromagnetic field all along».[41] Psillos argues that a realist conception of reference can be defended from Laudan's argument by equating reference with "causal description". According to him, «the descriptions that really count, then, and which must be satisfied by an entity in order for a term to refer to it, are those making up what he calls the theory's 'core causal description' of the entity in question, the descriptions that would have to be true in order for the entity to play the causal role the theory assigns to it».[42] According to Psillos, the term "phlogiston" failed to refer due to the fact that nothing exists that would correspond to the descriptions which assign to phlogiston the properties it requires to play an intended causal role in combustion. Stanford states that the main problem with Psillos' concept of reference of scientific terms is that one cannot be sure as to whether the particular description associated with the referring term «will be retained in the further development of science».[43] According to Psillos, the realists' reply to Laudan's argument of pessimistic induction should be held as an attempt «to reconcile the historical record with some form of realism».[44] Psillos argues that although some theories have been rejected in the history of science, this does not have to mean that all of their terms failed to refer. Instead, he asserts that those theoretical constituents which were responsible for the empirical

[40] L. Laudan, 1981, p. 24.
[41] P.K. Stanford, 2003, p. 556.
[42] *Ibidem*, p. 558.
[43] *Ibidem*, p. 563.
[44] S. Psillos, 2000, pp. 720-721.

successes of science do refer, and, moreover, that they are retained in current theories.

Kitcher makes a distinction between "working posits" – the putative referents of terms that occur in problem-solving schemata and "presuppositional posits"; i.e., those entities that apparently must exist if the instances of the schemata are to be true.[45] According to Kitcher, the pessimistic induction argument does not actually undermine scientific realism with the statement that historically successful theories had posited entities that no longer exist, as such entities were presuppositional and non-working.

According to Stanford, all these realists' attempts to defend the constancy of reference through changing theories, in order to undermine antirealists' critiques, represent only «Pyrrhic victories».[46] According to him, realists «use the historical record to defend realism»,[47] which means that they sacrifice «the substantive tenets of the realist position on the altar of its name».[48] This would mean that Psillos' idea of reference as fixed by causal description does not undermine the pessimistic induction argument. «The reason is that this case for the referential status of central terms in successful past theories simply invites, from the historical record, a renewed form of pessimistic induction itself, this time it's concerning our ability to distinguish [...] which of our beliefs about an entity are actually part of its core causal description».[49] As can be concluded from this analysis of conceptions of reference employed in theories of scientific realism, as well as in antirealist theories, the problem of reference is perceived as being too narrow. Realists and antirealists equate reference with denotation, which is the reason they do not succeed in explaining the character of non-referential terms and theories which employ them. They also do not elucidate on the power of such theories and concepts to transform the experience of reality. Both approaches only emphasize epistemological aspects of reference and separate them from those which are hermeneutical and ontological, which are also crucial for understanding the reference of non-existent concepts.

2. The Success of Non-referring concepts: A Hermeneutical Aspect of Reference

Carrier attempts to show how it is possible that non-referring concepts, now rejected but once employed in scientific theories, had led to success. He analyses two theories: the phlogiston theory and the caloric theory of heat. Both were successful in their own time, although their central terms were non-referential. It is obvious from these examples as to what manner these non-

[45] P. Kitcher, 1993, p. 149. [46] P.K. Stanford, 2003, p. 555.
[47] *Ibidem*. [48] *Ibidem*. [49] *Ibidem*, p. 559.

referring terms transform our picture of reality and scientific knowledge.[50] In these examples, hermeneutical aspects of reference are apparent, which refigure our experience.[51] However, Carrier did not explicitly argue about the refigurative character of these non-referring scientific terms. In his article, "What is Wrong with the Miracle Argument", he argues that strong predictive success is possible even though the central terms which are employed are non-referential: «Reference is not necessary for strong success. This implies that the success of science cannot be even partially explained by assuming that theoretical terms of successful theories are genuinely referential».[52] For example, the caloric theory of heat regards heat as a material substance. «Temperature is to be identified with the concentration of caloric, i. e. density of caloric is high in a warm body and low in a cold one. Because of its material nature, caloric is indestructible, and this implies a conservation law for heat. Like all other substances, caloric is composed of particles. According to the affinity theory, that is, according to the generally accepted theory of chemical reaction and chemical bonding, all particles attract each other by means of short-range forces […] There is, however, one peculiar aspect about these heat particles, namely, a repulsive force is present between them. The repulsion is evidenced by thermal expansion. The cause of thermal expansion is that the particles of the heated body are carried along or pushed apart by the heat particles, indicating in this way the effect of the repulsion between the latter […]. On this account, the solid state is characterized by an equilibrium between the attractive affinity forces (that are specific to each substance) and caloric repulsion (that is unspecific to chemical nature). This implies that the thermal expansion of solid bodies varies from substance to substance, as

[50] The same can also be argued for works of fiction. According to Ricoeur, the writer of fiction takes into account metaphysical possibilities, which are often neglected by conventional science and philosophy (P. Ricoeur, 1988). The same can be concluded from Borges' story "Tlön, Uqbar, Orbis Tertius" (1964), which shows how ideas and collective imagination make reality. «The story involves a discovery that secret groups have conspired to imagine a non-existent country and a non-existent planet and to write about them as they were actually real. These conspirators […] also attempt to insert their creations into reality by covertly distributing meticulous and ostensibly factual histories of the country of Uqbar and the planet Tlön among private and public libraries. The eventual result is that Tlön, the product of a secret group of imaginers called Orbis Tertius enters the popular imagination, and aspects of that fictional world became real in this world. The idealist philosophers of Tlön are adopted and artefacts from the imagined world, made of materials never before seen, begin appearing in this one. Ideas became reality. […] In Borges' story, the mythology of Tlön as created by Orbis Tertius conspirators and embroidered by the press, by academics, and by the popular imagination takes over and displaces the 'real' history" (Asma, 2004, 3). This story of Borges serves as an example of how non-existent concepts can shape and refigure reality.

[51] Z. Bečanović-Nikolić, 1998, p. 102.

[52] M. Carrier, 1991, p. 32.

was long well-known. But, things are different with respect to gaseous states. Gases are characterized by an accumulation of caloric, after all, they can be generated by heating. In this state, the particles of the body are pushed so far apart that the short-range attractive forces between them are no longer effective and the repulsive force between the caloric particles prevails. This means that the elastic properties of gases are due exclusively to the repulsion between these caloric particles. Thermal expansion of gases is nothing but the expansion of caloric. This has in turn, the consequence that the rate of expansion is the same for all gases. In 1802, Dalton and Gay-Lussac, independently of each other, ascertained that this was indeed true and thereby confirmed a novel prediction of the caloric theory […]. From the modern point of view, the equality of the thermal expansion of gases comes about roughly as follows. Because of the large relative distance of gas molecules and because of their high kinetic energies, the strength of substance-specific bonding forces between them (the van-der-Waals forces) becomes negligible. Correspondingly, gases can be approximately interpreted as collections of colliding point mass particles».[53]

From this example, how it is possible that a theory can be successful even when its central terms do not refer is clarified. If a theory does succeed in transforming our experience of reality by a confirmed prediction of an empirical law (for instance, as in the case of the caloric theory of heat) it can also be successful even though its main concepts are non-referential. «The pivotal point of the caloric account is the assumption of repulsive forces of caloric. But in the modern view, there is no caloric and there are no repulsive forces of any other kind involved. Nothing similar to the essential ingredient of the caloric explanation actually exists in nature».[54] Still, the empirical law which was produced by the caloric theory of heat had been «previously unknown to the relevant scientific community» and had not been expected «given the background knowledge».[55] Thus, it may be argued that this empirical law resulted from the caloric theory of heat refiguring our experience of reality and also contributed to the postulation of the theory of the thermal expansion of gas molecules.

Another example Carrier provides is that of the theory of phlogiston: «According to the phlogiston theory, phlogiston is the 'principle of combustibility' i. e. it is contained in all combustible substances and escapes in burning. Combustion is decomposition into phlogiston and some residue. The same model was thought to apply to the calcination of metals (i.e. their 'oxidation'). When a metallic calx ('oxide') is formed from a metal, phlogiston is set free, and this implies that all metals are compounds of their respective calces and phlogiston […]. In 1766 this theoretical account was empirically confirmed by Cavendish.

[53] *Ibidem*, pp. 30-31. [54] *Ibidem*, p. 31. [55] *Ibidem*.

He dissolved some metals (iron, tin, and zinc) in some acids […] and found that a gas with some noteworthy properties escaped. This gas (hydrogen by our present lights) was extremely light, extremely combustible and burned without any recognizable residue […]. Given the background knowledge of the time, it was almost self-evident that a light, combustible gas contained in metals, and burning without residue, could be nothing other than pure phlogiston. Accordingly, Cavendish thought that he had succeeded in experimentally identifying phlogiston».[56] This theory was thereafter extended as «in 1782 Priestley managed to successfully predict a novel regularity on the basis of this interpretation. If inflammable air is pure phlogiston, so his reasoning went, it should be able to supply the phlogiston necessary to transform a calx into a metal. In other words, inflammable air should exhibit the same chemical effects as charcoal, which was known to be reached in phlogiston. Priestley succeeded in confirming this novel prediction. He heated several calces in inflammable air and observed that the gas almost completely disappeared and that the calces turned into their respective metals. This demonstrates, beyond any reasonable doubt, that the calces have absorbed the inflammable air and therefore regained their metallic properties».[57] This power of non-referring concepts to transfigure our experience of reality can be actualized in the formulation of a «theoretical prediction of an empirical regularity that was not known to science before and that was not to be expected prior to the formulation of Cavendish's variant of the phlogiston theory».[58] On the other hand, the phlogiston theory is «completely off the mark».[59] «The reductive properties of hydrogen are due to the fact that hydrogen easily gives off electrons and this is not even remotely similar to its capacity of supplying phlogiston to metal calces. The reductive properties of hydrogen have nothing to do with its being the principle of combustibility contained in all metals. Though the model is not as non-referring as it could be, it was strongly successful».[60]

In both examples, non-referring concepts reformulated our scientific knowledge and they therefore affected our picture of reality. From contemporary standards, it would seem that both the caloric theory of heat and the theory of phlogiston had been founded on rather naive theories of heat and combustion. It subsequently could be argued that these two examples do not undermine the realist conception of reference, as similar examples are able to be found in contemporary science. For instance, «the term 'atomic orbital', which is also strictly non-referring, unless one is concerned with the hydrogen atom – continues to be used in chemistry. In fact, orbitals and the related concept of electronic configurations, neither of which truly 'exists' in many-electron atoms, according to a strict interpretation of quantum mechanics,

[56] *Ibidem*, p. 30. [57] *Ibidem*. [58] *Ibidem*. [59] *Ibidem*.
[60] *Ibidem*.

have become the central paradigm at all levels of chemistry».[61] «This situation raises a philosophical question regarding the status of orbitals and configurations. Although they may not exist in the context of quantum mechanics, both concepts serve as a very useful approximation, which clearly should not be abandoned».[62] According to Wolley and other authors, «the concept of molecular structure, which is so central to modern chemistry, is nothing but a metaphor having no objective reality at the quantum mechanical level».[63] «Wolley claims that the structure of the molecule (or the relative positions of the nuclei) is introduced somewhat artificially in calculations by invoking the Born-Oppenheimer approximation which assumes that only electrons move within a rigid framework defined by the positions of the nuclei, which are assumed to be fixed in space. This approximation is based on the large differences in mass between electrons and nuclei, with the assumption that electrons can respond instantaneously to changes in position of the nuclei […]. Wolley and others have claimed that a purely quantum mechanical description […] does not require the attribution of any structure to molecules».[64] Consequently, some authors in recent articles in the philosophy of chemistry have suggested that the question of realism regarding scientific terms in chemistry should be revised.

[61] E. Scerri, 2000, p. 524.

[62] *Ibidem*. It might be concluded that this argument relies on the pragmatist notion of truth ("If it works, it is true") to defend the claims in this given example. It is not my claim that the truth as non-reference (based on reference understood as a refiguration of our experience) is close to the pragmatic notion of truth. Rather, I am attempting to demonstrate the phenomenon of truth as a non-reference to be an established, broadened, and revised conception of reality. Non-referring concepts in scientific theories lead to true predictions since they refigure the understanding of reality and science. Moreover, the realist notion of truth is too narrow to embrace the phenomenon of truth as non-reference. «It is often said that the conception of truth best-suited to realism is a correspondence conception of truth. On such a conception, truth is a property which a statement has in virtue of a relation of correspondence that holds between the statement and the way the world is. A statement is true just in case what the statement claims to be the case is in fact the case. The relation of correspondence is, therefore, a relation between the language and reality. For it is a relation between a statement couched in a language and an extralinguistic state of affairs that obtains in reality» (H. Sankey, 2002, p. 66). «To qualify as a realist conception of truth, the correspondence theory must be supplemented with the metaphysical realist assumption of a mind-independent reality. On the realist conception of truth that results, truth consists in correspondence between a linguistically formulated statement of fact and an extralinguistic state of affairs, where the state of affairs that makes a statement true is a mind-independent state of affairs. If it is true that electrons have negative charge, then this is due to the fact that, independently of anything we think about the matter, there are electrons, and they indeed have negative charge» (*ibidem*, p. 67).

[63] E. Scerri, 2000, p. 524.

[64] *Ibidem*.

According to Paneth,[65] chemists must abandon the realist notion of reference if they are to make any sense of a number of scientific terms employed in chemistry, pointing to ontological aspects of reference to support this claim.[66] This approach to reference and non-reference as a refiguration of experience leaves aside a key problem which has often been underscored by realists and antirealists alike: the problem of the truth and success of scientific theories.[67] The question therein is what the success of science is when the terms of once successful scientific theories – even if proved to be non-referential – are replaced by new theories? Another question is if it can be argued at all that current scientific theories are successful or true, while still bearing in mind the argument for pessimistic induction.

Additionally, different definitions of scientific success exist among realists and antirealists both. Kukla defines the success of scientific theories as follows: «By the 'success of science' I mean that our scientific theories enable us to make significantly more correct predictions than we could make without them».[68] This definition, though, is unclear. On the other hand, Psillos emphasizes the importance of defining the meaning of the notion "success of science" for scientific realism. According to Kukla, the success of science is irrelevant to truth. He has, as well as many other realists, abandoned truth as an explanation for success, and taken "approximate truth" as an explanation for the success of scientific theories. According to Laudan, most realists continue to argue that successful scientific theories, even «if strictly false, are nonetheless 'approximately true', or 'close to the truth', or 'verisimilar'».[69] Laudan argues that this claim can be represented as follows: «T1) If a theory is approximately true, then it will be explanatorily successful; and T2) If a theory is explanatorily successful, than it is probably approximately true. What the realist would like to be able to say, of course, is this: T1') If a theory is true, then it will be successful».[70] According to Laudan, the success of a scientific theory is not a warrant for its approximate truth and vice versa.

Some realists also argue that one of the main problems concerning scientific realism is the failure of the realist to define the notion of "approximate truth", as there is no coherent version of this idea among realists. Carrier argues that Laudan's argument for pessimistic induction is invalid, stemming from his misconception of the empirical success of science: «The following notion of empirical success underlines Laudan's argument. A theory is said to be successful if, first, it exhibits only a small number of anomalies and accommodates the facts in its intended domain of application with satisfactory

[65] Fritz Paneth, one of the founders of radiochemistry.
[66] Cfr. E. Scerri, 2000, p. 525.
[67] Z. Bečanović-Nikolić, 1998, p. 56.
[68] A. Kukla, 1998, p. 12.
[69] L. Laudan, 1981, p. 30.
[70] *Ibidem*.

precision and second, it is accepted by the relevant scientific community. Predictive success is, accordingly, meant to refer to the successful prediction of single observations or to the outcome of single experiments».[71] According to Carrier, realism cannot be founded on this conception of scientific success, and he concludes that «since Laudan's historical counter-examples contain no reference to strong predictive success, his alleged refutation leaves scientific realism unscathed».[72] «In short, truth is significant for reference, reference is necessary for truth. This implies that reference is, in any case, unsuited as a basis for a comprehensive explanation of the success of science. What reference can at most account for is how the success of science is possible».[73]

It would therein seem that realists have not solved the problem of the relation between truth, success, and reference of scientific theories. The concepts of "success," "approximate truth" and "reference" which scientific realists use are in need of analysis. No unified definitions of "success of science" or "approximate truth" in scientific realism are yet present. However, if reference (and non-reference) is perceived as the transformation of our experience and reality (scientific knowledge), the question of the truth and success of science becomes a second-order question which can be answered only when the answer to a first-order question has been found; namely, what is the distinction between real and unreal and can it be made?

3. Conclusion

The perception of reality and truth cannot only be perceived as reference, but as a non-reference as well. The non-referential concepts are part of our reality; they refigure it and transform it. In order to understand references to these terms, our picture of reality (and unreality) should be broadened and transformed. Both realists and antirealists should revise their conceptions of reference as to not only include ontological and epistemological aspects of reference, but hermeneutical as well. For this reason, the phenomenon of the truth as a non-reference is not clearly explained within the philosophy of science itself. Both realists and antirealists do not identify reference as refiguration. Instead of doing so, they rely on the conception of reference as denotation, which is not able embrace the domain of "possibility" and "unreal". Thus, the idea of reality they take into account is too narrow an idea.

[71] M. Carrier, 1991, p. 25. [72] *Ibidem*, p. 28. [73] *Ibidem*, p. 24.

References

Asma, M. (2004), "Philosophy Through Fiction, Borges: Intruding on Reality", www.scribddoc.com/doc23.

Bečanović-Nikolić, Z. (1998), *Hermeneutika i poetika: Teorija pripovedanja Pola Rikera*, Belgrade, Geopoetika.

Borges, J. (1964). "Tlön, Uqbar, Orbis, Tertius", *Labyrinths: selected stories & other writings*, [Augmented ed.], New York, New Directions Pub.Corp.

Carrier, M. (1991), "What is Wrong with the Miracle Argument?" «Studies in the History and Philosophy of Science», 22, pp. 23-36.

Feyerabend, P. (1975). *Against Method*, London, Verso Books.

Kitcher, P. (2003), *The Advancement of Science*, Oxford, Oxford University Press.

Klement, K.C. (2002), *Frege and the Logic of Sense and Reference*, New York and London, Routledge.

Kukla, A. (1998), «Studies in Scientifis Realism», Oxford, Oxford University Press.

Laudan, L. (1981), "A Confutation of Convergent Realism", «Philosophy of Science», 48, pp. 19-49.

Leplin, J. (1984), "Introduction" in *Scientific Realism*, J. Leplin (ed.), Berkeley and Los Angeles, University of California Press.

Psillos, S. (2000), "The Present State of the Scientific Realism Debate", «British Journal for the Philosophy of Science», 51, pp. 705-728.

Putnam, H. (1984), "What is Realism?" in *Scientific Realism*, J. Leplin (ed.), Berkeley and Los Angeles, University of California Press.

Putnam, H. (1995), *Mind, Language and Reality*, Cambridge, Cambridge University Press.

Ricoeur, P. (1984), *Time and Narrative Vol. 1*, K. Mc Laughlin and D. Pellauer (trans.), Chicago, University of Chicago Press.

Idem, (1985), *Time and Narrative Vol. 2*, K. Mc Laughlin and D. Pellauer (trans.), Chicago & London, University of Chicago Press.

Idem, (1988), *Time and Narrative Vol. 3*, K. Mc Laughlin and D. Pellauer (trans.), Chicago, University of Chicago Press.

Idem, (1991). "World of the Text, World of the Reader", interview by J. Roman, in: *A Ricoeur Reader: Reflection and Imagination*, M. Valdés (ed.), Toronto, University of Toronto Press.

Sankey, H. (2002), "Realism, Method and Truth", *The Problem of Realism*, M. Margonet (ed.), Ashgate, Aldershot.

Scerri, E. (2000), "Philosophy of Chemistry – A New Interdisciplinary Field?", «Journal of Chemical Education», Vol. 77, pp. 1-4.

Smith, Q. (1998), "Marcus Kripke and the Origin of New Theory of Reference", *The New Theory of Reference: Kripke, Marcus and its Origins,* P. W. Humphreys (ed.), Dordrecht, Kluwer Academic Publishers.

Stanford, P.K. (2003), "Pyrrhic Victories for Scientific Realism", «Journal of Philosophy», 100, pp. 553-572.

Abstract: *Both realists and antirealists employ narrow and one-sided conceptions of reference. They take into account only ontological and epistemological dimensions of reference, neglecting the hermeneutical aspect. Consequently, both realists and antirealists do not succeed in explaining the phenomenon of truth as a non-reference within the philosophy of science. Reference should not only be perceived as denotation.*[74] *It should also be considered a refiguration of reality.*

Keywords: *reference, realist, antirealist, truth, reality, non-reference*.

[74] Denotation is the specific idea, concept, literal image, or object that a sign refers to.