NATURAL KIND TERMS, RIGIDITY AND THE PATH TOWARDS NECESSITY

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Summary: *1. Introduction. 2. Kripke's framework. 3. Natural kind terms as rigid designators. 4. Rigidity and the truth and necessity of theoretical identities. 5. Kripke's essentialist claims for the truth and necessity of theoretical identities.*

1. Introduction

In the first two lectures of *Naming and Necessity*[1] Kripke primarily deals with proper names, while in the third he pays particular attention to natural kind terms and terms for natural phenomena, in which one of his main aims is to allege the existence of certain *similarities* between both sorts of terms and proper names. In this paper I will deal exclusively with natural kind terms specifically concentrating on a prototypical sort of these, the so-called *substance terms*, such as "water" and "gold".

According to Kripke, one of the similarities between natural kind terms and proper names is that both sorts of expressions appear in identity statements that, if true, are necessary – although they are true *a posteriori*. Kripke calls the sort of identity statements containing natural kind terms "theoretical identifications" and "theoretical identities" (I will opt for the second denomination) and he exemplifies them by the statements "Water is H_2O" and "Gold is the element with the atomic number 79". Nevertheless, Kripke claims that this similarity follows from another, namely that natural kind terms are like proper names *rigid designators*. Thus, he asserts:

«Theoretical identities, according to the conception I advocate, are […] identities involving two rigid designators and *therefore* are examples of the necessary *a posteriori*».[2]

As already indicated, Kripke conceives of theoretical identities as a sort of identity statements.[3] He assumes that the natural kind terms flanking the identity

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[1] S. Kripke, *Naming and Necessity*, Blackwell, Oxford 1980, revised and enlarged edition, first published in D. Davidson & G. Harman (eds.), *Semantics of Natural Language*, Reidel, Dordrecht 1972. [2] S. Kripke, o.c., p. 140; first emphasis added.

[3] It could be claimed that theoretical identities are not linguistic expressions and hence

sign in such statements are rigid designators and that theoretical identities are true – false identity statements cannot be necessary. Such claims would justify the necessity for theoretical identities.

In this paper I have a threefold aim. Firstly, I will contend that it can be held that natural kind terms are rigid designators. Secondly, I will argue that the conception of natural kind terms as rigid designators hinders the establishment of the truth of theoretical identities and hence of their necessity. Thirdly, I will dispute some of Kripke's claims of a metaphysical character to support the truth and necessity of theoretical identities.

2. KRIPKE'S FRAMEWORK

It is appropriate to start with some remarks about the framework within which Kripke puts forward the thesis that natural kind terms are rigid designators. In this respect it is noteworthy that Kripke does not offer a precise characterization of natural kind terms. He asserts, on the one hand, that natural kind terms are *general terms,* which include count terms, for example, the terms "cat" and "tiger" as well as mass terms, for example, the terms "water" and "gold";[4] the latter sort of terms being precisely the *substance terms*. On the other hand, Kripke uses indistinctly the expressions "natural kind terms" and "terms for natural kinds".[5] Thus, Kripke mainly characterizes natural kind terms as general terms whose function is to designate *natural kinds*, but this characterization requires an elucidation of how natural kinds are conceived – see section 3 below.

In the first lecture of *Naming and Necessity* Kripke introduces the term *designator* as a common denomination for proper names and definite descriptions, the two types of *singular terms* he takes into consideration. The definition of a rigid designator or rigid designation or, for short, rigidity is found in the first and second lectures and thus it is introduced before Kripke focuses on natural kind terms. Since Kripke claims that natural kind terms are, like proper names, rigid designators, but he does not provide an *explicit* definition of rigid designation for natural kind terms, it must be assumed that the definition of rigidity for such terms will be an extension of the one proposed for singular terms.

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not identity statements, but rather the propositions expressed by them. Nevertheless, my considerations about theoretical identities, understood as identity statements, could be easily extended to the propositions expressed by them.

⁴ S. KRIPKE, o.c., p. 134. There are some occurrences of mass terms where they behave as singular terms. Nonetheless, since Kripke regards them as general terms, here I will only consider them as such. In any case, it can be argued that the primary use of mass terms is the one in which they function as general terms (see S. SOAMES, *Beyond Rigidity. The Unfinished Semantic Agenda of Naming and Necessity*, Oxford University Press, Oxford 2002, pp. 246-48).

⁵ See S. KRIPKE, o.c., pp. 162, 134, 136 and 128, n. 66.

The definition of rigid designation contained in the first edition of *Naming and Necessity* – published in 1972 – and in his paper *Identity and Necessity*[6] can give rise to different characterizations. This ambiguity led David Kaplan to write Kripke asking him for a clarification of that notion. In his answer Kripke affirms that the notion of a rigid designator intended by him is the following:

«[A] designator *d* of an object *x* is *rigid*, if it designates *x* with respect to all possible worlds where *x* exists, and *never designates an object other than x with respect to any possible world*».[7]

This definition leaves two options open. The first is that a rigid designator designates the same object with respect to every possible world – whether the object exists therein or not –, while according to the second, it designates the same object with respect to every possible world in which the object exists and has no reference with respect to every other possible world. Following a usual terminology, initially proposed by N. Salmon,[8] rigid designators satisfying the first characterization are *obstinate* designators, while those fulfilling the second one are *persistent* designators.

Kripke prefers to leave this double alternative open so as not to get involved in questions arising from the possible non-existence of an object. However, the definition of rigid designation applicable to proper names actually intended by Kripke is the first one, because in the Preface to the enlarged version of *Naming and Necessity* – published in 1980 – he asserts that he considers proper names as rigid *de jure*.[9] A designator is rigid *de jure* if when its reference is fixed it is *stipulated* that its referent is the same independently of whether we are speaking of the actual world or of a possible world different from it.[10] Nevertheless, even though Kripke does not explicitly resort to the distinction between persistency and obstinacy, he links the notion of rigidity *de jure* to the notion of obstinate rigidity, so that rigid *de jure* designators are obstinate designators.[11]

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[6] S. KRIPKE, *Identity and Necessity*, in M. K. MUNITZ (editor) *Identity and Individuation*, New York University Press, New York 1971, pp. 135-164.

[7] Quoted in D. KAPLAN, *Afterthoughts*, in J. ALMOG et al. (editors.), *Themes from Kaplan*, Oxford University Press, New York 1989, p. 569.

[8] N. SALMON, *Reference and Essence*, Princeton University Press, Princeton 1981, pp. 33 f.

[9] S. KRIPKE, *Naming and Necessity*, cit., p. 21, n. 21.

[10] For a proposal to determine more precisely the character of the sort of stipulation involved in the rigidity *de jure* see C. BESSON, *Rigidity, Natural Kind Terms, and Metasemantics*, in H. BEEBEE and N. SAABARTON-LEARY (editors), *The Semantics and Metaphysics of Natural Kinds*, Routledge, New York/London 2010, pp. 34 f.

[11] Kripke asserts: «[s]ince names are rigid *de jure* […] I say that a proper name rigidly designates its referent even when we speak of […] [possible worlds] where that referent would not have existed» (S. KRIPKE, *Naming and Necessity*, cit., p. 21, n. 21).

Although most definite descriptions are *non-rigid designators*,[12] Kripke acknowledges that some definite descriptions are rigid; they are not yet rigid *de jure* but rigid *de facto*. In the case of a rigid *de facto* designator it is not stipulated that there is one object that is its referent with respect to all possible worlds, but the predicate contained in the description applies to the same object "in each possible world".[13] Nonetheless, it is convenient to modify this characterization of rigidity *de facto* in two senses. Firstly, it is suitable to leave open the option that the predicate or general term with which the description has been built applies to the same object with respect to every possible world *or* only with respect to every possible world where the object exists, having no reference with respect to every other possible world. Thus, rigid *de facto* designators can be obstinate or persistent.[14] Secondly, although rigid *de facto* designators are one sort of description, I will extend this notion of rigidity to the *general terms* with which such descriptions have been built, since, as already indicated, according to Kripke natural kind terms are a class of general terms.

Returning to proper names, as it is well known a consequence of the rigidity of proper names is that true identity statements involving two proper names are *necessary*, i.e., true with respect to every possible world. One of the most famous examples is the identity statement "Hesperus is Phosphorus". This statement is true, since the names "Hesperus" and "Phosphorus" designate the same object, to wit, the planet Venus. Now, since proper names are rigid *de jure* and hence obstinate designators those names will designate the planet Venus with respect to every possible world, from which it follows that the statement "Hesperus is Phosphorus" is necessary. However, it was an empirical discovery that these proper names designate the same object; therefore, the statement "Hesperus is Phosphorus" is, though necessary, true *a posteriori*.

Having reached this point, we must propose a definition of rigid designation

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[12] Here and in the following I will only consider definite descriptions in their attributive use.

[13] S. KRIPKE, *Naming and Necessity*, cit., p. 21, n. 21. In the formalization of descriptions there are variables involved; I will assume that the domain of quantification of variables with respect to a possible world is restricted to the individuals in that world.

[14] Although rigid (*de facto*) descriptions are in principle persistent designators (see S. SALMON, o.c., p. 35), which is especially plausible in the case of rigid descriptions of contingently existent objects, there may be rigid descriptions that are obstinate, to wit, those that designate objects that exist in all possible worlds, i.e., necessarily existent objects. Since Kripke denominates the designators of necessarily existent objects *strongly rigid designators*, strongly rigid descriptions will be obstinate. Thus, e.g., if one tentatively concedes that mathematical entities necessarily exist (see S. KRIPKE, *Identity and Necessity*, cit., p. 145), the description "the smallest prime" will be an obstinate designator, since it will designate the same object – the number two – with respect to every possible world. This description is precisely the example of a rigid *de facto* designator Kripke gives in the Preface to S. KRIPKE, *Naming and Necessity*, cit.

for natural kind terms in accordance with Kripke's definition for singular terms and make explicit Kripke's view on their referents, i.e., on natural kinds. Both tasks are necessary to determine whether natural kind terms can be regarded as rigid designators.

3. Natural kind terms as rigid designators

Regarding the first task, we must bear in mind the definition of rigid designation for singular terms put forward by Kripke in his answer to Kaplan. Since in the third lecture of *Naming and Necessity* he extends the notion of a rigid designator to natural kind terms, we will extend that definition to natural kind terms or, more generally, to kind terms.[15] Although it is not mentioned in the bibliography on this subject, the most natural extension, and the only one I will take into consideration,[16] is the following:

«A designator *d* of a kind *k* is *rigid*, if it designates *k* with respect to all possible worlds where *k* exists, and *never designates a kind other than k with respect to any possible world*».

As occurs with the definition of rigid designation for singular terms, this characterization of rigidity for kind terms leaves *two* options open for natural kind terms, namely that they designate the same kind with respect to every possible world *or* that they designate the same kind only with respect to every possible world where the kind exists, having no reference with respect to every other world. Thus, natural kind terms can be obstinate or persistent designators.

Regarding the second issue, that is, how Kripke conceives natural kinds, it is pertinent to pay attention to the two rather idealized examples that Kripke presents of how the introduction of natural kind terms would proceed, at which their reference would have been fixed. These are the following:

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[15] In the bibliography other types of kind terms, besides natural kind terms, are usually distinguished, for instance, artifactual kinds and sociolegal kinds (see M. Devitt and K. Sterelny, *Language and Reality*, Basil Blackwell, Oxford 2nd rev. and enlarged ed. 1999, pp. 93 ff.). All of these terms belong to the category of general terms that are common nouns. When in the following I refer to general terms I will only take into account those that are common nouns.

[16] Soames (see S. Soames, o.c., pp. 251 f.) proposes another extension of Kripke's definition of rigid designation for singular terms to natural kind terms, in Soames' terminology "natural kind predicates", according to which a (natural kind) predicate is rigid if and only if it is an essentialist predicate. Nevertheless, the definition of an essentialist predicate is actually not a definition of rigid designation but of rigid application, similar to the definition of a rigid applier presented by Devitt (see M. Devitt, *Rigid Application*, «Philosophical Studies», 125 (2005), p. 146), who concedes that this definition would not be the one intended by Kripke. For different versions of essentialist predicates see M. Gómez-Torrente, *Rigidity and Essentiality*, «Mind», 115 (2006), pp. 227-289.

«[I]n general, terms for natural kinds (e.g., animal, vegetable, and chemical kinds) get their reference fixed in this way; the substance is defined as the kind *instantiated* by (almost all of) a given sample».[17]

In a similar sense, when Kripke talks about how we should imagine that the reference of the term "gold" would have been fixed, he asserts:

«Gold [i.e, the referent of the term "gold"] is the substance *instantiated* by the items over there, or at any rate, by almost all of them».[18]

Now, since according to these two quoted passages, Kripke characterizes the relationship between a natural kind and the entities of the kind as a relationship of *instantiation*, he must have conceived a natural kind as a type of universal, although he does *not* give any details in this regard. However, from here there follows a noteworthy consequence, to wit, that with regard to natural kind terms we will need to distinguish between their *reference* and their *extension*. The reference of a natural kind term is a natural kind, understood as a universal, while the extension of that term is the set whose members are the instances of the universal in question. This distinction will apply in general to the rest of kind terms as far as we conceive of their referents as universals.

Nonetheless, taking into account the definition of rigid designation for kind terms proposed above, one has to make a proposal regarding the conditions under which a kind exists with respect to a possible world. Although Kripke has not been very explicit in this regard, the most consistent position with some of his claims, or at least the one I will assume in the following, is that a natural kind exists with respect to a possible world if and only if that possible world contains instances of the kind.[19] Thus, the claims about the existence of a kind with respect to a possible world are *derived* from those concerning the existence of instances of the kind in that world. In this respect, I will adopt two further assumptions. On the one hand, I will assume the following *necessary condition* for the identity of natural kinds: if two natural kinds are

[17] S. KRIPKE, *Naming and Necessity*, cit., pp. 135-136; emphasis added. In this passage the expression "substance" is being understood in a broad sense, i.e., as interchangeable with the expression "natural kind".

[18] S. KRIPKE, *Naming and Necessity*, cit., pp. 135; emphasis added. The use of the expression "almost all" in those passages is based on the fact that *some* of the entities belonging to the sample involved in the reference fixing of a natural kind term may not be instances of the kind. If it is discovered that the number of such entities is not small, the sample being only slightly homogenous, there may be different reactions to it, among which Kripke mentions those of considering that the sample instantiates two sorts of kind, or of dropping the natural kind term we had supposedly introduced (see S. KRIPKE, *Naming and Necessity*, cit., p. 136). In the following, I will pass over that qualification.

[19] This proposal agrees with some of Kripke's assertions on natural kinds; see S. KRIPKE, *Naming and Necessity*, cit., p. 136.

identical, then the instances of each kind are the same in all possible worlds. Therefore, in order to establish that two natural kinds are not identical it is sufficient to establish that there is a possible world in which the instances of both kinds are not the same.[20] On the other hand, since the instances of natural kinds are not necessarily existent entities, because we can stipulate possible worlds where there are no such instances,[21] the existence of the natural kinds will not be necessary either, but rather contingent. Thus, I will assume that natural kinds are not necessarily existent.

The view of natural kinds as certain universals (substances, species, and so on) – instantiated in concrete entities –, is the predominant view at present among the authors who accept the thesis that natural kind terms are rigid designators.[22] This view allows us to maintain that natural kind terms are rigid designators, according to the definition of rigid designation for these terms, and in general for kind terms as proposed above, since the universals designated by natural kind terms – natural kinds – will be the same with respect to every possible world or at least with respect to every possible world where such kinds exist, i.e., with respect to every possible world that contains instances of such kinds, in accordance with our aforementioned proposal concerning the conditions under which a kind exists with respect to a possible world.

However, the view of the referents of natural kind terms as universals instantiated in concrete entities seems to be applicable to the referents of *all* general terms that apply to concrete entities, and this will lead us to accept that not only natural kind terms, but also all general terms (see note 15 *supra*), are rigid designators – or at least, all general terms applicable to concrete entities. In the following, however, I will leave this qualification aside. In this regard it can be held that the view of the entities designated by natural kind terms as universals *trivializes* the notion of rigidity. There are different characterizations of this problem of trivialization, but the most important one is the following: according to this view, rigidity does not distinguish natural kind

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[20] That identity condition is reasonable; thus according to it, the natural kinds creature with a heart and creature with a kidney are not identical, since we can stipulate – see the following note – a possible world where their instances are not identical. The consequence that those kinds are different is, I claim, intuitive.

[21] My assumption that natural kinds do not necessarily exist is grounded on the claim that according to Kripke possible worlds are stipulated, not discovered; thus, we can describe a possible world beginning with the following words: "Let us imagine a possible world that does not contain instances of H_2O". A similar stipulation could be made regarding the instances of any natural kind in the event the description of the possible world in question does not imply, explicitly or implicitly, the existence of such type of instances.

[22] See, e.g., N. Salmon, o.c., and N. Salmon, *Are General Terms Rigid?* «Linguistics and Philosophy», 28 (2005), pp. 117-134 as well as G. Martí and J. Martínez-Fernández, *General Terms as Designators: A Defence of the View*, in H. Beebee and N. Saabarton - Leary (editors), *The Semantics and Metaphysics of Natural Kinds*, Routledge, New York/London 2010, pp. 46-63.

terms – and terms for natural phenomena – from other general terms, since all general terms would become rigid.[23]

Nonetheless, having reached this point it is appropriate to make certain distinctions. As already pointed out, Kripke asserts that proper names, i.e., singular terms that are semantically simple,[24] are rigid designators, while most definite descriptions, that is, singular terms that are semantically composed, are non-rigid designators. In the same line it can be claimed that semantically simple general terms are rigid designators. Thus, for example, the terms "water" and "gold" are rigid designators,[25] but so are other general terms such as "bachelor" – a sociolegal kind term – or "table" – an artifactual kind term (see note 15 *supra*). Accordingly, rigidity does not make it possible to *distinguish* natural from non-natural kind terms.[26] However, since I think that this is the most natural way of extending the rigidity of proper names to natural kind terms I will accept this consequence.

Nevertheless, according to that view of the referents of natural kind terms, and overall of general terms, *not all* general terms will be rigid designators. More precisely, *most* semantically composed general terms will not be rigid designators. Thus, for instance, the terms "most valuable metal" or "liquid preferred by John" will not be rigid designators or, at least, they have a non-rigid interpretation since they can designate with respect to different possible worlds different metals or liquids, conceived as universals. However, there will be some semantically composed general terms that will be rigid, for example, the terms "element with the atomic number 79" or "H_2O". Concerning this last term it is appropriate to point out that according to the most natural interpretation of "H_2O", this expression is (the abbreviation of) a definite description, to wit, the description "The substance composed of molecules

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[23] According to another version of the problem of trivialization, the view of the rigidity of general terms as designating universals trivializes the notion of rigidity because it cannot distinguish between rigid and non-rigid readings of those terms, as the truth conditions of sentences that contain general terms are the same independently of whether we consider rigid or non-rigid readings of them. For a reply to this charge of trivialization see G. MARTÍ and J. MARTÍNEZ-FERNÁNDEZ, o.c., pp. 48 ff.

[24] Here and in the following by "semantically simple" I mean terms that do not contain meaningful parts or, if they do, those whose meaning (and reference) is not determined by the meaning (and reference) of their component parts. I will use "semantically composed" as the adjective opposed to "semantically simple".

[25] When Kripke claims that «certain general terms, those for natural kinds, have a greater kinship with proper names than is generally realized» (S. KRIPKE, *Naming and Necessity*, cit., p. 134) – that kinship including rigidity –, most of the examples of natural kind terms he gives are semantically simple terms; the only exception is the term "chunk of gold", derived from the semantically simple term "gold".

[26] Semantically simple general terms that are introduced by stipulation as the abbreviation for a non-rigid description will not be rigid either.

consisting of two hydrogen atoms and one oxygen atom" (or similar). When I refer to the term "H_2O" as a *general term*, I understand it to mean the general term obtained from the description by deleting the article "the". In this respect we should bear in mind that according to Kripke natural kind terms are general terms.

That said, once we have conceded that there are semantically composed general terms which are rigid designators, it is plausible to *extend* the similarity between the rigidity of singular and general terms as follows: semantically *simple* general terms are, like proper names, rigid *de jure*, while semantically *composed* general terms that are rigid are, like rigid definite descriptions, only rigid *de facto*.

4. Rigidity and the truth and necessity of theoretical identities

However, if one accepts this last claim, the two examples of theoretical identities mentioned above will contain a rigid *de jure* designator and a rigid *de facto* one, and while all designators of the first sort are obstinate, those of the second sort can be obstinate or persistent.[27] But if they are persistent, the necessity of theoretical identities could not be established following the *same* procedure as that adduced with regard to identity statements involving two proper names and hence two obstinate designators.

In this regard it is appropriate to point out that on one occasion Kripke admits to a *weak* sense of necessity, when he asserts:

«We can count statements as necessary if whenever the objects mentioned therein exist, the statement would be true».[28]

Although this passage concerns identity statements formed by singular terms, we can apply that remark to identity statements built with natural kind terms.

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[27] In Salmon's framework all designators of kinds are obstinate (see S. Salmon, *Reference and Essence*, cit., p. 72). In S. Soames, o.c., this author takes into consideration another possible interpretation of the notion of rigidity for predicates – besides the one according to which rigid predicates are essentialist predicates; see note 16 *supra* –, in which the rigidity of predicates derives from the rigidity of some corresponding singular term, and in his definition of such predicates he considers rigid predicates as persistent (S. Soames, o.c., p. 260). On the other hand, Soames' essentialist predicates and Devitt's rigid appliers – both mentioned in note 16 – are persistent. In M. Gómez-Torrente, o.c., this author, assuming possibilist quantification – quantification in which the domain of variables at a world include all possible objects, whether they exist or not in that world –, claims that predicates for natural kinds are obstinately essentialist, although his arguments for that claim are far from conclusive. Moreover, he concedes that «our intuitions about obstinacy and persistence are somewhat flimsy» (M. Gómez-Torrente, o.c., p. 252).

[28] S. Kripke, *Identity and Necessity*, cit., p. 137.

Thus, if we consider that "water" is an obstinate designator and "H_2O" is a persistent designator, then the statement "Water is H_2O" could only be necessary in said weak sense, since with regard to possible worlds where the substance H_2O does not exist, the identity statement in question would be false or have not truth-value. Now, if we assume that in that case the statement would be false and accept that the statement "Water is H_2O" is true with respect to possible worlds where the substance H_2O exists, we can build with that identity statement a conditional statement to the effect that, if necessary, it is necessary in strict sense. The consequent of this conditional statement will be the identity statement and its antecedent will be a statement affirming the existence of the substance in question. Thus, the statement "If H_2O exists, then water is H_2O" would be, if necessary, necessary in strict sense, i.e., true with respect to all possible worlds, even if the term "H_2O" is a persistent designator. For this reason we may focus, as up to now, on the necessity in strict sense. Besides, with regard to natural kind terms Kripke has not taken into consideration the distinction between *de jure* rigid designators and *de facto* rigid designators, and hence the distinction between obstinate and persistent designators either. Rather he simply alludes to them as rigid designators. Therefore we shall follow the same procedure. In this regard I will take into consideration, as I have done until now, the first example of theoretical identity mentioned, i.e., the statement "Water is H_2O", since similar remarks would apply to the theoretical identity about gold.

The statement "Water is H_2O" is regarded by Kripke as an *identity statement* in which the identity sign (of second order) is flanked by the general terms "water" and "H_2O". Following the pattern of the identity statement "Hesperus is Phosphorus", it can be asserted that, since the terms "water" and "H_2O" are rigid designators, if the identity statement "Water is H_2O" is *true*, it will also be *necessary*, that is, it will be necessary if true, as Kripke claims. However, these identity statements are dissimilar as far as the establishment of their truth is concerned. In the case of the statement "Hesperus is Phosphorus", and in general of identity statements that contain two proper names, we only need to take into account the actual world and ascertain whether the entity designated by both names in the actual world is the same. Nonetheless, according to our proposed necessary condition for the identity of substances, which is reasonable, in order to establish the truth of a theoretical identity like "Water is H_2O" all possible worlds are involved.

As already indicated, we have adopted a view of kinds and hence of natural kinds, and therefore of substances, according to which the substances (kinds) water and H_2O are universals. Thus, the statement "Water is H_2O" will be *true* if and only if the substances water and H_2O are identical. Now, according to the necessary condition for the identity of kinds and hence of substances we have proposed above, this will hold *only* if the instances of both substances

are the same in all possible worlds, i.e., if and only if the terms "water" and "H_2O" are coextensive in all of them. Nevertheless, we cannot take into consideration every and each possible world to ascertain whether the instances of the substances designated by those two terms are the same in all of possible worlds, i.e., whether those terms are coextensive in all of them.

Let us recapitulate. We have adopted a view of natural kinds as universals, that which makes it possible for natural kind terms to be rigid designators. Consequently, we have accepted the rigidity of the terms "water" and "H_2O". Furthermore, we have conceded the coextensivity of these terms in the actual word, which would have been established *a posteriori*. However, what does not follow from this is their coextensivity in all possible worlds, which is a necessary condition for the truth – and the necessity – of the statement "Water is H_2O".

This can be illustrated in the following way. Let us take into account a sample of water that does not exist in the actual world, but does exist in a non-actual world. From the rigidity of the terms "water" and "H_2O" and their coextensivity in the actual world it does *not* follow that said sample will also be an instance of H_2O.[29] Thus, the rigidity of the terms "water" and "H_2O" together with their coextensivity in the actual world are not sufficient to establish that the instances of the substances designated by those terms are the same in all possible worlds, and therefore that the statement "Water is H_2O" is true. Consequently, since we have no justification to accept the *truth* of that statement, we have no reason to admit its *necessity* either.

In other words, even if we accept that the terms "water" and "H_2O" are rigid designators and that the extension of those terms is the same in the actual world, this does not lead to the conclusion that their referents – the universals designated by them – are identical, i.e., that the theoretical identity "Water is H_2O" is true, although if it were true, it would be also necessary.

5. Kripke's essentialist claims for the truth and necessity of theoretical identities

Thus it is understandable that Kripke resorts, although apparently in an independent way, to further considerations to justify the thesis that theoretical identities are true and necessary statements; as already indicated, in order to be necessary they have to be true, and if they are true, they will be also necessary.

Indeed, Kripke further resorts to *a priori* claims concerning what the *essence* of a natural kind is – in the strict sense of its instances, although in the fol-

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[29] See S. Soames, o.c., pp. 257-258 and M. Devitt, o.c., p. 152 as well as the passage by Putnam quoted in section 5. *infra*.

lowing I will sometimes leave aside this specification. Regarding this he asserts that the essence of a substance is identified with its *atomic structure*[30] – in which he also subsumes, as I will do in the following, the molecular structure. Thus if water is *essentially* the substance (that is, each of its instances are) composed of molecules consisting of two hydrogen atoms and one oxygen atom – for short, the substance H_2O –, then being H_2O is the essence of water and the corresponding theoretical identity will be true and therefore necessary – necessary if true. However, it has to be underlined that such assumptions about the essence of (the instances of) substances are justified, according to Kripke, by – in his own words – "a priori philosophical analysis".[31] He claims:

«All the cases of the necessary *a posteriori* advocated in the text have the special character attributed to mathematical statements: Philosophical analysis tells us that they cannot be contingently true, so any empirical knowledge of their truth is automatically empirical knowledge that they are necessary. This characterization applies, in particular, to the cases of identity statements and of essence».[32]

Nonetheless, neither Kripke's philosophical analysis nor its conclusions have to be agreed with. As already indicated, the terms "water" and "H_2O" can be regarded as rigid designators, whose reference are substances conceived of as universals, and it may be accepted that the instances of those substances are the same in the actual world.[33] Nonetheless, as we have noticed, from here it does not follow that the statement "Water is H_2O" is true and, in that case, necessary. In order to obtain this conclusion a questionable thesis must be accepted, to wit, that the essence, or an essential property, of a substance is its atomic structure, and hence that it is necessary that the substances or rather their instances have, in all possible worlds in which they exist, the same atomic structure as they have in the actual world. Kripke would claim that the truth

[30] See S. KRIPKE, *Naming and Necessity*, cit., pp. 124-25 and 128.
[31] S. KRIPKE, *Identity and Necessity*, cit., p. 153. Kripke makes this assertion in the framework of his claim that an essential property of a material object, like a table or a lectern, is to be made of the substance of which it is actually made (see S. KRIPKE, *Identity and Necessity*, cit., pp. 151 ff. and *Naming and Necessity*, cit., pp. 113 ff.), but Kripke would extend the same type of consideration to the essential properties of the instances of substances. In this regard, it is suitable to point out that by essential properties of an entity Kripke understands those properties, aside from existence and from trivial properties like self-identity, such that the entity is to posses them in all possible worlds where it exists (see S. KRIPKE, *Identity and Necessity*, cit., pp. 151-52).
[32] S. KRIPKE, *Naming and Necessity*, cit., p. 159. Kripke conceives of the statement "Water is H_2O" as an identity statement in such a way that the substance designated by the second term constitutes the essence of the substance designated by the first term.
[33] There are authors who reject this claim; see, e.g., M. WEISBERG, *Water Is Not H_2O*, in D. BAIRD et al. (editors), *Philosophy of Chemistry*, Springer, Dordrecht 2006, pp. 337-345. Nevertheless, for the sake of the argument we have assumed that in the actual world instances of water are instances of H_2O.

of this thesis is established by *a priori* philosophical analysis, but at this point the philosophical debate reaches a *deadlock*.

Nevertheless, even if it is conceded that the atomic structure of the instances of water in the actual world is H_2O, we could imagine a possible world where there is a substance whose instances have all (or most) macroscopic properties of instances of water – and let us take into consideration not only its qualitative and functional properties, but also its important properties from a scientific point of view, like its freezing point, its density etc. –, but whose atomic structure is not H_2O, although very similar to it. There is *no* reason to reject that the instances of such substance should be instances of water, and hence that the mentioned possible world is one where water is *not* H_2O, unless we assume that it is an *essential* property of the instances of water to have in all possible worlds in which they exist the same atomic structure as they have in the actual world. This claim, however, can be questioned. As Putnam very reasonably alleges:

«[T]he "essence" that physics discovers is better thought of as a sort of *paradigm* that other applications of the concept ('water' […]) must *resemble* than as a necessary and sufficient condition good in all possible worlds».[34]

The conclusion to be drawn from the foregoing considerations is that, although it can be held that natural kind terms are rigid designators, the view of natural kinds as universals, which makes it possible for natural kind terms to be rigid designators, hinders the establishment of the truth of theoretical identities, and given their truth, of their *necessity*. On the other side, one can question Kripke's further considerations to establish the truth and necessity of theoretical identities, which adopt the form of *essentialist* claims concerning (the instances of) substances, supposedly grounded on *a priori* philosophical analysis. However, and lastly, if our above considerations are accepted, it could be difficult to avoid the conclusion that in order to justify the existence of *a posteriori* necessary true statements, statements whose truth has been established *a priori* will have to be adopted as premises.[35]

ABSTRACT: *According to S. Kripke, two important similarities between natural kind terms and proper names are that both types of expressions are rigid designators and that they appear in identity statements that are necessary if true; Kripke denominates these types of statements containing natural kind terms "theoretical identities". Nevertheless, Kripke claims that the latter similarity follows from the former. In this paper the author has a threefold aim. Firstly, he contends that it can be held that natural kind terms are rigid designators. Secondly, he argues that the conception of natural kind terms as rigid designators hinders the establish-*

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[34] H. PUTNAM, *Realism and Reason*, Cambridge University Press, Cambridge 1983, p. 64.

ment of the truth of theoretical identities and hence of their necessity. Thirdly, he disputes some of Kripke's claims of a metaphysical character to support the truth and necessity of theoretical identities.