

# HOW TO FREGE–DUMMETT A PUTNAM

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**Abstract.** The object of this paper is to suggest how the Frege–Dummettian notions of *criterion of identity* and *criterion of application* can be put to work within Putnam’s account of reference for natural kind terms in “Meaning of ‘Meaning’”. By doing so, some light can be shed on Putnam’s earlier views on “necessity relative to a body of knowledge” as well as his later views on sortal identity. If the Frege–Dummettian criteria are indeed at work within Putnam’s account, then we must either give up (strong) rigidity or else give up the division of linguistic labor hypothesis. I will give an example from biological nomenclature that may sway us towards giving up the former.

**Keywords:** Theories of reference; natural kinds; criteria of application; criteria of identity.

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## 1. Introduction

As Ian Hacking points out (2007), philosophers are mistaken in speaking of a “Kripke–Putnam” theory for the semantics and metaphysics of natural kinds. In his post-“Meaning of ‘Meaning’” (henceforth, “post-MoM”) papers “Possibility and Necessity” (1975) and “Is Water Necessarily H<sub>2</sub>O?” (1990), Putnam developed a language-relative version—one which “Kripke would reject”—of his account on the subject. The key features of this version are the emphasis on indexicality (rather than rigidity), the explicit adoption of a notion of sortal identity, and a rejection of the idea that conceivability entails possibility. The post-MoM Putnam tries to sever some of the connections he had made (in MoM) with the fledgling Kripkean views on rigidity and the metaphysics of natural kinds.

The object of this paper is to suggest that Putnam’s account on the meaning of natural-kind terms had never been fully Kripkean (i.e., both in MoM and in the post-MoM papers), and that it is in fact compatible with some aspects from the “rival” Fregean account. More precisely, I believe Putnam’s account to be compatible with Dummett’s analysis of the constituents of Fregean senses for *sortal predicates*. According to Dummett, Fregean senses for sortal predicates are composed (at least partly) of two components, a *criterion of application* and a *criterion of identity*. A criterion of application for a predicate *P* is the criterion of truth for a “crude predication” of the form “this is *P*”. A (sortal) criterion of identity for an entity of kind *K*, on the other hand, is the criterion of truth for “this is the same *K* as that”.

My point is that criteria of application and identity can be put to work (or perhaps are already at work, in the case of criteria of identity) within Putnam’s account

both in MoM and in post-MoM papers. The fact that Putnam presupposes something like a criterion of identity is apparent in his use of the “same<sub>L</sub>” (i.e., “same liquid”) relation, and in his post-MoM acceptance of sortal identities. On the other hand, in his discussion of the division of linguistic labor hypothesis, Putnam talks of “criteria” in a way that closely resembles the notion of criterion of application. If that is true, then there is a conflict between rigidity and the division of linguistic labor hypothesis. I will give an example from biological nomenclature suggesting that the former should be given up.

I will first present Dummett’s model for Fregean senses, and conjecture that criteria of identity and of application present two undermining factors for strong necessity. I then expound briefly some textual evidence about Putnam’s shifting views concerning metaphysical necessity. As we shall see, the strong view developed in MoM is the exception, rather than the rule. In both pre- and post-MoM periods, Putnam espouses a weakened, relative notion of necessity. Starting with criteria of identity, I then discuss how the Frege–Dummettian pair of criteria can be sources of weakened necessity. Putnam does not give an explicit formulation of what he takes to be an adequate criterion of substance-identity, but I attempt to present a viable candidate that avoids a counterargument presented by Bob Hale (2004). My solution involves positing a criterion that operates within a framework of restricted quantification over possible worlds. Lastly, I turn to criteria of application, and here I rely on an example from biology in order to show that a community of experts is able to override at least one purported metaphysically necessary truth.

## 2. Dummett on Fregean senses

The elucidation of what exactly are the constituents of Fregean senses has been a highly controversial subject, and I do not intend to pursue it here. I merely wish to point out that Michael Dummett’s analysis, even if judged by Frege scholars to be inadequate, can be applied at face value to Putnam’s ideas concerning natural kinds. Dummett distinguishes between the compositions of senses for proper names, sortal predicates and adjectival predicates. According to Dummett, senses of *proper names* are composed exclusively of criteria of identity; those of *adjectival predicates* (e.g., “ $\xi$  is dusty”) are composed only of criteria of application; lastly, senses of *sortal predicates* (e.g., “ $\xi$  is a book”) are composed of both criteria of application and of criteria of identity.

Considering Frege’s doctrines to the effect that senses are responsible for the cognitive significance of expressions, and that understanding an expression consists in “grasping” its sense, Dummett derives the constituents of senses from the requirements for understanding *ostensions* that involve the three types of expression above.

Let us first consider an ostension involving a proper name, such as “This is the River Windrush”. The question is what is involved in understanding the name “River Windrush” and, thus, in identifying the referent of this ostension. (River names are, of course, a favorite example in discussions about the ambiguity of ostensions.) Quine’s (1980) naturalistic response is that, given several acts of ostension, the listener is “aided by his own tendency to favor the most natural groupings” (p.68) and arrives, by induction, at a hypothesis as to which summation of momentary objects (“river stages”) is identical to the river. Even in this naturalistic mindset, Quine acknowledges that:

The concept of identity [...] is seen to perform a central function in the specifying of spatio-temporally broad objects by ostension. Without identity,  $n$  acts of ostension merely specify up to  $n$  objects, each of indeterminate spatio-temporal spread. (1980, p.68).

While it is not clear whether Quine understands the concept of identity required for the disambiguation of ostensions as absolute or relative, Dummett explicitly states that senses of proper names are constituted by criteria of identity that are *relative* to the sortal that the referent belongs to. That is because, according to Dummett, “‘... is the same river as...’ cannot in all cases be analysed as meaning ‘... is a river and is the same as...’” (Dummett 1973, p.74). Thus, a relative criterion of identity for rivers is involved in the sense of the proper name “River Windrush”.

Requiring that the criterion of identity be part of the sense of a proper name enables Dummett to solve the problem of ambiguous ostensions rather trivially. This problem, sometimes called the *qua*-problem (see Devitt and Sterelny 1999, section 4.5), is especially pressing for direct theories of reference such as Kripke’s causal theory. Since such theory emphasizes that no description *at all* need be true of the name bearer in order for reference to succeed, there seems to be no reason that would disallow one from believing that “River Windrush” is the name of a particular bunch of water molecules with which the river’s baptist was in ostensive contact. The *qua*-problem receives its name from the fact that it would not be clear that “River Windrush” would refer to its bearer *qua* a river rather than, say, *qua* a bunch of water molecules, or even *qua* a particular city which the river runs through.

One possible solution for the *qua*-problem is to amend the causal theory with the requirement that the name should receive “multiple groundings”, which amounts to saying that the object be baptized multiple times with the same name (Devitt and Sterelny 1999). However, this solution would have to rely on a Quinean mechanism by which every speaker eventually picks up the name’s reference “aided by his own tendency to favor the most natural groupings”. If we agree with Quine, to ground a name  $n$  times is only to perform  $n$  acts of ostension which, without a background criterion of identity, merely specify up to  $n$  objects. Quine seemed to suggest that

criteria of identity can be derived from our natural psychological tendencies. I am not convinced that this can always be done, though I cannot argue for this point here.

Dummett's solution for the *qua*-problem would be simply that a criterion of identity is always associated with a name. So, a criterion of identity for rivers makes up (at least part of) the sense of the name "Windrush". From the standpoint of one who understands "Windrush", there is no question that the object of the ostension "This is the River Windrush" is being referred *qua* river and not *qua* bunch of molecules. Dummett does not attempt to explain where did the criterion of identity come from in the first place; I posit that, in the case of scientific names, criteria of identity come from theories.

So much for the senses of proper names; let us now turn to the two classes of predicates. According to Dummett, senses of predicates are composed, at least partly, of *criteria of application*. A criterion of application for a predicate *P* is the criterion of truth for a *crude predication* of the form "that is *P*". A grasp of the criterion of application of a predicate is "an ability to judge the truth or falsity of crude predications made with that predicate" (Dummett 1973, p.233). As I have mentioned at the beginning of this section, Dummett distinguishes between adjectival predicates, whose senses are composed only of criteria of application, and sortal predicates, whose senses are composed of both criteria of application and criteria of identity.

Unfortunately, Dummett does not provide a formal analysis of criteria of application. In section 5, we shall consider a couple of ways to do this. For now, there is a rather controversial point of Dummett's that is worth mentioning. The point is that, at least where sortal predicates are concerned, criteria of application can be grasped independently of criteria of identity, that is to say, there are sentences, such as "That is a book", whose truth conditions do not depend at all on the criterion of identity associated with the (sortal) predicate (Dummett 1973, p.74). Dummett tells us to consider the following example. Suppose I am reading a book and a friend asks "Is that the same book you were reading yesterday?". It may be the case that I had to return to the library the copy I was reading yesterday, but I enjoyed the book so much that I ended up buying my own copy of it. So I reply, "It is the same *work*, but not the same *copy* of it" (Dummett 1973, p.74). The two senses of "book", in Dummett's model, stem from differences in criteria of identity, not of application. In concluding, Dummett writes:

These examples also show that the criterion of identity is not derivable from the criterion of application: however thoroughly I have mastered the criterion for determining when it is right to say, "That is a book", I can never derive from it the criterion which determines when statements of the form, "That is the same book as the one which. . .", are true. (Dummett 1973, p.74–5)

The independence between criteria of application and of identity is further illustrated by adjectival predicates. In order to judge the truth of “This is dusty” one need not (and in fact *cannot*) be able to judge the truth of “This is the same dusty as that” (see Dummett 1973, p.233ff). It makes no sense (pun intended), except perhaps for realists about universals, to ask whether red is “the same” everywhere. Of course, one can ask whether this red is the same red as that in the sense of “. . . same *hue* of red as . . .”, but then “. . . is a hue of red” is a *sortal*, but not adjectival, predicate.

My point will be that natural kind terms behave like sortal predicates in Dummett’s model, in that their senses have both criteria of application and of identity. Let us first see, however, how Putnam relates weakened necessity to criteria of sortal identity.

### 3. Putnam on weak necessity

The story about Putnam’s changing views on metaphysical necessity is well known (Hacking 2007; Hale 2004). In this section, I will briefly recapitulate some of the key episodes in this story.

Perhaps one of the first articles in which Putnam develops his views on weak necessity is his 1962 paper “It Ain’t Necessarily So”. Therein, Putnam discusses some views from Donnellan (1962) concerning the necessity of truths such as “all whales are mammals”. Donnellan’s conclusion was that there is no fact of the matter as to whether this truth is necessary or contingent. There would be a fact of the matter, Donnellan conceded, if we could say for sure that the *criteria of application* for the subject term are included in the criteria of application for the predicate term. Inclusion of criteria could account for the necessity of “all squares are rectangles”, but in the case of “whales” and “mammals”, criteria of application seem to differ widely across speakers (when comparing, e.g., the layman and the zoologist).

Putnam, in his response, argues that diversity of criteria does not undermine necessity. He writes:

The distinction between statements necessary relative to a body of knowledge and statements contingent relative to that body of knowledge is an important methodological distinction and should not be jettisoned. But the traditional philosophical distinction between statements necessary in some eternal sense and statements contingent in some eternal sense is not workable. (Putnam 1962, p.670)

As it is clear from the first sentence in this citation, Putnam argues that the solution for Donnellan’s problem lies in the acceptance of a notion of necessity that is *relative to a body of knowledge*. By saying that a statement is necessary from the standpoint of a given body of knowledge, “we imply that [. . .] it enjoys a special

role in that body of knowledge” (Putnam 1962, p.662). From the viewpoint of the layperson’s knowledge whose criteria of application for the term “whale” are not included in those of “mammal”, “all whales are mammals” may well be a contingent statement. In contrast, according to some construals of biological knowledge (e.g., de Queiroz 1995), that statement would be necessarily true.

Now, this weaker notion of necessity relative to a body of knowledge is surprisingly absent in MoM and in the papers leading up to it (Putnam 1977a,b). In fact, some passages in MoM seem to flatly contradict Putnam’s previous view; such is the case of the following: “Once we have discovered that water (in the actual world) is  $H_2O$ , *nothing counts as a possible world in which water isn’t  $H_2O$* ” (Putnam 1975, p.233).

Later, in “Is Water Necessarily  $H_2O$ ?” (1990), Putnam tries to reconcile his views in MoM with weaker necessity. In that article, his points concerning weak necessity hinge upon a discussion of sortal criteria of identity. Relative (or sortal) identity is the thesis that there is no single, absolute notion of identity that can be applied regardless of the nature of the objects in a given domain. Two given objects can be different *As* while still being the same *B*, where *A* and *B* are sortal predicates. For instance, the same *piece of bronze* can be two different *statues*, the ship of Theseus can be the same *ship* as before while being a different *collection of planks*, and so forth.<sup>1</sup> It is important to note that Putnam accepts relative identity, while Kripke seems to reject it (cf. Kripke 1980, p.115n).

But how does the acceptance of relative identity lead Putnam to develop a weakened notion of necessity? Putnam reconstructs his own trajectory as follows. The thesis from MoM that natural kind terms are rigid designators was designed, Putnam writes, to oppose the “descriptivist” view that those terms are synonymous with a description in terms of clusters of laws (Putnam 1990, p.59–60). Rejecting the descriptivist view is tantamount to saying that a criterion of substance-identity is not reducible to a cluster of laws. In this vein, the Twin Earth thought experiment was intended to show that “deep” microstructural composition—rather than “surface” following of laws—has the last word on substance-identity. Putnam writes that the reason for taking this stance is that in MoM he assumed that sameness of microstructure *implied* sameness in lawful behavior (Putnam 1990, p.69). If that were the case, we would not have to worry about possible worlds in which  $H_2O$  obeyed vastly different laws, and thus we could establish that “water” refers rigidly (in the Kripkean, strong sense) to  $H_2O$ .

But, against this possibility, Putnam writes:

[...] I do not think that a criterion of substance-identity that handles Twin Earth cases will extend handily to “possible worlds”. In particular, what if a hypothetical “world” *obeys different laws*? Perhaps one could tell a story about a world in which  $H_2O$  exists [...], but the laws are slightly different

in such a way that what is a small difference in the *equations* produces a very large difference in the *behavior* of H<sub>2</sub>O. Is it clear that we would call a (hypothetical) substance with quite different behavior *water* in these circumstances? I now think that the question “What is the necessary and sufficient condition for being water *in all possible worlds?*” makes no sense at all. And this means that I now reject “metaphysical necessity.” (Putnam 1990, p.69–70)

The main point is that sameness of lawful behavior, which Putnam takes to be part of a sortal criterion of substance-identity, places constraints on the range of possible worlds over which our substance terms can rigidly refer. That is how we arrive at a first source of weakened necessity. If identity was absolute, as Kripke seems to assume it should be,<sup>2</sup> then perhaps our substance terms would refer unrestrictedly to all possible worlds in which those substances existed, regardless of disparity in lawful behavior. Unfortunately, Putnam does not get into the details of how to formalize criteria of substance-identity. He does put forward a desideratum for any such criterion: that it “must have the consequence that *A* and *B* are the same substance if and only if they obey the same *laws*” (Putnam 1990, p.68).

Now, I will turn to the issue of how we could come up with a criterion that fulfills this desideratum.

#### 4. On the adequacy of criteria of substance-identity

From the citations given in the previous section, it is clear that Putnam considers criteria of substance identity as playing a role in determining the reference of natural kind terms. As we have seen, some of Putnam’s intuitions about sortal identity were already present in MoM. Such is the case for the crucial passage in which Putnam considers two different accounts for the meaning of “water” (1975, p.231), before settling on this one:

(MW) (For every world *W*) (For every *x* in *W*) (*x* is water  $\leftrightarrow$  *x* bears *same<sub>L</sub>* to the entity referred to as “this” in *in the actual world W<sub>1</sub>*)

I wish to focus on the *same<sub>L</sub>* (“same liquid”) relation here; we shall return to the left-hand side of the biconditional in a moment. This is clearly what Putnam would later (in 1990) call a sortal identity criterion. But his choice of calling it “same liquid” seems misguided; in consistency with his post-MoM papers, let us use “same substance” instead. Putnam explicitly writes he does not wish to discuss how a substance-identity criterion should be formalized (1990, p.68), but let us consider some alternatives.

The standard formalization for sortal identity, where  $x$  and  $y$  are of kind  $K$ , is something like the following (Lowe 1997):

$$\forall x \forall y ((Kx \wedge Ky) \rightarrow (x = y \leftrightarrow Rxy))$$

where “ $R$ ” is the criterial relation. However, if “ $=$ ” as standard mathematical identity, it seems to me that this is an ersatz relative identity criterion, since in the end there is a single notion of identity merely “filtered” through the antecedent ( $Kx \wedge Ky$ ). This would violate Dummett’s requirement that “... is the same river as...” should not always be analyzable in terms of “... is a river and is the same as...”. Thus, I believe a genuine criterion of relative identity should posit one identity relation for each kind  $K$ , like so:

$$(KI) \quad \forall x \forall y ((Kx \wedge Ky) \rightarrow (x \stackrel{K}{=} y \leftrightarrow Rxy))$$

So, what would be the criterial relation for substance-identity? Recall Putnam’s desideratum to the effect that “the criterion must have the consequence that  $A$  and  $B$  are the same substance if and only if they obey the same laws” (Putnam 1990, p.68). Bob Hale (2004, p.354) thinks that there is an important scope ambiguity in this citation. It can either be read as “the criterion must have the consequence that ( $A$  and  $B$  are the same substance if and only if they obey the same laws)”, or else as “(the criterion must have the consequence that  $A$  and  $B$  are the same substance) if and only if they obey the same laws”.

The difference between the two readings can be captured in the following rough formalization (slightly modified from Hale (2004, p.357)). Let  $C$  be any proposed criterion of substance-identity, and  $Lxy$  the relation “ $x$  follows the same laws as  $y$ ”; Putnam’s meta-criterion for the adequacy of any criterion of identity can then be alternatively formalized as:

$$(R1) \quad C \text{ is adequate} \rightarrow (C \text{ entails that } (x \stackrel{S}{=} y \leftrightarrow Lxy))$$

$$(R2) \quad C \text{ is adequate} \rightarrow ((C \text{ entails that } x \stackrel{S}{=} y) \leftrightarrow Lxy)$$

In his paper, Hale argues in favor of reading (R2) (2004, p.354). While I am not entirely convinced that (R2) is what Putnam intended, it is worth examining Hale’s argument in full, so that we may arrive at a more promising criterion of substance-identity. Hale argues that “Putnam needs to show that *no* proposed criterion [...] of substance identity would be good for all possible worlds” (2004, p.356). So Hale intends to show that Putnam’s case about a world in which laws are slightly different can be generalized to show that no criterion of substance-identity is *unrestrictedly* adequate, that is, able to legislate *all* cases of transworld substance-identity.



The first step is to construe  $x \stackrel{S}{=} y$  and  $Lxy$  as four-term, cross-world relations. Thus, I shall write

$$x^w \stackrel{S}{=} y^{w'}$$

for “ $x$  in  $w$  is the same substance as  $y$  in  $w'$ ”. Similarly, let

$$Lx^w y^{w'}$$

stand for “ $x$  in  $w$  follows the same laws as  $y$  in  $w'$ ”.

Now, we can modify the consequent in (R2), and call a criterion *unrestrictedly* adequate only if (Hale 2004, p.357):

$$(U) \quad \forall w \forall w' ((C \text{ entails that } x^w \stackrel{S}{=} y^{w'}) \leftrightarrow Lx^w y^{w'})$$

That is, a criterion is *unrestrictedly* adequate only if, given any pair of possible worlds  $w$  and  $w'$ , it entails that  $x$  in  $w$  is the same substance as  $y$  in  $w'$  iff  $x$  in  $w$  follows the same laws as  $y$  in  $w'$ . Recall that Putnam allowed for a possibility in which  $x$  and  $y$  had the same microstructure, but had different lawful behaviors. Now, since “following the same laws” is a vague notion, Hale thinks nothing can stop Putnam from positing a possible case in which  $x$  and  $y$  obey the same laws, but it is indeterminate whether  $x \stackrel{S}{=} y$ . In other words, suppose there is a case in which:

$$(P) \quad \exists w \exists w' (Lx^w y^{w'} \wedge (C \text{ is adequate} \rightarrow \neg(C \text{ entails that } x^w \stackrel{S}{=} y^{w'})))$$

Let us assume, moreover, that  $C$  is *unrestrictedly* adequate (U). So (P) entails  $\neg(U)$ , and thus contradicts (U): it follows that there can be no *unrestrictedly* adequate criterion of substance-identity (Hale 2004, p.357).

How can we then construct a *restrictedly* adequate criterion of substance-identity? I believe there are two ways of restricting criteria of identity. We may either impose restrictions on the criterial relation  $Rxy$  (see (KI), above), or else impose restrictions on any quantifiers involved in the criterion. The first option would involve amending the criterial relation with conjuncts, i.e., conditions which are jointly necessary and sufficient for substance-identity. Putnam could be read as saying that sameness in microstructure and sameness in lawful behavior are each, taken separately, necessary but not sufficient conditions; their conjunction, in turn, is sufficient.

Let  $Mx^w y^{w'}$  denote “ $x$  in  $w$  has the same microstructure as  $y$  in  $w'$ ”. Thus, the proposed criterion—with a restriction on the criterial relation—could be formalized as:<sup>3</sup>

$$(RR) \quad \forall w \forall w' \forall x^w \forall y^{w'} ((Sx \wedge Sy) \rightarrow (x \stackrel{S}{=} y \leftrightarrow (Mxy \wedge Lxy)))$$

However, if Hale's argument is sound, (RR) will not do. The point of the argument is that no matter how many conjuncts we include in the criterial relation, we can always come up with a possible case in which all the conjuncts are true but the criterion does *not* entail that  $x \stackrel{S}{=} y$ .

We are left with the second option, that is, to somehow restrict the different quantifiers involved in the criterion. We can take a cue from Bob Hale himself:

[...] Putnam's adequacy condition will require some qualification. It will need to be understood as requiring, of an adequate criterion, only that, *with respect to some restricted range of possible worlds*, the criterion entails that  $A$  in  $w$  and  $B$  in  $w'$  are the same substance if and only if  $A$  obeys the same laws in  $w$  as  $B$  obeys in  $w'$ . But whether any suitable restriction can be formulated, and if so, how it should be formulated, are difficult questions that I shall not pursue here. (Hale 2004, p.358)

In my view, it is counterproductive to talk of *substances* as exhibiting the same lawful behavior in different worlds. "Following the same laws" should be a relation between two *worlds*, each taken as a whole, not a cross-world relation involving the *members of the domain of quantification* in two different worlds.<sup>4</sup> I agree with Hale that a form of restricted quantification *within* worlds that achieves restricted adequacy as required would be cumbersome, and perhaps impossible to implement, but what of restricted quantification *among* worlds?

In face of these considerations, I would like to suggest the following move. Let  $\mathfrak{F} = \langle D, W, R \rangle$  be a standard modal frame in a quantified modal logic, so that  $D$  is a domain of quantification (be it constant or variable),  $W$  is a set of possible worlds *containing the actual world*  $w^*$  (i.e.,  $w^* \in W$ ), and  $R$  is a relation of accessibility so that  $R \subseteq W \times W$ . Let  $L$  be an equivalence relation so that  $L \subset R$ . Now, this relation  $L$  is to be intuitively understood as holding between two worlds,  $Lww'$ , whenever  $w$  follows the same laws as  $w'$ . In particular, let  $\mathcal{L}$  denote the set of all worlds  $w$  such that  $Lww^*$ , that is, the set of worlds that follow the same laws as the actual world<sup>5</sup>. Finally, let us define an operator  $\Box_{\mathcal{L}}$  whose semantics is such that, given a well-formed formula  $\alpha$ ,  $v(\Box_{\mathcal{L}}\alpha, w) = T$  if and only if  $v(\alpha, w') = T$  for all  $w' \in \mathcal{L}$ .

The motivation behind  $\Box_{\mathcal{L}}$  (read as "It is physically necessary that...") is, of course, to provide a weakened notion of necessity in order to capture Putnam's insights on "objective nonlogical modality" (1990, p.70). Since the operator  $\Box_{\mathcal{L}}$  performs a *restricted quantification over possible worlds*, we are now in position to offer our second candidate for a restricted criterion of substance-identity:

$$(RQ) \quad \Box_{\mathcal{L}} \forall x^{w^*} \forall y^{w'} ((Sx \wedge Sy) \rightarrow (x \stackrel{S}{=} y \leftrightarrow Mxy))$$

If we move sameness of lawful behavior out of the criterial relation, and present it as a form of restricted quantification over possible worlds, sameness of microstructure should be sufficient as a criterial relation. This might ease Putnam's qualms

about two substances having the same microstructure while exhibiting different lawful behaviors. It seems to me also that (RQ), because it does not purport to be *unrestrictedly* adequate, is immune to Hale’s argument. Moreover, it seems to me it would even fulfill the stronger condition in Hale’s “discarded” reading (R1), above.

We can now return to our general form of a criterion of relative identity for a kind  $K$  ((KI), above). In keeping with the spirit, if not the letter, of Putnam’s (1990), (KI) should be recast so that it always involves the restricted quantification over possible worlds we envisaged in (RQ). But do all scientifically interesting criteria of identity quantify over  $\mathcal{L}$ ? Call  $\mathcal{B}$  the set of worlds that follow the same biological regularities as the actual world: biological reductionists would hold that  $\mathcal{B}$  is exactly the same set as  $\mathcal{L}$ . I wish to remain agnostic on this topic, so I will use  $\mathfrak{T}$  as a metavariable for any set of possible worlds that is interesting from the standpoint of a given scientific theory. If such a theory provides a criterion of identity for a kind  $K$ , I suggest that it is of the following form:

$$(CI) \quad \Box_{\mathfrak{T}} \forall x^{w*} \forall y^{w'} ((Kx \wedge Ky) \rightarrow (x \stackrel{K}{=} y \leftrightarrow Rxy))$$

Henceforth, when I write of a criterion of identity, I shall mean an instantiation of the form (CI).

## 5. Frege–Dummetting Putnam

In this section, I will try to apply the Frege–Dummettian model to Putnam’s account. The idea is that a natural kind term, such as “water”, behaves like a *sortal predicate* on Dummett’s model, in that its sense is composed of a criterion of application and a criterion of identity. Of course, one of Kripke and Putnam’s main points is that natural kind terms behave in modal contexts more like proper names than anything else.<sup>6</sup> In Dummett’s terms, this would result in their senses’ having only criteria of identity, not of application.

But one might wonder (as I do) why Dummett does not think that criteria of application are involved in the senses of proper names as well. Of course, in “This is Fido”, “Fido” is not being predicated of “this”. But, given the proper name  $N$  of a concrete object, one can always derive the (functional) sortal predicate “. . . is a part of  $N$ ”. The criterion of application for  $N$  could then be made to coincide with this derived criterion. In analogy to two-level criteria of identity (Lowe 1997, p.620), we may call this a two-level criterion of application for the name  $N$ , since the criterion of application for the name is grounded on the criterion of application for a derived sortal predicate.

Let us consider the passage in *Naming and Necessity* where Kripke talks about the “baptism” of a natural kind:

In the case of proper names, the reference can be fixed in various ways. In an initial baptism it is typically fixed by ostension or a description. [...] The same observations hold for such a general term as “gold”. If we imagine a hypothetical (admittedly somewhat artificial) baptism of the substance, we must imagine it picked out as by some such “definition” as, “Gold is the substance instantiated by the items over there, or at any rate, by almost all of them”. [...] I believe that, in 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. The “almost all” qualification allows that some fools’ gold may be present in the sample. (Kripke 1980, p.135–6)

It seems that Putnam’s account in MoM agrees substantially with Kripke’s views in this citation. Recall, however, Putnam’s (MW):

(MW) (For every world  $W$ ) (For every  $x$  in  $W$ ) ( $x$  is water  $\leftrightarrow x$  bears  $same_L$  to the entity referred to as “this” in *in the actual world*  $W_1$ )

Given the context in which Putnam presents this account (1975, p.229–31), he is clearly *not* talking about the “baptism” of water. As it stands, (MW) has *ontological* overtones in that the left-hand side of the biconditional reads “ $x$  is water”. But we can imagine a context in which the “baptism” of water is made using a formula very similar to (MW), replacing the ontological phrase with the *deontological* “the term ‘water’ applies to  $x$ ”. The resulting formulation would be precisely what I would like to call a criterion of application for the term “water”:

(AW) (For every world  $W$ ) (For every  $x$  in  $W$ ) (the term “water” applies to  $x \leftrightarrow x$  bears  $same_L$  to the entity referred to as “this” in *in the actual world*  $W_1$ )

Let me further rephrase this in the notation I have been employing; also, let me include restricted quantification over possible worlds (where “ $Sx$ ” means “ $x$  is a substance”):

(AW’)  $\Box_{\varphi} \forall x^{w'} (Sx \rightarrow ( \text{“water” applies to } x \leftrightarrow x \stackrel{S}{=} \text{this sample (in } w^* ) ) )$

Of course, this criterion of application begs the question as to what constitutes bearing the “same-substance” relation to the sample. So, the Frege–Dummettian model I wish to propose goes as follows. There are two levels of sortals at work: the sortal which is the focus of the analysis I shall call the *narrow* sortal, the sortal to which that sortal belongs to, on its turn, I shall call the *broad* sortal.<sup>7</sup> Our model has three stages. First, the baptism of the narrow sortal (e.g., “water”), based upon a “sample” of it, establishes a criterion of application that calls for complementation by a criterion of identity for the broad sortal. The criterion of identity for a broad sortal (e.g., “substance”) may require, in Putnam’s words, “an indeterminate amount

of scientific investigation to determine” (Putnam 1975, p.225). After the criterion of identity for the broad sortal is determined, something like a *particular* criterion of identity for the narrow sortal can be stated (e.g., “water is H<sub>2</sub>O”).

This three-stage model can be thus summarized:

1. Baptism of narrow sortal: “the term ‘water’ shall apply to *this*”;
2. Establishment of criterion of identity for the broad sortal: “being the same substance as this ↔ having the same microstructure”;
3. Establishment of criterion of identity for the narrow sortal: “water is H<sub>2</sub>O”.

Our considerations in the previous section point to the fact that stages 2 and 3 operate against a background of restricted modality. Next, we will consider a case in which, after stage 3, the community of experts restates the criterion of application for the narrow sortal.

## 6. The case of biological nomenclature

There are currently three major codes of biological nomenclature in effect: the International Code of Botanical Nomenclature (ICBN), the International Code of Zoological Nomenclature (ICZN), and the International Code of Nomenclature of Bacteria (ICNB) (Wiley and Lieberman 2011, p.345). In all three codes, nomenclature depends on a procedure called *typification*. This procedure involves attaching a species name permanently (albeit not irrevocably) to one or more *type specimens*. In the case of the ICZN,<sup>8</sup> a type specimen can be, for example, “an animal, or any part of an animal, or an example of the fossilized work of an animal, or of the work of an extant animal if the name based on it was established before 1931” (ICZN, article 72.5.1). For instance, a skullcap named “Trinil 2” is the type specimen for *Homo erectus* (Cracraft and Donoghue 2004, p.528). A type specimen is analogous to the sample used in the baptism of a natural kind such as gold.

How can we apply the Frege–Dummettian model for the case of biological species? Let us take “*Homo erectus*” as the narrow sortal and “species” as the broad sortal. First, an act of baptism for the narrow sortal establishes a criterion of application:<sup>9</sup>

- (H1) The name “*Homo erectus*” shall refer to whatever bears the same-species relation to Trinil-2.

Next, a criterion of identity for the broad sortal “species” is required. That is to say, some background biological theory should spell out what constitutes bearing the “same-species” relation to an organism. Anyone familiar with philosophy of biology will recognize this as the “species problem”: currently, there is no single consensual

species concept that could provide a criterion of identity for species.<sup>10</sup> For the sake of argument, let us adopt Joel Cracraft's (1992) Phylogenetic Species Concept (PSC). According to the PSC, a species is "the smallest diagnosable cluster of individual organisms within which there is a paternal pattern of ancestry and descent" (Cracraft 1992, p.103). So, the second stage in our model is to establish the criterial relation for the broad sortal:

- (H2)  $x$  bears the same-species relation to  $y$  if and only if  $x$  and  $y$  are part of a single smallest diagnosable cluster of individual organisms within which there is a paternal pattern of ancestry and descent.

Finally, we can plug this criterion of identity back into the criterion of application and thus obtain a criterion of identity for the narrow sortal:

- (H3)  $x$  is *Homo erectus* if and only if  $x$  is the single smallest diagnosable cluster of individual organisms that includes Trinil-2 and within which there is a paternal pattern of ancestry and descent.

If this model is correct, however, this third stage can feedback into stage one, and allow a community of experts to review the criterion of application. This is analogous to Kripke's considerations (see above) to the effect that an original sample upon which gold was baptised may have contained some fools' gold. I believe Putnam indirectly allowed for this possibility in MoM, in the form of the famous *hypothesis of the division of linguistic labor*:

Every linguistic community [...] 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 co-operation between them and the speakers in the relevant subsets. (Putnam 1975, p.228)

Perhaps I am reading too much into this principle, but I believe that the reference to "criteria" should be understood as involving both criteria of application and criteria of identity. If this is correct, and if the community of experts is entitled to *change* the criteria of application of terms that are under its expertise, then we can safely assume that this ability can trump necessary statements, even in the weaker form we have been considering.

A simple example of Matt Haber's (2012) helps to illustrate this point. Let us consider once again the nomenclatural practice of typification, whereby a type specimen is assigned to a species with the objective of functioning as the name-bearer of that species. There has recently been a brief exchange between Alex Levine (2001) and Joseph LaPorte (2003) concerning whether type specimens necessarily or contingently belong to their species. Levine (2001, p.332ff) raises the following paradox.

- (1) Organisms contingently belongs to their species.
- (2) Type specimens necessarily belong to their species.
- (3) Therefore, type specimens necessarily and contingently belong to their species.

(1) seems uncontroversially true. Most philosophers of biology and biologists would agree that the criterion of identity for species cannot be extensional (Haber 2012, p.771); any species could have had fewer or more members than it actually has. So any particular organism, including the species' type specimen, could have not existed. But given Kripke's arguments, (2) seems to be true as well, which leads to the paradoxical conclusion in (3). LaPorte's (2003) solution is the following: there is a *de re* / *de dicto* ambiguity in (2). It can either be read (*de re*) of the particular type specimens that they necessarily belong to their species, or else (*de dicto*) that, necessarily, a type specimen (whatever it may be in the possible world under consideration) belongs to its species. The paradox arises only in the *de re* reading of (2), which is false.

I will here slightly adapt Haber's (2012, p.771–2) formalization of the *de re* and *de dicto* readings to suit the notation I have been using. Haber proposes  $Txy$  for “ $x$  is  $y$ 's type specimen” and  $Bxy$  for “ $x$  belongs to (species)  $y$ ”. Clearly,  $Txy$  and  $Bxy$  are not meant to be cross-world relations; I will indicate that by using superscripts in the quantifiers. Additionally, let me specify that  $x$  is an organism ( $Ox$ ) and  $y$  is a species ( $Sy$ ), and add a conjunction of these as an antecedent to Haber's formulae. Now the formulae can be rendered like so:

- $$(DD) \quad \Box \forall x^w \forall y^w ((Ox \wedge Sy) \rightarrow (Txy \rightarrow Bxy))$$
- $$(DR) \quad \forall x^w \forall y^w ((Ox \wedge Sy) \rightarrow (Txy \rightarrow \Box Bxy))$$

If LaPorte is correct, (DR) is false. But while LaPorte and Levine seem to agree that (DD) is true, Haber's example intends to show that it is also false. Haber asks us to consider a pair of snake species, the California Red-Sided Garter Snake and the San Francisco Garter Snake.<sup>11</sup> If (DD) were correct, Haber argues, we would expect the type specimen of the California Red-Sided snake to belong to its species. Of course, Haber is assuming a background modal logic that is at least as strong as to validate ( $\Box \alpha \rightarrow \alpha$ ), so that (DD) would imply “actually, all type specimens belong to their species”. But the fact of the matter is that, due to what is technically called a *misidentification* of a type specimen, the type specimen of the Red-Sided Snake species was actually a San Francisco Garter Snake. So, by *modus tollens*, (DD) is false.

Would weakening  $\Box$  to  $\Box_{\mathcal{B}}$  (“it is biologically necessary that...”) save (DD)? Given our previous assumptions (section 4), the actual world is a member of the set of possible worlds  $\mathcal{B}$  that preserve biological regularities as we know them.

Additionally, if we assume ( $\Box_{\mathcal{B}} \alpha \rightarrow \alpha$ ), i.e., that what is biologically necessarily true is true, then the weakening cannot save (DD).

The snake case sparked a discussion within the community of experts that involved a petition for the assignment of a new type specimen to the Red-Sided Snake. Eventually, the International Commission on Zoological Nomenclature issued a ruling in compliance with the petition (Haber 2012, p.778). In the Frege–Dummettian model I have proposed here, this amounts to a change in the criterion of application of a name. If this is true, it entails that the practices of a community of experts—at least in the case of biological nomenclature—are able to override some seemingly fundamental necessary statements.

## 7. Concluding remarks

I have tried to show that Putnam’s story about natural kind names can be fruitfully analyzed in terms of an interplay between Frege–Dummettian criteria of application and of identity. Those two sorts of criteria, I have argued, constitute two sources of weakness for metaphysical necessity as conceived by Kripke and by Putnam in MoM. Even though Putnam himself acknowledged in later papers that criteria of identity cannot be metaphysically necessary in the strong sense, he was not clear as to how this could formally be done. Taking up an argument of Bob Hale’s, I have suggested that a form of weakened criteria of identity can be drawn from restricted quantification over possible worlds.

In order to show that criteria of application can also be a source of weakened necessity, I have considered a case—originally presented by Matt Haber—from biological nomenclature in which the single sample used in the baptism of a kind turned out not to belong to that kind. The example shows that a purported *de dicto* necessary truth, which we can rephrase as “necessarily, the sample used in the baptism of a kind belongs to that kind” is actually false. If I am right in saying that a baptism of a kind is nothing but the establishment of a criterion of application for the kind’s name, the example shows that the criterion of application can be revised, falsifying modal claims such as the above. The example also belies a tension between the division of linguistic labor hypothesis and metaphysical necessity. A change in the criterion of application of a term by a community of experts can trump necessity, even in the weaker, restricted quantification sense we have previously considered.

Frege–Dummettian criteria of identity and application may well be, after all, compatible with Putnam’s views in MoM. All one has to do is move these criteria out of “graspable” senses and into semantic vectors as used by expert speakers inside a community that exhibits division of linguistic labor.<sup>12</sup>



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**Resumo.** O objetivo deste artigo é sugerir como as noções Frege–Dummettianas de critério de identidade e critério de aplicação podem cumprir um papel importante no relato acerca da referência para as classes naturais desenvolvido por Putnam em “Meaning of ‘Meaning’“. Desse modo, podemos esclarecer as ideias anteriores de Putnam sobre a “necessidade relativa a um corpo de conhecimento”, bem como suas visões subsequentes sobre identidade sortal. Se os critérios Frege–Dummettianos cumprirem de fato o papel que aqui atribuímos a eles, então devemos abandonar ou a rigidez (forte) ou a hipótese da divisão do trabalho linguístico. Fornecerei um exemplo da nomenclatura biológica que pode nos convencer a desistir da primeira opção.

**Palavras-chave:** Teorias da referência; classes naturais; critérios de aplicação; critérios de identidade.

## Notes

<sup>1</sup> These examples are from (Noonan 1997, p.634), which is a good introduction to the subject.

<sup>2</sup> However, against the view that Kripke assumes a form of absolute identity, see Hale (2004).

<sup>3</sup> I will henceforth omit superscripts in order to ease readability. The domains to which  $x$  and  $y$  belong to will be presented as superscripts in the quantifiers prefacing the formulae under consideration.

<sup>4</sup> I take this claim to hold regardless of whether the underlying variety of quantified modal logic is one of constant or of variable domain.

<sup>5</sup> All laws? How are we to know which laws to include? I believe that is a difficulty already present in Putnam’s discussion of the issue, so I will gloss over it. Nevertheless, I think it is safe to assume that only those laws which Elliott Sober (1993) calls *source laws* (as opposed to *consequence laws*) should figure in any discussion about which worlds constitute the set  $\mathcal{L}$ .

<sup>6</sup> See Lecture III in (1980), and p.231 in (1975).

<sup>7</sup> It is jarring to call “water” a sortal. While I am not fond of the terminology myself, let me note that words that are mass terms in one language may be sortals in another. “Bread” in English is a mass term; in Portuguese, it is a sortal.

<sup>8</sup> The code can be accessed online at [www.iczn.org](http://www.iczn.org).

<sup>9</sup> The baptism for the species now known as *Homo erectus* was a bit different from what I present here. The species was originally baptized as *Australopithecus erectus* by Eugène Dubois in 1892. For details, see Cracraft and Donoghue (2004, p.528).

<sup>10</sup> For an overview of the species problem, see the papers collected in Ereshefsky (1992).

<sup>11</sup> The complete ICZN names of these species are: California Red-Sided Garter Snake: *Thamnophis sirtalis infernalis*, de Blainville 1835; San Francisco Garter Snake: *Thamnophis sirtalis tetrataenia*, Cope, E.D., in Yarrow, H.C. 1875.

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