Kuhn, Putnam and the Reference

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Abstract: In some of his writings, Kuhn criticized Putnam's causal theory of reference for natural kind terms put forward in his classic paper "The Meaning of 'Meaning'" claiming that Putnam's theory cannot explain the reference changes of natural kind terms. After looking into Kuhn's objections to Putnam's reference theory, some of the main features of Kuhn's incommensurability thesis and some traits of Putnam's later version of his theory, we will argue, on the one hand, that Putnam's later reference theory contains some components that enhance the explanation of the reference change of natural kind terms, and on the other hand, that Kuhn's and Putnam's views on reference do not differ that much, especially in virtue of certain similarities between Kuhn's incommensurability thesis and Putnam's thesis of conceptual relativity.

Keywords: *conceptual relativity, incommensurability, kind-identity, natural kind term, reference*

Introduction

It is well known that Kuhn put forward his incommensurability thesis initially in his book *The Structure of Scientific Revolutions* (Kuhn, 1970); the notion of incommensurability, as presented in that book, had several components, among others an onto-epistemic and a semantic one. Nevertheless, since the seventies, and more explicitly in (Kuhn, 1983), Kuhn conceived the incommensurability thesis as an exclusively semantic thesis according to which competing or successive

theories, those involved in a scientific revolution, are *untranslatable*, due to the untranslatability of a reduced number of interrelated kind terms common to such theories (see, e.g., Kuhn 1983; 1993). Although Kuhn characterized the incommensurability of theories through the notion of untranslatability, and this thesis directly concerns the notion of translation and hence that of *meaning*, on many occasions Kuhn justified the incommensurability thesis resorting to the notion of *reference*, maintaining in this regard the thesis of *reference change*, according to which, simply put, theory change involves reference change.

The acceptability of the thesis of reference change will depend on how the reference of kind terms and especially of natural kind terms is determined. Since it is usually considered, and this is Kuhn's view, that according to the *causal theory* of reference the thesis of reference change should be rejected,¹ it is understandable that Kuhn critically examined the causal theory of reference for natural kind terms. Kuhn (1979) already contained some critical remarks on this reference theory (see the section 'The incommensurability thesis...' below), but a more detailed argumentation against it is put forward in two later writings, (Kuhn, 1989) and (Kuhn, 1990), the latter being fundamentally a slightly abridged version of the former. In these two writings *Putnam's version* of that theory in his classic article (Putnam, 1975b) becomes the target of Kuhn's criticism. However, although Kuhn asserts that he restricts himself primarily to Putnam's formulation of the causal theory (Kuhn, 1989, p. 25), he claims that his objections to it would also apply to other versions of this theory.

Kuhn's critique to Putnam's classic formulation of his causal reference theory

Kuhn's main objection to the causal theory is that it cannot explain reference changes, or more precisely the *change of reference* of some natural kind terms² common to the languages of theories involved in scientific revolutions; that change results from the *redubbing* of natural kind terms, due to modifications in the criteria for membership into natural kinds. Kuhn's incommensurability thesis aims just at explaining why and how such sorts of changes occur (see the third section of this article).

¹ However, there are exceptions to that objection, like the causal theory put forward in (Devitt & Sterelny, 1999), whose authors propose a version of the causal theory that enables the explanation of reference changes.

² Although Kuhn's incommensurability thesis concerns different sorts of kind terms (see Kuhn, 1993, p. 249), we will focus on natural kind terms, since these are the kind terms mainly taken into consideration by Putnam.

According to Kuhn's characterization of the causal theory for natural kind terms, this theory claims that the reference (extension) of a natural kind term is determined by two factors, i.e., by some initial act of baptism or dubbing of samples of the kind and by the relation of *kind-identity*; this relation is constituted, in Kuhn's interpretation of the causal theory, by *one* essential property, i.e., one property necessarily possessed by the members of the kind. However, although some of Putnam's claims in (Putnam, 1975b) justify this essentialist interpretation of his theory, such reading can be questioned, albeit that position is assumed by most causal theorists like Kripke (1980). In this regard it is noteworthy that, in Putnam's articles of the first half of the seventies and especially in (Putnam, 1975b), he very often writes the word "essence" (and "essential") in shudder-quotes (see, e.g., Putnam, 1970, p. 142; 1975b, p. 235), and he asserts in his intellectual biography (Putnam, 2015, pp. 78–79) that he never intended to defend a metaphysical realist position in (Putnam, 1975b). However, it is difficult to understand Putnam's notion of kind-identity in (Putnam, 1975b) in a non-essentialist way (see the next paragraph). In any case, since Kuhn, like most authors, attributes to Putnam an essentialist position in (Putnam, 1975b) we will follow Kuhn's terminology.

The version of Putnam's reference theory on natural kind terms contained in (Putnam, 1975b), and in other articles of the seventies prior to it, could be denominated the *classic formulation* of Putnam's theory; this version of Putnam's theory is the one that has mainly been—and still is—at the center of the contemporary debate, partly due to some similarities with Kripke's, and it is this formulation of Putnam's theory that is taken into consideration by Kuhn.

In (Putnam, 1975b), the framework of Putnam's view on (observational) natural kinds and, hence, on the extension or reference of such terms,³ consists of the following two ideas. Firstly, a natural kind includes a subset of entities to which is attributed the character of paradigmatic members of the kind, and the attribution of this feature to such entities is due to the fact that they share superficial or normal distinguishing properties, i.e., the properties that average speakers associate with the members of the kind. Secondly, such entities share underlying properties, which are responsible for the superficial properties. Given this framework, Putnam's main thesis on the reference of natural kind terms is that this is *determined* by the possession of such underlying properties or, in

³ We will only pay attention to Putnam's view on observational natural kinds and on the corresponding terms, since these, like the term "water", are the natural kind terms dealt with by Putnam in (Putnam, 1975b); his theory concerning non-observational natural kind terms is similar to it (see Putnam, 1973).

other words, by the relation of *kind-identity* with paradigmatic members of the kind, which is constituted by such underlying properties.⁴ Thus, concerning the members of natural kinds, Putnam distinguishes between two different types of properties. On the one hand, the *superficial* (see Putnam, 1975b, pp. 235, 239) or normal distinguishing properties, which can be easily discerned; on the other hand, their *underlying* properties, which constitute the kind-identity of such members, and that he identifies with their composition, microstructure, hidden structure, internal structure or “essence”.

Putnam underlines two contributions involved in the determination of the reference of natural kind terms, the *contribution of the environment* and the *contribution of the society*. On the one hand, the extension of a natural kind term depends on how our (actual) world is, since it is determined by underlying properties of the members of the kind belonging to it. On the other hand, every linguistic community exhibits a *division of linguistic labor*, that is:

[It] possesses at least some terms whose associated ‘criteria’ are known only to a subset of the speakers who acquire the terms, and whose use by the other speakers depends upon a structured cooperation between them and the speakers in the relevant subsets (Putnam, 1975b, p. 228).⁵

Putnam denominates the speakers belonging to such subsets *experts*, and these are the speakers who are able to apply reliable tests to distinguish members of a natural kind from samples not belonging to it; with regard to natural kinds, the prototypical experts are the members of the relevant scientific community, for the discovery of the underlying properties of natural kinds is a matter of scientific research.⁶ Given that experts are more knowledgeable than the *average* or normal speakers about the membership conditions into a natural kind—and, hence, about the extension of the corresponding natural kind term—average speakers, who recognize the existence of that expertise, are willing to defer to experts the determination of the reference of natural kind terms as they use them. Thus, in every linguistic community there are links of *social* character

⁴ Most causal theorists conceive the underlying properties possessed by members of a natural kind as the essential properties of such members, and hence as the properties they necessarily have. Therefore, most versions of the causal theory of reference assume essentialism.

⁵ In (Putnam, 1975b), he considers this claim as a hypothesis—the so-called “hypothesis of the universality of the division of linguistic labor”—but in later works he does not allude to that claim as a hypothesis but as a thesis he sustains. Kuhn agrees with this thesis (see Kuhn, 1989, p. 29, n. 29; 1990, p. 318, n. 26).

⁶ However, the group of experts has to be conceived in a broad sense; for instance, concerning the word “gold”, Putnam considers as experts on gold, among others, atomic physicists, chemists, metallurgists, miners and jewelers (see Putnam, 2013, p. 198).

between average speakers and experts, and those play an important role for the reference of natural kind terms as used by average speakers.

Putnam's main target in 1975b is to criticize the "traditional theory of meaning" on natural kind terms and to propose an alternative view of the semantics of such terms. According to this theory,⁷ the meaning of a natural kind term is given by a set of properties, so that the conjunction of those properties (or at least a sufficient number of them) determines the reference or extension of the term. In this regard it is noteworthy that Putnam assumes that the properties to which the traditional theory of meaning of natural kind terms resorts are exclusively superficial properties.⁸ In (Putnam, 1975b), he proposes some thought experiments against that theory of meaning, but the only one taken into consideration by Kuhn is that involving the term "water". However, in his examination of this thought experiment, Kuhn explicitly asserts that he is not taking into consideration the term "water" in his everyday use, but in its use "within the community of scientists and philosophers to which Putnam's arguments need to be applied" (Kuhn, 1989, p. 26, n. 18; 1990, p. 318, n. 25).

In this thought experiment we can distinguish two parts, as Kuhn does. In the first part Putnam asks us to imagine a planet in our galaxy—or in another possible world, since there are two versions of this thought experiment—that is similar to Earth, called by him "Twin Earth", in which we can suppose that every inhabitant of Earth has a duplicate (an identical copy). Although there are some small differences between Earth and Twin Earth, the only one relevant to our aim is that, although the superficial properties of the substance called "water" in both planets is the *same*, the chemical composition of it on Twin Earth is not H₂O but a very different one, which is very complicated and will be abbreviated as XYZ.

Let us now imagine that an Earthian travels to Twin Earth; he will firstly assume, according to the superficial properties of the substance called "water" on Twin

⁷ In the formulation of that theory in (Putnam, 1975b), he resorts to the notion of psychological states in the narrow sense (Putnam, 1975d, p. 220), i.e., psychological states that do not presuppose the existence of any individual other than the one in that state. Since this notion is not relevant for the following, we will take into consideration the characterization of the traditional theory of meaning presented in (Putnam, 1970), which for our aim is to be considered as equivalent to the one contained in (Putnam, 1975b).

⁸ According to Putnam's theory, the meaning of a natural kind term is given by a finite sequence of elements, one of which is the extension, expressed by a description of it. Other elements of that sequence are the syntactic markers, the semantic markers and the stereotype. The two latter comprise the superficial properties of the members of the kind. The difference between them is that the semantic markers—in the case of water, being a liquid—are the most general, central or hardly revisable of such properties; according to Putnam, among the properties that constitute the stereotype of water are those of being colorless, transparent, tasteless, etc.

Earth, that the term “water” means the same (in the sense of having the same extension) on Earth and on Twin Earth, but according to Putnam, the Earthian will reject this assumption as soon as he knows that the chemical composition of the substance on Twin Earth is not H_2O , but XYZ; the extension of the term “water” as employed on Earth consists of samples of H_2O , while the extension of the term “water” as used on Twin Earth, consists of samples of XYZ. In addition, Putnam and most causal theorists maintain that natural kind terms are rigid, i.e., they designate (or apply to) the same entities with respect to all possible worlds; if the rigid character of natural kind terms is accepted, then it will have to be concluded that the liquid denominated “water” on Twin Earth is not water.

Kuhn objects to this part of the thought experiment that Twin Earth is not a chemically possible world: “Modern chemical theory is incompatible with the existence of a substance with properties very nearly the same as water but described by an elaborate chemical formula” (Kuhn, 1989, p. 27; 1990, p. 310). Putnam’s reply to objections of this sort is that “the question is what we would say under perfectly imaginable circumstances, not what is chemically or physically possible” (Putnam, 2013, p. 200). However, it is questionable that chemically or physically impossible circumstances are “perfectly imaginable”.

In the second part of the thought experiment, Putnam asks us to go back in time to about 1750, when neither the Earthians nor the Twin Earthians knew the chemical composition of the substance they called “water”. Putnam asserts that the reference of the term “water” as it was used by Earthians in 1750 and 1950 is the same—the corresponding assertion would apply to the use of the term by Twin Earthians.

The justification of this claim rests on the thesis that the substance referred to by “water” as employed on Earth is in the relation of *kind-identity* with paradigmatic samples of water in our world, both in 1950 and 1750, and that said relation is given by their chemical composition. Now, the chemical composition of the paradigmatic samples of the substance on Earth called “water” is H_2O , and the samples of that substance had the *same* chemical composition in 1750 as in 1950, although in 1750 their chemical composition was not yet known. Since the chemical composition of the paradigmatic samples of this substance, and hence the corresponding relation of kind-identity, has not *changed* since 1750, the term “water” as used on Earth has the same extension in 1750 as in 1950—the respective thesis would apply to the reference of the term “water” as used on Twin Earth in 1750 and on 1950.

Kuhn challenges that the term “H₂O” has the same extension as the term “water” used on Earth in 1750. The extension of the term “water” from the perspective of present chemistry or of 1950’s chemistry is the set of samples of H₂O, *regardless* of whether these samples are in solid, liquid, or gaseous state. But Kuhn alleges that this was not so from the perspective of 1750’s chemistry. According to Kuhn, at that time, namely, before the so-called chemical revolution, which took place in the 1780s, it was considered that different chemical substances corresponded to the three states of aggregation, to wit, the solid, liquid, and gaseous states, as it was regarded that a chemical substance could only exist in *one* of these three states, and water was conceived in 1750’s chemistry as having the essential property of being a *liquid*. Hence the term “water”, such as this term was used in 1750’s chemistry, would not be co-referential with the term of modern science “H₂O”, but with the term “liquid H₂O” (or “close-packed H₂O particles in rapid relative motion”). From here it follows that the term “water”, as employed in 1750’s chemistry, is *not* co-referential or coextensive with the term “water” as used in present chemistry; from the perspective of 1750’s chemistry, a piece of ice would not belong to the extension of the term “water”, while it does belong to that extension from the perspective of present chemistry or of 1950’s chemistry. Thus, in this case the relation of kind-identity and hence the reference of the term “water” has *not* remained stable through theory change, against the claim endorsed by the causal theory.

This is Kuhn’s main objection to Putnam’s theory and in general to the causal theory of reference, an objection which concerns the thesis of reference change. However, Kuhn formulates in (Kuhn, 1989) and (Kuhn, 1990) two other objections to the causal theory, which bear on the so-called essential properties. On the one hand, and as already said, Kuhn attributes to the causal theory the thesis that only *one* essential property determines the reference of each natural kind term, and then he objects that more than one *essential* property is required to determine the reference of the term “water” as used in 1750, namely, the properties of being H₂O and of being a liquid (Kuhn, 1989, p. 29; 1990, p. 312). However, the causal theory does not seem to be committed to the thesis that Kuhn attributes to the proponents of this theory, since there is no reason why causal theorists could not accept that the reference of a term is determined not by *one* essential property but by a set of such properties.

Now, causal theorists identify essential properties with theoretical properties, but Kuhn questions the assimilation of theoretical properties to necessary or essential properties and of so-called superficial properties to contingent ones.

Kuhn claims that the so-called *superficial properties* are as necessary as the theoretical ones, since if a theory that posits the relevant theoretical properties could not predict the superficial properties, or at least some of them, it would not be taken seriously. Thus Kuhn claims that, as theoretical properties have been posited to explain and predict superficial ones, the latter will be as *necessary* as the former (Kuhn, 1989, pp. 29 f.; 1990, pp. 312 f.). Furthermore, he alleges that “superficial properties are the ones called upon in those difficult cases of discrimination characteristically raised by new theories” (Kuhn, 1989, p. 30; 1990, p. 313). Thus, against the causal theory, the reference of natural kind terms is not only determined by underlying properties shared by the members of the kind, since the superficial properties also play a role in that reference determination (Kuhn, 1989, p. 28; 1990, p. 312).

However, although the causal theory of reference is not adequate concerning the term “water” in its scientific use, and this claim extends to many natural kind terms used in science, Kuhn admits that the causal theory can be *acceptable*—or very closely so (Kuhn, 1989, pp. 25–26)—with respect to some natural kind terms whose extension has been approximately the same through history, as is the case of “gold”:

What remains special about “gold” is [...] that, unlike “water”, only one of the underlying properties recognized by modern science—having atomic number 79—need be called upon to pick out members of the sample to which the term has continued through history to refer (Kuhn, 1989, p. 30; 1990, p. 313).⁹

The reference of the term “gold” has a singularity not shared by the majority of natural kind terms—namely, that its extension has been relatively *stable* through history—and, thus, the causal theory can be approximately adequate for some terms like “gold”.¹⁰ Additionally, there is another sort of cases where the causal theory of reference for natural kind terms can be adequate, that is, in the periods of normal science, that is in the periods between scientific revolutions,¹¹ but it does not work in periods of *scientific revolutions* or, in general, of *reference changes*.

⁹ In this regard it is assumed that the superficial properties of gold have been the same or approximately the same through history.

¹⁰ Thus, some of our considerations on natural kind terms should contain implicitly the caveat that there are a few of them for which the causal theory can be adequate. But also the proviso that, since the incommensurability of theories only concerns a reduced number of interrelated kind terms of such theories (see the third section) many of the terms common to those theories will have the same reference.

¹¹ Kuhn claims that only in periods of normal science natural kind terms are rigid designators (Kuhn, 1990, p. 315).

The incommensurability thesis, Kuhn's view of reference and further critical remarks on the causal theory

Kuhn became interested in issues regarding semantics when he examined the semantic component involved in his incommensurability thesis, although Kuhn's considerations about the meaning and reference of natural kind terms are not intended to be an exhaustive theory. They are rather directed to emphasize the semantic *modifications* undergone by those terms during scientific revolutions, and his criticism of the causal theory of reference for natural kind terms is to be interpreted from this perspective.

It is noteworthy that in (Kuhn, 1989) and (Kuhn, 1990), he does not object that the causal theory of reference be adequate for *proper names*, but he argues that it is questionable when extended to *natural kind terms* (Kuhn, 1989, p. 25; 1990, p. 309; see also Kuhn, 2000b, p. 312). The same contrast between that theory for proper names and natural kind terms had also been put forward in (Kuhn, 1979), where he asserts:

When one makes the transition from proper names to the names of natural kinds, one loses access to the career line or lifeline which, in the case of proper names, enables one to check the correctness of different application of the same term (Kuhn, 1979, p. 199).

However, even if the causal theory of reference be acceptable for proper names because it is possible to check the correct use(s) of a name by tracing back the career line or lifeline of the individual to whom the name applies, sometimes up until the act of initial baptism or dubbing, this procedure does *not* work for natural kind terms because “the individuals which constitute natural families do have lifelines, but the natural family itself does not” (Kuhn, 1979, p. 199).

Further on, he adds:

The techniques of *dubbing* and of *tracing lifelines* permit astronomical individuals—say, the earth and moon, Mars and Venus—to be traced through episodes of theory change, in this case the one due to Copernicus. The lifelines of these four individuals were continuous during the passage from heliocentric to geocentric theory, but the four were differently distributed among natural families as a result of that change. (Kuhn, 1979, p. 205)

Here Kuhn mentions one of his favorite examples of a scientific revolution, namely the transition from the Ptolemaic system to the Copernican system in astronomy. Kuhn asserts that the extension of the term “planet” is different before and after the Copernican revolution. Before it, the moon and the sun—but not the earth—were included in the extension of the term “planet”; but as a consequence of that revolution, the term “planet” was *redubbed*, since the criteria of membership into its extension were modified, so that the earth came to belong to the extension of the term “planet”, but the sun and the moon ceased to be members of its extension—the former became a part of the extension of the term “star”, while the latter turned into a new sort of body, a satellite. This example explains why, according to Kuhn, it is not possible to trace back the lifeline of a natural kind term such as “planet”. Put in a general way, the reference of natural kind terms is not fixed at once in an initial act of baptism or dubbing, but it is subject throughout *revolutionary* periods to redubbing, which is as relevant to the reference of those terms as their dubbing. In order to shed light on Kuhn’s view about the redubbing and change of reference of natural kind terms, it is convenient to focus on his *incommensurability* thesis.

As said above, Kuhn introduced the notion of incommensurability in (Kuhn, 1970). However, Kuhn’s allusions to this concept in that work are rather scarce. It appears, for instance, at the beginning of Chapter X, ‘Revolutions as Changes of World-View’, where Kuhn presents his widely disputed world-change thesis according to which, e.g., “after a revolution scientists are responding to a different world” (Kuhn, 1970, p. 111). Kuhn also uses the term “incommensurability” in Chapter XII, ‘The Resolution of Revolutions’, where he claims that advocates of rival or successive paradigms experience some communication problems during the processes of comparing theories. As already said, the incommensurability thesis, as presented in (Kuhn, 1970), includes several components, among others an onto-epistemic and a semantic one,¹² but in subsequent writings Kuhn focused on the latter and alleged that incommensurable theories are untranslatable: “The claim that two theories are incommensurable is then the claim that there is no language, neutral or otherwise, into which both theories, conceived as sets of sentences, can be translated without residue or loss” (Kuhn, 1983, p. 36). Although incommensurable theories share a great deal of their vocabulary and conceptual apparatus, they also include a set of *interrelated* terms whose meaning differs from one theory to another; incommensurability is then a *local* phenomenon, for it is restricted to a localized part of (the languages of)

¹² Kuhn also refers to the “incommensurability of standards” (Kuhn, 1970, p. 149) as the view that the proponents of competing paradigms disagree about the set of problems that any candidate for a paradigm must resolve.

theories. However, although incommensurability has a local character, it helps to explain why advocates of incommensurable theories experience communication problems, since they use some terms with different meanings, and according to Kuhn this difference of meaning (of a group of interrelated terms common to incommensurability theories) prevents the translation between those theories.

Kuhn's incommensurability thesis considered as a semantic thesis is accompanied by some onto-epistemic views. His writings in the 1980s and 1990s are largely inspired by the insight that the processes of learning the language of a theory and learning something about nature are two sides of the same coin. On this matter, he claims that "in much of language learning these two sorts of knowledge—knowledge of words and knowledge of nature—are acquired together" (Kuhn, 1987, p. 31), and also that "different languages impose different structures on the world" (Kuhn, 1983, p. 52). These ideas are emphasized in the framework of his *taxonomic* version of incommensurability, Kuhn's last view on incommensurability, according to which two theories are incommensurable if they employ *non-homologous lexical taxonomies*, and thus taxonomies with incompatible taxonomic structures.

In this regard it is suitable to mention that Kuhn generally uses the terms 'taxonomy', 'lexical taxonomy' or 'lexicon' as interchangeable (see, e.g., Kuhn, 1991, p. 101), and that in his characterization of a lexicon he underlines the notion of structure, e.g., he asserts that a lexicon is a "structured vocabulary" (Kuhn, 1989, p. 11; 1990, p. 300) of kind terms where the structure is composed by a set of taxonomic categories arrayed in a particular way on the basis of some similarity, and dissimilarity, relations among the members of the kinds.¹³ On the other hand, it is important to emphasize that a lexicon "contains both kind concepts and their names" (Kuhn, 1993, p. 229); thus when speaking about a lexicon, taxonomy, etc. we could speak indistinctly of taxonomic categories, kind concepts and kind terms, but since we are focusing on natural kind terms, we will only use the expressions 'natural kind' or simply 'kind', and 'natural kind term' or just 'kind term'.

¹³ In some of his writings, Kuhn claims that the similarity relations between the members of a kind do not depend only on their likeness but also on their differences from the members of other kinds. Hence, the mere exposition to resemblances between the entities of a kind may not suffice to apprehend the similarity relations that make up a taxonomy, and the presentation of dissimilarities from other entities, which constitutes a contrast set, plays an essential role in acquiring them (see, e.g., Kuhn, 1974, p. 307; 1976, p. 194, n. 27; 1983, p. 51). For example, when a child is learning that natural kind waterfowl, the exposition to ducks, geese, and swans—which form a contrast set—will play an important role in his acquisition of the natural kind term (see Kuhn, 1974). For this reason, hereafter we will include these dissimilarity relations as part of the network of relations that constitute a taxonomy, as Kuhn often does.

The process of language learning brings with it the acquisition of a particular taxonomy, which is used when describing (a part of) the world; in this regard Kuhn claims that during the process of socialization within the framework of a theory, students are exposed to situations that exhibit similarity and dissimilarity relations among the members of kinds and they learn how to recognize those relations. Competing or successive theories are *incommensurable* because they contain non-homologous lexical taxonomies, and thus taxonomies that make use of incompatible or discrepant similarity and dissimilarity relations, as a result of which they contain natural kind terms whose referents do not coincide, but *overlap*.¹⁴

The similarity and dissimilarity relations embodied in a taxonomy establish a particular organization of the natural kinds included in the taxonomy and determine the membership into such kinds. Incommensurable taxonomies will classify the same individuals under overlapping natural kinds—hence attributing different extensions to the corresponding natural kind terms—in virtue of their use of discrepant similarity and dissimilarity relations. Indeed, Kuhn claims that “one of the things (*perhaps the only thing*) that changes in every scientific revolution is some part of the network of similarity [and dissimilarity] relations” (Kuhn, 1976, p. 194, emphasis added) involved in assembling a group of natural kind terms and giving structure to it, and the meaning and reference changes that some natural kind terms undergo during revolutionary periods are the result of modifications in such relations.¹⁵

Incommensurable or non-homologous taxonomies, which contain discrepant similarity and dissimilarity relations in organizing a set of natural kinds, involve different networks of relations among the corresponding kind terms, as well as no *coextensive* criteria for membership into them. This is exactly what happens in the aforementioned example of the Ptolemaic and Copernican taxonomies, where, e.g., the term “planet” was *redubbed* through the Copernican revolution, due to modifications in the criteria for membership into the natural kind planet. And similar considerations apply to the term “water” before and after the chemical revolution. Kuhn’s (taxonomic) incommensurability and his considerations on

¹⁴ As Kuhn develops his taxonomic version of incommensurability he introduces the no-overlap principle as an important feature of such phenomenon. According to this principle “no two kind terms, no two terms with the kind label, may overlap in their referents unless they are related as species to genus” (Kuhn, 1991, p. 92). However, this is exactly what happens in the case of incommensurable taxonomies.

¹⁵ Since the network of relations that a natural kind term maintains with other natural kind terms within the framework of a taxonomy is an important factor in the determination of its reference, Kuhn claims that “reference is a function of the shared structure of the lexicon” (Kuhn, 1989, p. 25, n. 25; 1990, p. 317, n. 22).

reference imply that the natural kind terms involved in the incommensurability thesis will have a *plurality of extensions*, each of which relative to a particular taxonomy or conceptual scheme.

Having come to this point, it is relevant to indicate that in later writings Kuhn presents an account on scientific progress that focuses on specialization: “After a revolution there are usually (perhaps always) more cognitive specialties or fields of knowledge than there were before” (Kuhn, 1991, p. 97). Scientific specialties that emerge after revolutionary periods are largely incommensurable, which means that incommensurability, and therefore the taxonomical disparity that goes hand in hand with it, is not only a *diachronic* phenomenon, but a *synchronic* one too—that is, non-homologous taxonomies usually coexist at any particular moment of time. Thus, the plurality of extensions of natural kind terms is not only a diachronic phenomenon, but also a *synchronic* one.

Putnam’s later theory, incommensurability and the plurality of extensions

Putnam sometimes assimilates his theory to Kripke’s theory, in which the notion of initial baptism plays an important role—Putnam even talks of an “introducing event” in the sense of initial baptism on one occasion (see Putnam, 1973, p. 200). According to Kripke (1980), the reference of proper names and natural kind terms is *fixed* in an initial baptism where the reference of the term is introduced ostensively or by a description. Once a natural kind term (or a proper name) has been introduced in an initial baptism, the term is transmitted by the introducer to other speakers, thus establishing a *causal chain*; however, in order for a speaker to be a link of the chain involving a term it is required that when he learns the term he intends to use it with the *same* reference as it was used by the speaker from whom he learnt it. Thus, it appears that the reference of a term *cannot* be subject to change.

However, it is noteworthy that in (Putnam, 1975c) he comes to maintain that the links of *social* character between the average speakers and the experts of their linguistic community are more important for the reference of the term as used by average speakers than the links of historical character that would bind their uses ultimately to the initial introduction of the term. In this line, Putnam asserts that the person placed at the beginning of a causal chain—he literally says “chain of transmissions or cooperations” (Putnam, 1975c, p. 275)—need

not be the original introducer of the term, but he may be the “relevant expert”. Hence, if the “introducer” of a natural kind term need not be the first person who introduced the term, but it can be another person, though it has to be an *expert*, the possibility should be left open for different experts—or, if preferred, different “relevant experts”—to carry out different introductions of the term and thus bring about different chains of transmission of it. Thus, Putnam leaves aside Kripke’s appeal to the (initial) introducing event (dubbing) for each term, which fixes its reference, and leaves open the way to explain the redubbing of natural kind terms and thus of the *plurality of extensions* of natural kind terms.

But there is a more explicit way to justify the claim that according to Putnam natural kind terms will have a plurality of extensions. He defended various forms of realism in different periods of his intellectual career among which is internal realism.¹⁶ Concerning internal realism Kuhn asserts: “When Hilary started talking about internal realism, I thought, hell, *now* he’s talking my language” (Kuhn, 2000b, p. 312). The main components of internal realism are verificationist semantics and conceptual relativity, and in the quoted passage Kuhn seems to allude to the latter.¹⁷

According to the thesis of conceptual relativity,¹⁸ the logical—and ontological—basic concepts like those of object, essence, existence, identity, property, etc. and

¹⁶ The internal realist view of reference is not the causal theory of reference that Putnam held in 1975b, but rather a disquotational theory of reference according to which we understand the notion of reference by learning assertability conditions of the sort “‘Cat’ refers to an object X if and only if X is a cat” (Putnam, 1983, p. xv), where the use of “cat” presupposes that we understand that word, and at the time that Putnam supported internal realism, his account of understanding was verificationist. That view of reference is not compatible with his causal theory of reference put forward in (Putnam, 1975b). However, after the internal realist’s period Putnam advocated for a natural realism—or commonsense realism—and a disquotational account of reference, and this is compatible with a causal theory of reference (see, e.g., Putnam, 2015, p. 97 ff.).

¹⁷ Kuhn also asserts: “Putnam has, I believe, now abandoned significant components of the essentialist viewpoint that underlies this paper [“The Meaning of ‘Meaning’”, i.e. Putnam, 1975b], moving now from it to a view (‘internal realism’) with significant parallels to my own” (Kuhn, 1989, p. 25, n. 26; 1990, p. 317, n. 23); however, he adds that “few philosophers have followed him” (Kuhn, 1989, p. 25, n. 26; 1990, p. 317, n. 23). Nevertheless, since one of the main components of internal realism, i.e., verificationist semantics, is not related to Putnam’s supposed essentialism in Putnam 1975b, one of the parallels to Kuhn’s view must be conceptual relativity. Internal realism involves the rejection of metaphysical realism; although both authors share their rejection for that view we cannot enter into this question here. However, it is noteworthy that the thesis of conceptual relativity is independent from internal realism and indeed Putnam’s later rejection of internal realism was not accompanied by the rejection of conceptual relativity, which Putnam continued to hold throughout his philosophical career.

¹⁸ Some thoughtful considerations on the thesis of conceptual relativity can be found in (Button, 2013, pp. 199–220).

their corresponding linguistic expressions do not have an absolutely precise use, but an extensible family of *uses*. As a result of this, and depending on the type of uses we make of those concepts or expressions or, if preferred, for which of the possible languages or *conceptual schemes* constituted by those uses we opt for, the same situation, in a common sense understanding of the “same” situation, can be described in different ways, and the sentences expressing those different descriptions can be equally true. One of the examples more commonly used by Putnam to illustrate the phenomenon of conceptual relativity (see, e.g., Putnam, 1987, p. 18 ff.) can be put as follows. Let us take into consideration a world in miniature and adopt, e.g., the sort of language employed by Carnap in the decade of the fifties when he formulated his systems of inductive logic, in such a way that the sentence “That world contains three objects” is true, where the expression “object” is being used in the way Carnap employed the expression “individual”. Nonetheless, the sentence “That world contains seven objects”—and therefore not only three objects—is true if the expression “object” is being used in the framework of a mereological system – and if leaving aside the null object accepted in some mereological approaches. Thus, a same situation, in a common sense understanding of the “same” situation, can be described as involving a different number of objects and different sorts of objects, depending on the reference of the term ‘object’, which in the two situations mentioned has a different reference.

However, although we have at our disposal different languages or conceptual schemes and, hence, different possible conventions for the employment of the basic logical—and ontological— notions, once we have indicated how we are using the notions in question, the answers we give to questions including those notions or their corresponding expressions—for instance, the question of how many objects exist—are not subject to convention. Put in another way, the answers to such questions are relative to the choice of a language or conceptual scheme, but this does not prevent such answers from being objectively true or false, i.e., their truth or falsity does not simply depend on what we think. And Putnam alleges that conceptual relativity is *compatible* with realism if this is understood in the following sense: “A realist who recognizes conceptual relativity [...] is to believe that there is an aspect of reality which is independent of what we think at the moment [...] which is correctly describable [in more than one way]” (Putnam, 2015, pp. 86–87).

The phenomenon of conceptual relativity agrees with the *plurality of extensions* of natural kind terms. In this sense, taking into consideration biological species,

Putnam criticized the thesis that a natural kind term has a unique determinate essence—the *essentialist* thesis concerning natural kinds (see Putnam, 1994, pp. 75 ff.). Putnam alleges that evolutionary biology and molecular biology involve two different points of view concerning the essence of species—and thus two different notions of species-identity—that imply criteria of membership into a species not completely coextensive. Another way to put the same issue is that the relation of kind-identity depends on the conceptions of experts, mainly scientists, about the notion of kind-identity, and that “different descriptions of the ‘nature’ of a natural kind should lead to not quite coextensive criteria for membership in the kind” (Putnam, 1994, p. 77), and according to the example given by Putnam concerning two biological theories the “different descriptions” will result from different uses of the notions of identity—and hence kind-identity—or “essence” or “nature” or from various conceptual schemes constituted by those uses.

Concerning Kuhn’s view, as already indicated in the third section of this article, incommensurable taxonomies constitute non-homologous classifications of entities into natural kinds, and non-homologous taxonomies involve different kind-identity relations between the members of (some) natural kinds and thus different criteria for membership into the extensions of the corresponding natural kind terms. This implies that the same natural kind term will have different extensions—diachronically and synchronically—depending on the taxonomy where it appears, and thus natural kind terms will have a *plurality of extensions*. Taxonomic incommensurability thus understood explains why the term “water” did not refer to “H₂O” back in 1750 but to “H₂O liquid” and in general the dependence of the relation of *kind-identity* on scientists’ theorizing—or, in other words, on the taxonomies that scientists employ. Incommensurability also implies that questions concerning kind-identity, and thus regarding the extension of the corresponding natural kind terms, do not usually have a straightforward answer. Rather, they may have multiple, equally legitimate answers, each of which is relative to a lexicon, taxonomy, or conceptual scheme.

Kuhn argued that the causal theory of reference was problematic when applied to natural kind terms because, unlike what happens in the case of proper names, it is not possible to check the correct use of a natural kind term by tracing back the lifeline of the natural kind to which the term attaches—natural kinds do not have lifelines, as individuals do. Natural kind terms are reintroduced and *redubbed*, and so the criteria for membership into the natural kinds to which those terms refer, and consequently the *extension* of such terms, will change with time and from an incommensurable theory to another. The redubbing of

natural kind terms occurs especially in revolutionary periods during which new discoveries lead to conceptual changes that affect the taxonomies assumed by the theories accepted at the moment. Some theories are rejected and abandoned, and so their particular taxonomies are also discarded. Nevertheless, major changes are not common, since Kuhn claims that incommensurable theories share a great part of their vocabulary and cognitive apparatus—and, thus, also a great part of their taxonomy. The causal theory, he claimed, cannot account for the reference change of natural kind terms, resulting from their redubbing, which Kuhn explains by recourse to the changes in the similarity and dissimilarity relations that make up the taxonomies assumed by scientific theories.

As already said, Putnam's reference theory after (Putnam, 1975b) can actually explain the redubbing of natural kind terms and account for the plurality of extensions of natural kind terms in virtue of his thesis of conceptual relativity. His view is not so different from Kuhn's contentions regarding incommensurability and reference; in fact, Putnam's assertion that the relation of kind-identity depends on the scientists' uses of that notion or on the conceptual scheme they opt for connects with Kuhn's thesis that the relation of kind-identity depends on the taxonomy assumed by scientists at a given time. Thus, it can be argued that despite his criticism of the causal theory of reference put forward by Putnam in (Putnam, 1975b), his later stance did not differ that much from Kuhn's.

Conclusion

After examining Kuhn's criticism of the theory of reference put forward by Putnam in his classic (Putnam, 1975b), we have argued that Kuhn's view of reference and Putnam's later view regarding reference are not as different from each other as it may appear. First, we have pointed out that Kuhn's objection to the causal theory of reference concerning natural kind terms consists in its inability to explain the reference change of natural kind terms common to the languages of theories involved in scientific revolutions; that change results from the redubbing of natural kind terms, which is accompanied by modifications in the criteria for membership into natural kinds. Kuhn's incommensurability thesis was designed precisely to account for such reference changes. However, we have alleged that Putnam's reference theory after (Putnam, 1975b) contains components that facilitate the explication of the reference changes of natural kind terms, mainly in virtue of his thesis of conceptual relativity. Following

this argument, we have also attributed to both Kuhn and Putnam the thesis that natural kind terms will have a plurality of extensions. In this regard, we have maintained that conceptual relativity presents significant similarities with respect to Kuhn's taxonomic incommensurability: the former entails that the reference of natural kind terms depends on a particular conceptual scheme, which is constituted by specific uses of ontological and logical concepts such as identity, essence, etc., and the latter implies that the extension of natural kind terms depends on the taxonomy where they appear. Given the parallelism of these views, it can be concluded that Kuhn's and Putnam's stances on reference bear more similarities than it has usually been recognized.

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