Abstract: Since Hilary Putnam and Saul Kripke’s first attacks on traditional, descriptivist theories of natural kind terms, it has become customary to speak of the ‘Putnam-Kripke’ view of meaning and reference. This article argues that this is a mistake, and that Putnam’s account of natural kind terms is importantly different from that of Kripke. In particular, Putnam has from the very start been sceptical of Kripke’s modal claims, and in later papers he explicitly rejects the proposal that theoretical identity statements are metaphysically necessary (if true). I suggest that this is wholly in line with Putnam’s earlier, Quine-inspired writings on general terms, and his preoccupation with the philosophy of science. Moreover, I argue that the picture of general terms that emerges from Putnam’s writings is more plausible than that suggested by Kripke. However, contrary to Putnam, I also suggest that Putnam’s later views on natural kinds and natural kind terms do not support standard Twin Earth externalism.

Keywords: general terms, natural kinds, cluster theory, metaphysical necessity, externalism

During the last few decades the semantics of general terms has been dominated by the so-called ‘Putnam-Kripke view’ of meaning and reference. There is a reason Putnam and Kripke have come to be joined this way: about the same time, in the 1970s, they both developed views that sharply departed from the well-established, descriptivist views of the semantics of general terms and they both defended a radically new way of thinking about meaning and reference determination.1 In particular, they both rejected the idea that the meaning of general terms can be understood as a purely internal business, in complete independence of the causal interaction between the speaker and her environment. This was a watershed moment, and Putnam and Kripke were both responsible for it.

Despite this, I shall suggest, there are some very important differences between Kripke’s and Putnam’s theories of general terms. In fact, Putnam has said as much in several papers, although this has generally gone unnoticed.2 While he was initially sympathetic towards Kripke’s view, and took it to be compatible with his own account of natural kinds and natural kind terms, he soon came to question central aspects of the view. In particular, he came to question Kripke’s modal

1 The central texts are Kripke (1980) and Putnam (1975a), reprinted in Putnam (1975b) (page references will be to the reprint).
2 A notable exception is Hacking (2007) and Hacking (forthcoming).
claims involving natural kinds, for instance that if water is H\textsubscript{2}O, then it is necessarily H\textsubscript{2}O. This, I believe, is wholly in line with Putnam’s earlier writings on general terms and his preoccupation with philosophy of science. Indeed, I shall suggest, the picture of general terms that emerges from Putnam’s writings is more interesting, and more plausible, than that suggested by Kripke. However, contrary to Putnam, I shall also suggest that Putnam’s later views on natural kinds and natural kind terms do not support standard Twin Earth externalism.

The article is divided into three parts. In the first part, I sketch Putnam’s views in the early 1960s papers, and his account of the meaning of terms such as ‘bachelor’, ‘energy’ and ‘cats’. I then turn to his famous 1970s papers, in particular “Is Semantics Possible?” and “The Meaning of ‘Meaning’”, where the notion of a natural kind term is first introduced and the semantics of ‘water’ is discussed. In the third part I discuss Putnam’s post-1975 papers, where he explicitly distances himself from Kripke, in particular “Is Water Necessarily H\textsubscript{2}O?” from 1990. I shall explain how Putnam here departs from Kripke in important ways and why, I believe, this is a well-motivated departure.

1. Bachelors, Energy and Cats

It is important to remember that Kripke and Putnam came to the topic of general terms from very different angles: Kripke came from modal logic and his interest was in singular terms. A main objective was to show that Quine was wrong to claim that modal contexts are referentially opaque.\(^3\) The application of his views to general terms in lecture III of “Naming and Necessity” (Kripke, 1980) appears almost to be an afterthought, an attempt to extend the account of singular terms and identity statements to the theoretical identity statements of science. Putnam, by contrast, came from philosophy of science and was primarily interested in general terms (indeed, there is very little on proper names in his writings): he set out in the spirit of Quine, arguing against the positivist account of the relation between meaning and evidence, and his aim was to defend an alternative picture of the semantics of general terms, one that better cohered with the workings of science.

This point of departure is very clear in one of Putnam’s first extended discussions of general terms, his 1962 paper “The Analytic and the Synthetic” (Putnam, 1962a).\(^4\) The paper starts out by discussing the well-known Grice–Strawson reply to Quine’s rejection of the analytic–synthetic distinction. In their reply, Grice and Strawson (1956) argue that there must be such a distinction since there is widespread

\(^3\) See Neale (2000) for an interesting discussion of Quine’s criticisms of modal logic.

\(^4\) Reprinted in Putnam (1975b) (page references will be to the reprint).
agreement (among philosophers) on which sentences are analytic and which are synthetic. For instance, we all agree that ‘Bachelors are unmarried’ is a candidate for analyticity whereas ‘There is a book on the table’ is not. Putnam suggests that Grice and Strawson have a point since there are sentences that can properly be said to be analytic. There is a set of ordinary language terms, he argues, that have a minimum of systematic input, and are such that they typically only have one criterion for their application: ‘bachelor’ being one of them, ‘hunter’ another one. Putnam calls these terms ‘one-criterion’ terms. In the case of such a term, he argues, if we were to give up the one criterion for its application there would indeed be a change in meaning.

However, Putnam suggests, Quine is still more right than wrong: although there is an analytic–synthetic distinction, it is a trivial one, one that ‘bakes no philosophic bread and washes no philosophic windows’ (Putnam, 1975b, p. 36). The analyticities generated by the one-criterion terms are all trivial, such that anyone competent in the language can recognize them as analytic; moreover, the set of such words is very small (including perhaps a few hundred words), and does not include terms that are of philosophical or scientific interest. For most terms, Putnam argues, Quine’s picture holds:

The picture that emerges from Putnam’s remarks is a form of meta-semantic holism for most of the terms in our language (excepting the one-criterion terms): the meaning of a general term such as ‘man’ or ‘tree’ is determined by its overall use. There is not a particular use that can be singled out as constitutive of grasp of the word; there are not, as Williamson (2007, pp. 73–133) has recently put it, ‘understanding-assent links’ such that failure to assent to a certain sentence constitutes failed grasp of meaning (or grasp of a different meaning). At the same

5 However, Williamson would disagree with Putnam on the one-criterion terms since on his view Quinean holistic considerations imply that there are no such terms. According to Williamson the understanding-assent links fail also in the case of ‘bachelor’ and ‘all bachelors are unmarried men’.

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time, radical differences in use, where your pattern of assent differs greatly from mine, imply meaning differences.

Analogously on the level of semantic content, Putnam develops a version of the cluster theory: the content of a general term should be understood in terms of a cluster of properties, none of which constitute necessary or sufficient conditions taken singly, but which jointly determine the extension of the term at a world in such a way that individuals that fit the most (or the weighted most) of the properties at a world, are in the extension of the term. For instance, discussing the term ‘man’, he suggests that one could successively raise the questions ‘Could there be a man that is not featherless?’, ‘Could there be a man that is not rational?’, etc., and in each case the answer might be yes. And yet, he continues, a radical change in the associated properties would entail a change in meaning:

[W]e say that the meaning in such a case is given by a cluster of properties. To abandon a large number of these properties, or what is tantamount to the same thing, to radically change the extension of the term ‘man’, would be felt as an arbitrary change in its meaning. On the other hand, if most of the properties in the cluster are present in any single case, then under suitable circumstances we would be inclined to say that what we had to deal with was a man (Putnam, 1975b, p. 52).

Similarly, in case of the term ‘cat’ and the statement ‘cats are animals’. Putnam imagines we discover that the creatures we call ‘cat’ turn out to be robots. Depending on the circumstances, Putnam suggests, the proper conclusion could be that it turned out to be false that all cats are animals: for instance, in a scenario in which there never were any no-robot cats, but the creatures had always been robots (unlike the case where our old cats were killed overnight by Martians and replaced with robots). Hence, ‘Cats are animals’ which may appear ‘analytic’ is perfectly revisable without a change in meaning.

Putnam also applies the cluster theory to the terms of science, such as the term ‘kinetic energy’, and introduces the notion of a ‘law-cluster term’. These are terms whose meanings are given not by a bundle of properties, as in the case of typical general names such as ‘man’ and ‘crow’, but by a cluster of laws. Before the development of relativistic physics, Putnam suggests, the statement that kinetic energy is equal to half the product of mass and velocity squared ($e = \frac{1}{2} mv^2$) had the status of a definition of ‘kinetic energy’. Einstein’s discoveries led to the revision of a great many statements that would seem straightforwardly synthetic (‘Moving clocks don’t slow down’) but also to a revision of some very central laws, such as the one that seemed to provide a definition of ‘energy’. And yet, it would be

6 The example is from Putnam (1962b).
7 However, Putnam adds a note of caution and stresses that the question whether there has been a change in meaning in such scenarios does not always have a clear answer, thereby allowing for an element of indeterminacy (Putnam, 1962b, pp. 660–661). This caution, as we shall see, is present throughout Putnam’s writings.
incorrect to describe this as a change in meaning rather than a theory change. Statements of this sort, Putnam suggests, play a special role in that they are not overthrown by isolated experiments, and in this sense they are ‘necessary relative to a body of knowledge’, but they are not unrevisable (see also Putnam, 1962b, p. 662). Even an apparent definition may be revised without a change in meaning, because of the holistic nature of the meaning of these terms, their role in the overall network of the theory:

The concept ‘energy’ is an excellent example of a law-cluster concept. It enters into a great many laws. It plays a great many roles, and these laws and inference roles constitute its meaning collectively, not individually. I want to suggest that most of the terms in highly developed science are law-cluster concepts, and that one should always be suspicious of the claim that a principle whose subject-term is a law-cluster concept is analytic . . . in general, any one law can be abandoned without destroying the identity of the law-cluster concept involved, just as a man can be irrational from birth, or can have a growth of feathers all over his body, without ceasing to be a man (Putnam, 1975b, p. 52).

Now, part and parcel of Putnam’s criticisms of the positivist conception of the analytic–synthetic distinction is his rejection of the demand for operational definitions of the terms of science; for instance, the idea that ‘gold’ can be defined in terms of whatever tests are available to determine whether something is gold. On this point, Putnam is in fact fighting two enemies at once: on the one hand traditional positivism, on the other hand Wittgensteinian philosophers such as Malcolm (Putnam, 1962c).8 The Wittgensteinians reject many of the positivists’ tenets of course, but they do hold on to the idea that meaning should be understood in terms of criteria, ‘ways of recognizing’ whether the term applies to an object. As against this Putnam argues that there are cases where all we have is symptoms, for instance the case of diseases that are extremely difficult to diagnose, such as multiple sclerosis, where the symptoms resemble those of other neurological diseases. On Malcolm’s view if someone has a disease that fits all the current symptoms of multiple sclerosis, then this constitutes a ‘paradigm case’ of the disease, and no later scientific discoveries can show that the person does not have the disease. However, Putnam says, suppose we later identify a virus as the cause of the disease and the person’s conditions was not caused by this virus: would we have to conclude that this person still has the disease or, alternatively, that if the person then is judged not to have multiple sclerosis, there has been a change in meaning? Putnam answers no and argues that the natural thing to say is that we were mistaken and that someone can have all the symptoms of the disease without having the disease. In this context, Putnam mentions the notion of a natural kind:

8 Reprinted in Putnam (1975b) (page references will be to the reprint). See also Putnam (1963), reprinted in Putnam (1975b).
This seems to me to be the case with a great many terms: the use of the term is based on the supposition that there is something – a ‘natural kind’ so to speak – for which our criteria are good but not perfect indicators. In the case of such terms, the accepted criteria are often modified in the course of time. We could learn to speak with Malcolm, and say that the term is given a series of new uses. But this obscures just what we want to stress: that the changes in the accepted criteria reflect the fact that we have more and more knowledge concerning X (where X may be a virus, or a kind of chemical, etc.) (Putnam, 1975b, p. 311).

Here, of course, we have the seeds of what is to come. Let us move on to the next important step in the development of Putnam’s views on kind terms: his 1970s writings on natural kinds and natural kind terms.

2. Water

In “Is Semantics Possible?” from 1970, Putnam’s focus has shifted to a class of terms he calls ‘natural kind terms’. These are terms that are associated with natural kinds, ‘classes of things that we regard as of explanatory importance; classes whose normal distinguishing characteristics are ‘held together’, or even explained by deep-lying mechanisms. Gold, lemon, tiger, acid, are examples of such nouns’ (Putnam, 1975b, p. 139). Since natural kinds are special in this way, Putnam suggests, natural kind terms play a special role, that of pointing to common ‘essential features’ or ‘mechanisms’ beyond and below the obvious ‘distinguishing characteristics’ (Putnam, 1975b, p. 141). It follows, Putnam argues, that something may have all the properties typically used to identify lemons and yet not be a lemon and, conversely, that something may be a lemon without having all these properties.

This discussion, obviously, is a precursor of Putnam’s most famous paper on general terms, “The Meaning of ‘Meaning’ ” from 1975. Here, too, the notion of a natural kind term plays a central role and here, too, it is argued that traditional theories of meaning cannot provide a plausible account of these terms. In particular, Putnam argues that natural kind terms do not jointly satisfy two traditional assumptions: (i) Psychological state determines meaning, and (ii) Meaning determines extension. To illustrate this Putnam treats us to a thought experiment that has come to be more famous, perhaps, than any other thought experiment used in philosophy: Twin Earth. What Twin Earth shows, Putnam argues, is that two individuals can be in the same psychological states (narrowly construed), and use the term ‘water’ in the same way, and yet there is a difference in meaning as a result of differences in the underlying composition of the liquids on the two planets (H₂O on Earth,

9 Reprinted in Putnam (1975b) (page references will be to the reprint).
10 Reprinted in Putnam (1975b) (pages references will be to the reprint).
XYZ on Twin Earth). More precisely: the difference in composition entails a difference in the extension of ‘water’ on Earth and ‘water’ on Twin Earth, and a difference in extension entails a difference in meaning (except in the case of absolute indexicals); hence there is a difference in meaning, despite the fact that Oscar and his twin are psychologically identical, and so (i) must be false. Meaning is not determined by internal states of the speaker, but (at least in part) by features of the external environment (Putnam, 1975b, pp. 219–227).

Now, it should be stressed that despite the appeal to the external environment there are important continuities between this account of natural kind terms and Putnam’s earlier account of scientific terms. As before, Putnam contrasts the terms of science with one-criterion terms, and stresses that there are no analytic statements involving terms such as ‘lemon’ and ‘acid’, and as before, the idea that there can be theory change without meaning change plays a very central role. Our theories about water before the dawn of modern chemistry were about the very same substance as our contemporary theories, despite changing ‘operational definitions’.

Moreover, as noted above, the appeal to underlying properties is already present in Putnam’s criticism of the Wittgensteinian appeal to criteria. This is of some importance since it makes clear that the very idea that a term may be used to pick out an underlying property is not in itself incompatible with the earlier cluster theory. It is possible to hold, for instance, that among the cluster of properties associated with the term is ‘is a natural kind’, where this is taken to entail that the term applies to a kind which is such that there is an underlying property that explains and holds together the observable properties of the cluster. This is a point made by David Lewis in a paper from 1994:

Like any up-to-date philosopher of 1955, I think that ‘water’ is a cluster concept. Among the conditions in the cluster are: it is a liquid, it is colourless, it is odorless, it supports life. But, pace the philosopher of 1955, there is more to the cluster than that. Another condition in the cluster is: it is a natural kind . . . When we hear that XYZ off on Twin Earth fits many of the properties in the cluster but not all, we are in a state of semantic indecision about whether it deserves the name ‘water’ (Lewis, 1994, p. 424).

11 Notice that the principle that difference in extension implies difference in meaning is problematic when it comes to general terms. After all, the extension of a general term always varies from world to world, and we do not want to say that every such difference entails a difference in meaning. For instance, a world where there is one less tiger than in the actual world is hardly a world where ‘tiger’ has a different meaning. The idea, rather, must be that certain differences are not merely differences in extension but differences in the property picked out, and that when there is such a difference there will also be a corresponding difference in meaning.

12 For a more detailed discussion of Putnam’s version of externalism, see Wikforss (2008). As is well-known, Putnam also appeals to the role of the social environment arguing for a type of externalism that applies more widely, beyond the natural kind terms. My focus, however, shall be on his physical externalism and natural kind terms.

The semantic indecision Lewis speaks of is a result of the fact that the condition ‘is a natural kind’ is just one among the conditions in the cluster and one that may fail to hold. Hence, when encountering ‘twin-substances’ there is the choice of revising the assumption that the kind is a natural kind (held together by an underlying property) or conclude that the twin-substance does not fall within the extension of the term.\footnote{The fact that the notion of a natural kind is in itself far from clear and subject to theoretical revision contributes to the indeterminacy. For a discussion, see Häggqvist (2005).} The much discussed case of ‘jade’ is an example where the first choice was made, as Putnam notes: the discovery that ‘jade’ has been used to apply to two different minerals did not lead to a narrowing of its application but rather to a revision of the assumption that there was one underlying property. However, there is evidence that there was much indecision: some dictionaries recommended restricting ‘jade’ to one of the two minerals, but the actual practice went the other way.\footnote{See LaPorte (2004) for a discussion of ‘jade’ and related cases. Like Lewis, LaPorte argues that there is room for semantic indecision since, he suggests, natural kinds terms are open-textured or vague.} And this is precisely what the cluster theory predicts.

Putnam’s claim in the case of Twin Earth, of course, is that we would not treat it as a jade-type scenario. His prediction is that when it is discovered that twin-water has another chemical composition than our water, we would revise the initial claim that there is water on Twin Earth. Part of his reasoning here is that it makes a difference that twin-water is not found on Earth, is not the type of water that we have interacted with historically. The meaning of natural kind terms, he suggests, is established ostensively, by pointing to samples of the kind: for instance, ‘this liquid is called water’. We then presuppose that the sample we point to bears a certain sameness relation, ‘same L’, to the stuff speakers in our linguistic community have called ‘water’, that it has the ‘same important physical properties’ as the stuff that is ‘around here’ (Putnam, 1975b, pp. 225, 234).\footnote{It should be noted that Putnam does not therefore hold that natural kind terms are indexicals. The indexical element enters into the determination of meaning but he explicitly denies that it goes into the content of the term. See, for instance, Putnam (1975b, pp. 222, 270; 1988, pp. 33–34).} Putnam puts this by suggesting that natural kind terms have an ‘unnoticed indexical component’: water, he says, is stuff that bears a certain similarity relation to the water around here. Since twin water has a different chemical composition, he argues, it does not bear the relevant sameness relation to the liquid on Earth and hence ‘water’ has a different extension on Twin Earth.

However, it is of importance to see that although Putnam does say this about Twin Earth, his claim is rather guarded and his discussion of the relation ‘same L’ suggests that there is indeed room for semantic indecision of the sort stressed by Lewis. First, Putnam does not speak of essences, the way Kripke does, but of
‘important physical properties’. This suggests something much weaker than what is required for Kripke’s modal claims and, as we shall see below, this is also something Putnam later came to recognize. Second, Putnam stresses that the latter notion is interest-relative. Normally the ‘important’ properties of a substance are the ones that are structurally important, but this need not be the case. For instance, Putnam suggests, if we were to discover animals on Mars that resemble tigers but have a silicon based chemistry: ‘Are Martian ‘tigers’ tigers? It depends on the context’ (Putnam, 1975b, p. 239). On Putnam’s view, therefore, the ostensive definitions that underlie our use of natural kind terms deliver a much less decisive result than that required by standard microessentialism. Indeed, it would seem to deliver a much less decisive answer in the case of Twin Earth, more along the lines of Lewis.

At one point in the paper, however, Putnam presents a view that comes closer to standard microessentialism and would seem to provide a clear answer in the case of Twin Earth. This is the section labelled “Indexicality and Rigidity” where Putnam spells out and endorses Kripke’s account of natural kind terms (Putnam, 1975b, pp. 229–235).

Kripke, like Putnam, rejects traditional descriptivist theories according to which ‘gold is a yellow metal’ or ‘cats are animals’ are to be construed as analytic truths. Unlike Putnam, however, Kripke also sets out to argue against all versions of descriptivism, including the cluster theory. As noted above, Kripke approaches the topic of natural kind terms not from the point of view of philosophy of science, but from the point of view of modal logic and singular terms. In his discussion of singular terms, recall, Kripke (1980, p. 48) introduces the notion of a rigid designator: a term that designates the same object in every possible world. According to Kripke our modal intuitions suggest that proper names, such as ‘Nixon’, are rigid, whereas definite descriptions are not, such as ‘The president of the United States’. Consequently, the semantic content of a proper name cannot be equivalent to any definite descriptions, whether a single description or a cluster of them. We may rely on certain descriptions to fix the reference of the term, but this does not imply that these descriptions determine the reference at all worlds, that they give the meaning of the term or determine its modal profile: ‘the properties an object has in every counterfactual world have nothing to do with properties used to identify it in the actual world’ (Kripke, 1980, p. 55). Moreover, since rigid designators pick out the same individual in all possible worlds, an identity statement involving rigid designators will be necessary, if true (Kripke, 1980, pp. 102–105).

17 This is stressed by Hacking (2007, pp. 11–13) who suggests that Putnam ‘seldom dabbled in essences’.
18 Kripke, by contrast, has a rather different answer: nothing with a different internal structure than our tigers, he states, would count as a tiger (Kripke, 1980, p. 121).
Kripke (1980, p. 116) then turns to the case of theoretical identity statements, such as ‘light is a stream of photons’, ‘water is H$_2$O’, or ‘gold is the element with the atomic number 79’. And he goes on to argue that the terms involved here, natural kind terms, are just as rigid as proper names. We use terms such as ‘gold’ and ‘tiger’ rigidly, as applying to ‘that kind of thing’; consequently, the meaning of a natural kind term cannot be given a descriptivist construal any more than the meaning of a proper name (Kripke, 1980, p. 122). When fixing the reference of these terms we typically rely on certain easily identifiable properties, but these are only contingently related to the kind: something can be gold without being yellow and shiny and, conversely, something may be yellow and shiny without being gold. The essential property of the kind picked out, rather, is a matter for science to discover. Since natural kind terms are rigid designators, theoretical identity statements are necessary, if true, just like ordinary identity statements involving proper names. And since the necessity in question is metaphysical and _a posteriori_, it is disconnected from what is conceivable or epistemically possible: while it is conceivable that water is not H$_2$O, it is not possible (if indeed water is H$_2$O).

In the section on Kripke Putnam endorses much of this. As Putnam sets up his thought experiment, there is no talk of possible worlds or necessity. In this section, however, Putnam suggests that his view could be put in Kripkean terms. What Twin Earth shows, he says, is that ‘water’ is rigid. The rigidity of ‘water’ follows from our intentions to use this term: when we say ‘this liquid is water’ we intend to refer to the very kind that is picked out in the actual world, even if we do not know the underlying nature of this entity. And, echoing Kripke, Putnam (1975b, p. 233) suggests that theoretical identity statements are necessary, if true: ‘Once we have discovered that water (in the actual world) is H$_2$O, _nothing counts as a possible world in which water isn’t H$_2$O._’

It is easy to understand why Putnam should be attracted by Kripke’s theory. It fits in nicely with Putnam’s criticisms of traditional positivist conceptions of meaning and necessity. In particular, it allows for a description of the progress of science which Putnam had long been arguing for, according to which there can be theory change without meaning change, and later scientific discoveries can lead us to revise also very central statements of our theory, even those that had been considered definitional truths. Moreover, Kripke, like Putnam, stresses the special role of natural kind terms.

At the same time, as indicated above, there are important differences in Putnam’s and Kripke’s approaches. Looking to Putnam’s 1960s papers, there is the difference in attitude towards the cluster theory. Indeed, Kripke himself notes this. Kripke mentions “It Ain’t Necessarily So”, and Putnam’s discussion of ‘cats are animals’. If cats turn out to be automata or demons, Kripke says, the right thing to say is that cats have turned out not to be animals, not that there are no cats. However, Kripke (1980, p. 122, n. 62) does not like Putnam’s suggestion that a
statement such as ‘cats are animals’ is ‘less necessary’ than ‘bachelors are unmarried’, and notes that Putnam seems closer to the cluster theory in some respects.

This, arguably, reflects the fact noted initially, that Kripke and Putnam have very different attitudes towards Quine. Kripke’s reaction to Quine, simplified, is to grant everything Quine says about the \textit{a priori} and analyticity, but save necessity by disconnecting it from the \textit{a priori}.\footnote{Kripke has very little to say about analyticity but suggests that analytic truths \textit{are} \textit{a priori}, and that the necessity associated with analyticity \textit{is} distinct from metaphysical, \textit{a posteriori} necessity (see Kripke, 1980, pp. 39 and 122, n. 639).} Putnam’s reaction, by contrast, is to endorse Quine’s scepticism about the \textit{a priori} and the analytic, as well necessity. Thus, the suggestion that ‘cats are animals’ is less necessary, on Putnam’s view, is part and parcel of his endorsement of the Quinean picture of the ‘web of beliefs’, where statements are more or less central to our belief system, are more or less revisable. On this picture, no statement (beyond the trivial analyticities) is absolutely necessary. For Putnam the endorsement of the cluster theory is a corollary to this. Kripke, by contrast, has no need for the cluster theory: on the contrary, it would stand in the way of his attempt to save necessity from Quinean considerations.

If this is correct, then one should expect Putnam to be sceptical of Kripke’s appeal to metaphysical necessity. Quinean scepticism about necessity, after all, would naturally seem to spill over to metaphysical necessity and imply scepticism about the suggestion that scientific statements, such as ‘Water is H₂O’, are necessarily true, if true.\footnote{As Neale (2000) makes clear Quine’s focus in his discussions of modal logic is linguistic or \textit{a priori} necessity, since this is how his main targets (Lewis and Carnap) interpreted necessity. However, as Neale points out, Quine also worries about a non-linguistic, metaphysical construal of necessity on the grounds that it is committed to Aristotelian essentialism.} Interestingly, this is precisely what we find in Putnam’s texts.

3. It Ain’t Necessarily H₂O

The first explicit attempt to distance himself from Kripke can be found in “Possibility and Necessity” (Putnam, 1983). Putnam here raises some doubts concerning Kripke’s modal claims.\footnote{Reprinted in Putnam (1983) (page references will be to the reprint).} He grants that once we have discovered the chemical composition of water to be H₂O, we do not call any other substance ‘water’ unless it is similar in composition. However, he stresses, ‘similar in composition’ is a vague notion; saying that ‘water is H₂O’, or any such sentence, is ‘true in all possible worlds’ seems an oversimplification. The ‘essence’ that physics discovers, Putnam argues, should rather be thought of as a paradigm that other applications of the concept must resemble than as a necessary and sufficient condition in all possible worlds. Putnam here appeals explicitly to Quine:
This should have been apparent already from Quine’s criticism of the analytic–synthetic distinction. A notion such as temperature is controlled by many laws, notably by the Second law of thermodynamics; if we come to a possible world in which the laws are slightly different so that mean translational energy of molecules does not obey the Second law, while a slightly modified definition does, then the ‘definition’ of temperature may be changed in order to keep the Second law. Kripke would grant this point as far as epistemic necessity is concerned; but it also affects his ‘metaphysical necessity’, because it affects what we shall count as relevant similarity to the paradigm case (Putnam, 1983, p. 64).

Now, it might be said that Putnam’s formulation here suggests that he actually misunderstands Kripke’s metaphysical necessity. After all, metaphysical necessity is de re, and what we count as ‘relevantly similar to the paradigm case’ would seem irrelevant: we may count something as relevantly similar that is not (twin-water as water, for instance). There is some truth to this. In fact, Putnam himself has later suggested that he did indeed misunderstand Kripke and did not realize that Kripke took metaphysical necessity to be, precisely, metaphysical and de re. Thus, Putnam writes, ‘I did not appreciate how different Kripke’s and my visions are until I heard Kripke’s lecture to the 17th World Congress of Philosophy in Montreal [1986], a lecture almost entirely devoted to criticizing my account for being insufficiently metaphysical!’ (Putnam, forthcoming).22 When he first encountered the notion of metaphysical necessity, Putnam continues, he assumed it could be given a non-metaphysical, linguistic interpretation, in terms of Carnapian state-descriptions. This, as noted above, is reflected in “The Meaning of ‘Meaning’ ” where the notion of ‘relevant similarity to the paradigm case’ plays a central role.23 The reason we should conclude that twin-water is not water, is that twin-water does not stand in the relation of ‘being the same liquid’ to our water, which is to say that it does not share the physical properties that we take to be important to our water, in this case microstructural properties. This suggests what Putnam later confirms, that he did not take the relevant modality to be wholly de re or metaphysical.

Kripke, by contrast, rejects any such way of thinking about possible worlds. In the case of proper names Kripke (1980, p. 41) famously rejects the demand for criteria for cross-world identity, the idea that ‘whether an object has the same property in all possible worlds depends not just on the object itself, but on how it’s described’. The question whether Nixon could have lost the election, he argues, is the question whether this man could have lost the election. Then we can just stipulate a world in which Nixon lost the election, a world that seems prima facie possible, and we need no criteria for determining whether the individual in question is Nixon. Similarly in the case of substances: whatever the nature of ‘this kind of thing’ is, such as a liquid or an animal, this nature determines the modal profile of

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22 See also Putnam (1990, pp. 63–64).
23 For Putnam’s appeal to this sameness relation see Putnam (1975b, pp. 225, 232, 238–239).
the corresponding kind term. For instance, Kripke (1980, p. 122) writes, ‘the original concept of a cat is: that kind of thing, where the kind can be identified by paradigmatic instances’. If it turns out that cats are animals then this is a necessary truth about cats. Considering a possible world in which there are cat-like demons, it follows immediately that they cannot be cats: ‘it is part of their very nature that, when we describe a counterfactual world in which there were such demons around, we must say that the demons would not be cats’ (Kripke, 1980, p. 126; emphasis added). Hence, there is no need for cross-world identity criteria.

Now, whatever one’s view about Kripke’s discussion of individuals and proper names, it is easy to sympathize with Putnam’s worries in the case of kinds and general terms. Putnam and Kripke both stress the central role of ostensive definitions in fixing the reference of natural kind terms. However, what we point to in this case is not a kind but an individual, normally an object that we predicate a certain property of (as when we say of an animal ‘x is a cat’). As is well known from the debate, there are any number of properties that the individual might instantiate in such a scenario, and which one seems to depend on our intentions, on what we take to be ‘relevantly similar’ to the object pointed to (this is the so-called ‘qua’-problem). If so, the suggestion that we can settle the modal question simply by imagining a world in which ‘this kind of thing’ has a certain property, or lacks one, seems hopeless: I would first have to settle what ‘this kind of thing is’, and this cannot be done without considering the relevant cross-world criteria, just as Putnam suggests.

This is related to the fact that the notion of rigidity does very little work in the case of general terms. Recently it has been much debated how the notion of rigidity applies to natural kind terms, since these are most plausibly construed as general terms and the notion of rigidity was introduced by Kripke to apply to singular terms. One proposal is that kind terms can be construed as singular terms, picking out kinds or properties, and that as such a kind term is rigid if it picks out the same kind in all possible worlds. However, if this is correct then it would seem that all kind terms are rigid, not just natural kind terms but also artifact terms and other non-natural kind terms: after all, ‘bachelor’ picks out the kind bachelor in all possible worlds. There are several reactions to this problem and I will not be able to discuss them here. What is of importance from our point of view is simply this:

24 Contrast this with Putnam’s earlier discussion (in 1962b) of the statement ‘cats are animals’, mentioned above.
25 For a discussion, see Devitt and Sterelny (1987) and LaPorte (2004).
26 And, as often pointed out in the literature, it cannot be that we can just stipulate possible worlds. As Putnam (1990, p. 71) puts it: ‘there is the big problem of what is an admissible stipulation – the problem of criteria of identity across possible worlds is a small part of this big problem’.
27 This is sometimes called ‘the simple proposal’ (see López de Sa, 2008).
saying that ‘water’ picks out a particular kind rigidly (in this sense) is in itself saying very little since it is just to say that ‘water’ designates the kind water in all possible worlds. It does not follow from this that ‘water’ applies to all and only H\textsubscript{2}O (even if water does in fact have that chemical composition) since it is an open question whether chemical substances, such as water, have their microstructural properties essentially.\textsuperscript{29}

It might be objected, on behalf of Kripke, that the need for some disambiguation of the ostensive definition does not in itself speak against metaphysical necessity. Rather, it simply tells us something about the reference fixing procedures: when a kind term, such as ‘water’ or ‘cat’, has its reference fixed assumptions about sameness criteria play a central role. Once the reference is fixed, however, the object picked out, the kind, determines the modal profile of the term, not these ‘sameness criteria’. In fact, this is precisely how Kripke responds to the corresponding suggestion in the case of names, that a sortal property is needed to disambiguate the reference of a name and provide criteria of identity over time: for instance, ‘I use ‘Nixon’ as a name of that man’ (Kripke, 1980, pp. 115–116, n. 58). Kripke objects that even if a sortal is needed to disambiguate it need not be a priori true of the individual or in any way part of the meaning of the term. Similarly, it might be said, even if descriptions play a central role in fixing the reference of a kind term, these descriptions do not go into the meaning of the term and do not determine its modal profile. For instance, introducing a substance term such as ‘water’, speakers intend it to pick out stuff with a certain underlying constitution. Hence, whatever underlying constitution water has in the actual world, it has necessarily, across all possible worlds.\textsuperscript{30}

However, there are difficulties concerning such a proposal. In particular, why should it be assumed that ordinary speakers have a clear enough conception of ‘underlying constitution’ for this to do the work of determining the extension of ‘water’ across possible worlds? (The problem, of course, is much bigger if we consider speakers from ancient times, before the development of modern chemistry.) They may have some conception of ‘important underlying physical property’, just as Putnam suggests, but this is too unspecific to deliver the results

\textsuperscript{29} Taking this line, obviously, presupposes that the scientific statement ‘Water is H\textsubscript{2}O’ should not be construed as an identity statement spelling out property identities. However, this is in any case very plausible. Scientists are arguably not in the business of spelling out property identities; their interest is not in correlations that hold in all possible worlds, but correlations that hold in our world, or all physically possible worlds. A more plausible construal of ‘Water is H\textsubscript{2}O’, then, is simply as a universally quantified statement: ‘For all x, if x is water then x is H\textsubscript{2}O’. (This construal is defended by Needham, forthcoming. For a nice discussion see also Steward, 1990.)

\textsuperscript{30} This move is explicitly made by Soames (2002). The term ‘water’, Soames says, is introduced ‘with the intention that it should apply to all quantities of stuff that share the same underlying constitution with elements in its associated sample’ (p. 285). If the introduction is successful, Kripke’s modal conclusions follow.
Kripke desires. Indeed, if speakers were to have a very clear conception of the shared underlying property as being ‘microstructural’, for instance, it would seem as if most of the suggested natural kind terms involve cases of massive reference failure. It is well known that biological categories do not have anything like ‘underlying micro-level properties’ uniting them: hence, if microstructural properties were decisive ‘tiger’ and ‘lemon’ would fail to pick anything out. In fact, even substance terms such as ‘water’ are problematic in this respect since, it has been suggested by philosophers of chemistry, chemical kinds do not have ‘shared microstructural properties’ – there is simply too much variation at the level of microstructure. Thus, if the intention to pick out a microstructural property were decisive, even a term such as ‘water’ would fail to refer. This, it would seem, is no less problematic than traditional descriptivist accounts when it comes to the possibility of accommodating scientific theory development: in both cases there will be reference failure and meaning change rather than error and theory development.

There are therefore serious difficulties applying Kripke’s view of proper names and individuals to that of general terms and kinds. Putnam, in fact, was to take his scepticism of Kripke’s modal claims one step further. The trouble, he suggests, is not merely that we need criteria for sameness of substances, but also that these criteria are essentially tied to the actual world, our laws of nature, and hence do not apply across all possible worlds. In a paper from 1990, “Is Water Necessarily H2O?”, Putnam spells out these worries about cross-worlds criteria. An important adequacy condition on substance identity, Putnam suggests, is that two substances are the same if they exhibit the same law-like behaviour. This is why microstructural properties are of importance: ‘differences in microstructure invariably (in the actual world) result in differences in lawful behavior’ (Putnam, 1990, p. 69). However, difficulties arise when we consider counterfactual worlds where the laws of nature are different. Consider, for instance, a possible world in which the laws of nature differ causing H2O to have very different macro-level properties, for instance, causing it to be an opaque, pink solid. Would this be a world where there

31 As Hacking (2007, p. 15) stresses, the optimistic assumptions in the 1970s that biological categories such as lemons and tigers have a unique DNA were soon to be abandoned. What Hacking does not stress, however, is that Putnam realized this early on and revised his microstructural conception of biological kinds (see, for instance, Putnam, 1988).
32 See Needham (2000, 2010). If the distinctness of kinds of microparticles were the guide to distinctness of substances, Needham (2010, p. 18) writes, water would be a mixture.
33 These difficulties are discussed in further detail in Wikforss (2010) and in Häggqvist and Wikforss, “Natural Kinds and Natural Kind Terms” (unpublished MS). For an interesting discussion of the qua-problem and its implications for metaphysical necessity, see also Fodor (2000).
34 The example is from Steward (1990). Steward argues that Kripke’s modal claims go beyond what is licensed by chemistry and require problematic essentialist assumptions.
is water? Putnam now suggests that there is not a determinate answer to such questions, and that he would like to qualify his view in “The Meaning of ‘Meaning’”:

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 should 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_2O. 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, pp. 69–70).

I think Putnam is making an important point here: the very notion of a chemical substance is firmly planted in contingent facts about our world, such as the fact that differences in microstructure invariably lead to differences in law-like behaviour. Put differently: there simply are no perfect twin-substances, they are not nomologically possible.\(^{35}\) If so, it is not clear how we are to think about sameness and difference across possible worlds where these contingencies are removed (and it is certainly not something science considers). Similarly on the level of semantics: a term such as ‘water’ has clear enough application conditions in the actual world and in nearby worlds, and this fact allows us to use our terms in a stable and uniform way, ‘tracking’ underlying properties, despite our incomplete conceptions and theories of the substance in question. However, in far removed worlds where the laws of nature are different and macro- and micro-level properties come apart, it will be indeterminate what to say: our use of these terms is simply not prepared for such cases. We can decide to go with the underlying property, or we can decide to go with the macroproperties and deny that the liquid is water, but which way we go is a matter of decision, and is not laid down in the ‘meaning’ of the term.\(^{36}\)

Unlike Putnam, however, I do think this raises some questions about Twin Earth as well. Although Putnam rejects Kripke’s account of natural kind terms and metaphysical necessity, he does not think that this throws any shadow on externalism and holds that the Twin Earth conclusions remain intact. He states that while he wrote “The Meaning of ‘Meaning’ ” he was only concerned with actual substances and not with questions about ‘all possible worlds’ (possible worlds, he says, were mentioned only in connection with Kripke). In particular, he says, ‘questions about worlds in which the laws of nature can be different were not on my mind’ (Putnam, 1990, pp. 69–70).

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\(^{35}\) This is stressed by Needham (2010). It should be noted that jade is not an example of a perfect twin-substance, since there are observable differences between jadeite and nephrite.

\(^{36}\) This is nicely illustrated by LaPorte (2004). Studying the history of science, with a special focus on minerals, LaPorte shows that in cases where macro- and micro-level properties come apart we have sometimes chosen to go with the macro-level properties, sometimes with the micro-level properties.
For this reason, he argues, scepticism about metaphysical necessity does not imply scepticism about Twin Earth.\(^{37}\) Moreover, he suggests, a community can stipulate that ‘water’ is to designate whatever has the same chemical structure or whatever has the same chemical behaviour as the local paradigms, even if it does not know at the time exactly what this structure or lawful behaviour is. And this still has the consequence that ‘I may discover that something that satisfied all the existing tests for water wasn’t really water at all’ (Putnam, 1990, p. 70).

But there are problems with this proposal. First, although Putnam may claim not to be interested in other possible worlds, and in particular not to be interested in worlds in which the laws of nature are different, it should be remembered that twin water is not a substance in the actual world. As noted above, perfect twin substances are not nomologically possible (at least, this is what current chemistry gives us every reason to believe). Putnam can stipulate that Earth and Twin Earth are in the same world, of course, but he cannot stipulate that Twin Earth is in the actual world. And if twin water indeed belongs to a world that is nomologically impossible then his own scepticism about cross-worlds criteria for substance identity affects twin water. If so, by Putnam’s own account, we should not be so very certain what to say about Twin Earth. Rather, we should consider Twin Earth to be precisely a case where a decision is called for. And that, again, falls short of standard externalism according to which the physical environment serves to determine that ‘water’ applies to H\(_2\)O in all possible worlds.

Second, there is no denying that one can stipulate that ‘water’ is to apply to whatever has the same chemical structure as a given sample, and this would indeed have the consequence that something may have all the superficial properties of water and yet not be water (and, conversely, that if something has the underlying property then it is water irrespectively of the macro-level properties (heavy water, for instance)). However, why should the possibility of such a stipulation teach us anything about the semantics of our term ‘water’? The term is not a scientific term, and has not been given its meaning by stipulation. Moreover, as Quine stresses, even stipulations can be revised without a change in meaning. And evidence from past use and from science, as noted above, indicate that things are far messier and that there is a complicated interplay between properties at different levels.

That standard externalism is in trouble is not necessarily to say that we are back with traditional descriptivism. Obviously, if one rejects Kripke’s modal claims one cannot rely on his most famous argument against descriptivist theories, the modal argument. However, it seems to me, the most important objections to descriptivist

\(^{37}\) This, also, seems to be Hacking’s line. Nothing in the Twin Earth argument, Hacking (2007, p. 16) suggests, relies on possible worlds, and Putnam’s endorsement of Kripke in “The Meaning of ‘Meaning’ ” can be deleted ‘without affecting any position to which Putnam was himself later committed’.
theories of natural kind terms predate Kripke and derive, precisely, from Putnam’s earlier, Quine-inspired discussions, concerning theory revision and meaning stability: we should not accept a theory which does not allow for the possibility that associated descriptions, even central ones, may be mistaken, and forces us to describe scientific theory development as a series of meaning changes. This, again, is precisely why Putnam moved to accept the cluster theory. And, as stressed above, the cluster theory, properly construed, allows the external world to play a certain kind of role since it allows for the possibility that ordinary observational criteria may be insufficient and misleading: we are not forced to conclude that something which looks superficially like water, or a lemon or a case of multiple sclerosis, is water, or a lemon or a case of multiple sclerosis. Science may tell us that there is something important missing from the sample in question. What the cluster theory does not license, of course, is the suggestion that this something is the decisive feature; for instance, that something which has all the superficial qualities of water but a different chemical composition cannot be water (or, conversely, that something may be water without having any of the ordinary properties of water). But this is something, as Putnam himself suggests, we have reasons to question in any case. As Hacking (forthcoming, p. 18) puts it: “Contrary to the way in which many philosophers write, there is no such thing in general as ‘what we would say if’ some states of affairs came to pass. ‘We’ have said a lot of different things, when.”

The proper conclusion, I believe, is not that Putnam’s later view of natural kinds and natural kind terms leaves us with standard externalism minus Kripke, but that it challenges the whole way of thinking about natural kinds and natural kind terms that has become established post-Kripke. Indeed, I think, the view that emerges from Putnam’s later writings is more akin to his own earlier view, in the 1960s, according to which natural kind terms (like most general terms) are a type of cluster terms. The meaning of the term is given by a set of more or less observable properties, where some properties are more central than others, and less revisable, but none of them (whether underlying or macro-level properties) is such that it must be present across all possible worlds (if there is not to be a change in meaning). After a detour via Kripke in the 1970s, it might be said, Putnam has returned to his Quinean roots.

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