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On the Content of Natural Kind Concepts

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Abstract. The search for a nomological account of what determines the content of concepts as they are represented in cognitive systems, is an important part of the general project of explaining intentional phenomena in naturalistic terms. I examine Fodor's (1990a) "Theory of Content" and criticize his strategy of combining constraints in nomological terms with constraints in terms of actual causal relations. The paper focuses on the problem of the indeterminacy of the content of natural kind concepts. A concept like *water* can pick out either a phenomenological property or a scientific one. Moreover, even on the assumption that the latter is shown to be most adequate, a given sample will still come out as falling into different natural kinds, according to the taxonomy of each particular science of which it constitutes an object. Both chemistry and physics contain concepts which are scientific counterparts of the common sense concept *water*, yet their extensions differ. As a criterion for determining the most relevant science for a given concept, I suggest to ask which science is most specific for the typical interactions of the subject possessing the concept, with her environment. The use of this criterion also permits one to show that a nomological theory is not necessarily verificationist, contrary to what has been claimed by Fodor and Boghossian (1991).

According to Jerry Fodor's *Theory of Content* (1990a), the meaning of a 'cow'-token¹ as entertained by a cognitive system (or in my terminology, the meaning of an instance of the concept *cow*) is "cow if (i) there is a nomic relation between the property of being a cow and the property of being a cause of 'cow' tokens; and (ii) if there are nomic relations between other properties and the property of being a cause of 'cow' tokens, then the latter nomic

¹The issue of the origin of the meaning relation can be dissociated from Fodor's (1975) hypothesis that the concepts represented by a cognitive system are organised as a "Language of Thought" (LOT). So when Fodor speaks of a 'cow'-token, for him this is not only a concept, but a word in the hypothetical LOT. The present paper, however, focuses only on the conditions under which this entity, whether it has the additional property of being a word in a LOT or not, can be considered a token of the concept *cow*. (I shall designate concepts by the name of the property they denote, in italics.)

By a "concept" C, I mean a type of structure which can be actualized in a given cognitive system, and which represents a property P. P is then C's content or meaning, and the objects instantiating P constitute C's extension. The word "concept" is thus given a psychological (or even neurophysiological - in the case of a concept like that discussed in section 3) sense, which is different from a philosophical sense of this term according to which "concept" means "intension".

relations depend asymmetrically upon the former." (Fodor 1990a, p.93). This is the core of a theory intended to provide a "naturalistic"² account of the semantic relation linking a concept, as represented in a cognitive system, to its content.

It seems to me that this core theory, though superior to theories which make the content of a represented concept depend on the actual causal history of tokens of that concept³, is still unsatisfactory, because it is unable to predict the content of natural kind concepts in a non-ambiguous way.

The central idea which I set out to defend in this paper is that a concept like *water* acquired by a human individual in a standard manner is, in virtue of natural law, linked to many properties with, in general, different extensions. One sort of such properties is phenomenological; its extension is more inclusive than that of any particular scientific kind. But even on the assumption that the content of a concept is a "natural kind", in the sense that it is fixed according to a scientific predicate, there still remains more than one plausible candidate for this extension. At least this is what I shall try to show for the paradigmatical case of the concept *water*. Even if a "semantic intention", to the effect that the concept in question be a natural kind concept in a scientific sense, could rule out phenomenological properties as candidates for determining the extension of the concept *water*, this extension would still come

²To be "naturalistic", the theory must be stated exclusively in non-semantic and in general non-intentional terms.

³Such a theory has been defended, with respect to the meaning of words of a natural language, by Devitt (1981) and Devitt and Sterelny (1987). For lack of space, I shall not argue in any detail why it is unsuitable as a general account of how the content of concepts gets determined. Two fundamental flaws are the following. A theory invoking only actual causal relations cannot handle the possibility that a primitive term may represent an uninstantiated property; nor can it resolve the intensional indeterminacy (this has been labelled the "qua-problem" for causal theories of content, by Miller 1993) of standard natural kind concepts which is the topic of the present paper. Actual causal relations turn out to be insufficient for determining denotation in many cases.

out different depending on whether chemical or physical taxonomy is considered relevant.

Furthermore, I shall argue that both of Fodor's proposals for eliminating this ambiguity of content, namely the "asymmetric dependency condition" (ADC) and the "actual history condition" (AHC), fail. I suggest that the required constraint is rather to be found at the level of the *implementation* of the semantic law linking a concept to the property it denotes, by a categorizing mechanism.

1. Pure or Mixed Nomological Theory?

Fodor does not take a definite stand on the question regarding the ontological level at which the conditions have to be stated for a concept to have a well-determined content (extension). On the one hand, Fodor insists on the importance of the fact that the theory can't rely exclusively on *actual* causal relations between tokens of a concept and instantiations of the property it denotes. One reason for this is that for a nomic relation to hold, it is not necessary that it be instantiated. Being able to attribute to the concept *unicorn* a well-defined content even though the property of being a unicorn is uninstantiated, is "one of the reasons why I want to do the thing in terms of nomic relations among properties rather than causal relations among individuals. I take it that there can be nomic relations among properties that aren't instantiated." (Fodor 1990a, p. 100). If it is true that the actual causal history of the tokens of a represented concept is irrelevant for its having content, it should be possible to

formulate the theory exclusively in terms of nomic relations along the following lines.

A concept C has property P as its content if

(1) there is a nomic link between C and P (a "semantic law", for short "SL"), and

(2) this nomic link satisfies a further restrictive condition.

On the other hand, on at least two occasions, Fodor reintroduces into the formulation of sufficient conditions for a concept to have a well-determined content, a condition (which I shall name the "actual history condition" or, for short, AHC) to the effect that some actual token of the concept must actually have been caused in a certain way. The first occasion is the introduction of the notion of a *robust* nomic link which is intended as a strengthening of the ADC⁴.

What role is the ADC supposed to play within the nomological account of content? Fodor's motivation for introducing it is that it seems to provide a solution to the "disjunction problem". Perceptual error provides illustrative examples of the disjunction problem. Fodor proposes to imagine a situation in which a person entertains the concept *cow* as an immediate reaction to seeing a cat which she takes to be a cow. The ADC is in charge of ruling out the relation between a cat and a token of the concept *cow* as an instantiation of a semantic law (SL). "*'Cow'* means *cow* and not *cat* or *cow* or *cat*, because *there being cat-caused "cow"-tokens depends on there being cow-caused "cow"-tokens, but not the other way around*" (Fodor 1990a, p. 91, his emphasis). The ADC is meant to be an additional condition which can be substituted for (2) in

⁴The second occasion is an attempt to weaken the "verificationist" aspect of the theory. However, the introduction of an AHC is inefficient in both cases. I shall try to show in section 5 that a nomic theory is not necessarily verificationist and furthermore, that an AHC wouldn't help, even if it were.

order to produce a sufficient condition for having a determinate content.

Now, my claim is that the ADC does not express an additional requirement over and above (1), i.e. in this case the requirement that there be a SL linking the concept *cow* to the property of being a cow. The ADC expresses only an implication of that postulate, namely that an instantiation of a different law linking the concept *cow* to the property of, say, being a cat, may result in an *exception* to the SL. The SL has exceptions as any typical higher-level law⁵ does. Fodor (1974; 1975) has himself given a general account of the relation between natural laws and their implementation by laws of lower levels, which explains why all (at least most) higher-level laws have exceptions : an exception to a higher-level law linking the property F to the property G occurs whenever some of the lower-level properties which *realize* the property F are nomically linked to a property which is *not* one of those realizing G. The SL's having exceptions is thus a general feature it has simply by virtue of being a higher-level law; but a feature shared by (almost) all higher-level laws is definitely too general to be relevant for explaining the semantic nature of the SL. If a law's having exceptions suffices for its being semantic, the result is pansemanticism.

In other words, Fodor's ADC doesn't introduce any constraint over and above condition (1) because it is implied by the existence of a SL linking concept C to property P. The asymmetry condition is equivalent to the statement that exceptions to a SL, and instantiations of more complex laws containing the SL as a

⁵If the concept of a law of nature turns out to be a viable notion at all, we seem to be forced to admit that even most of the laws of physics allow for exceptions (cf. Hempel 1988). In the context of our discussion, it suffices to admit that higher level laws can have exceptions.

conjunct, are ontologically dependent on the SL, whereas the regular instantiations of a SL depend only on the SL itself. The ADC is a logical consequence of the postulate (1), together with a general assumption about the nature of exceptions. As an implication of (1), the ADC can still be used as a heuristic device to rule out some causal relations as candidates for the instantiation of a SL⁶, but it would be misleading to present it as adding a new restriction to the theory.

Fodor himself points out that there are at least two cases showing that the ADC alone is not sufficient to guarantee the existence of a meaning relation. We shall consider them in a moment. To overcome this difficulty, he offers as a sufficient criterion for determinate meaning a conjunction of the ADC and the so-called criterion of robustness. The requirement of robustness is one kind of what I have called an AHC, in the following sense: for A to mean B it is not only necessary that there is (i) a nomic link between the properties B and A and (ii) that other nomic links from properties C,D,E... to A are asymmetrically dependent on the nomic link between B and A, but also that there has been at least one token of A which was actually caused by something other than B. "The dependence of As on Bs *is robust only if there are non-B caused As.*" (Fodor 1990a, p. 118, his emphasis, variables renamed).

⁶In cases in which it proves incapable of doing that, the blame should be put on the lack of restrictions placed on the SL, not on the ADC itself. Bernier (1993) shows convincingly that a postulate of the form (1) to the effect that a SL links the concept *water* to some property we are causally related to when we interact with water, *plus* the ADC, do not suffice to establish whether XYZ (cf. Putnam 1975, and below) is in the concept *water*'s extension or not. The reason is that we don't know whether there is one SL linking water to some common property shared by H₂O and XYZ, or whether there are two SLs, one linking water to H₂O and one linking water to XYZ. I shall argue in section 4 that this question can be settled empirically; but this leaves valid Bernier's point that the ADC is of no help in resolving the ambiguity.

Let us see Fodor's reasons for introducing an AHC the satisfaction of which should make semantic nomic relations robust. In at least two sorts of cases there seem to exist nomic relations on which others are asymmetrically dependent, but which nevertheless are not semantic relations. First, if a law linking higher-level properties A and D is implemented by a law linking lower-level properties B and C, the law A **Erreur ! Signet non défini**. D is asymmetrically dependent on the law B **Erreur ! Signet non défini**. C; but if A **Erreur ! Signet non défini**. D is a law about airfoils and B **Erreur ! Signet non défini**. C is Bernoulli's law of fluid mechanics, the theory should better not predict that B **Erreur ! Signet non défini**. C has a semantic character (cf. Fodor 1990a, p. 117). Now, why should the criterion of robustness be helpful in ruling out B **Erreur ! Signet non défini**. C as a *semantic* law?

Once again, Fodor's (1974; 1975) own account of the origin of exceptions which applies to higher-level laws in general leads to the result that most laws which are at a sufficiently high level are also robust. If B-C is itself a higher-level law, we should expect that there occur exceptions of the type which characterizes robustness, namely situations in which C is caused by something different than B. But it seems plausible that laws implementing a semantic law are still at a higher level than particle physics; and this is sufficient to secure the premiss that the laws at the level of B-C are of a type allowing for exceptions. The robustness criterion does not, in the end, rule out macroscopic laws - as the law linking B and C - as candidates as sources of meaning.

The second sort of case is as pervasive as the first. In a causal chain instantiating a conjunction of laws, the whole chain

is asymmetrically dependent on its links, i.e. the causal relations constituting it. "Suppose As (qua As) cause Bs (qua Bs), and Bs (qua Bs) cause Cs (qua Cs), and assume that As are sufficient but not necessary for the Bs. Then the law A **Erreur ! Signet non défini**. C is asymmetrically dependent on the law B **Erreur ! Signet non défini**. C. Why doesn't it follow that Cs mean B?" (Fodor 1990a, p.118). In order to prevent the conclusion that *all* causal chains become sources of meaning, i.e. to rule out pansemanticism, Fodor must show two things: first, that in the general case a causal chain is not robust; and second, that all the laws implying concepts (as mentally represented) are robust, in the sense that it is true for all such concepts C, that there has occurred at least one occasion in which a token of C has been caused by an object which is not part of C's extension.

The latter hypothesis is implausible for the following reason. Think of a subject entertaining a concept representing a shade of green for which there is no word in the natural language(s) the subject possesses. It seems perfectly possible that, at least up to a certain time in his life, all tokens of the concept have been entertained in occasions of veridical perception, i.e. in situations in which the relevant semantic law (linking the color property to the concept) was instantiated. It seems simply irrelevant for the question whether the concept has a well-determined content, whether it has actually been entertained in virtue of *other* causal⁷ links than the one linking it to the property constituting its content.

⁷A causal link is always an instantiation of a nomic link: on the nomological account of causation, a version of which Fodor endorses, *all* causal relations are backed by a law of nature; the point is that, in this case, the concept token can be caused by virtue of a *different* law than that which is linking its type to the property constitutive of its content.

The former claim is untenable because, once again, there are exceptions. Causes are not in general necessary conditions for their effects; if Bs cause Cs, typically there are also situations in which a C has been caused by something other than a B⁸. It turns out that causal relations of all types are "robust" in Fodor's sense, not just those linking concepts to the property they denote.

Thus it seems as if robustness did not, in the end, constitute the specific difference permitting one to split the class of all laws satisfying the ADC into two subclasses: those which are able to ground the meaning relation, and the others which are not. An AHC, at least of the type proposed by Fodor, according to which there must be tokens of A which were actually caused by non-Bs, is incapable of accomplishing this partition.

Robustness can't play the role of the additional condition (2), because it fails to be specific for the relation between a (represented) concept and the property it denotes. We have started from the insight that a theory of mental content which is based on the postulate of nomic links (SLs) is preferable to a theory which invokes *only* actual causal relations and wholly excludes possible ones. Now, I have argued that a theory which can be stated exclusively at the nomological level is preferable to a "mixed" theory like Fodor's which invokes both nomic links and actual causal relations in its conditions for a concept having a definite content. In light of the foregoing discussion, conditions in terms of actual causal links seem incapable of singling out semantic relations from other nomic relations. On this record a theory

⁸A classic paper on this topic is Mackie (1975). For a recent discussion, see Bigelow and Pargetter (1990).

which is stated exclusively at a nomological level should be preferred, if only for being more parsimonious.

2. Indeterminacy between phenomenologically and scientifically fixed content

Fodor proposes two additional restrictions to the core condition (1) of a nomological theory of content which says that for a concept C to denote a property P, it must be related to it by a law of nature. We have already seen that the first restriction, namely the ADC, is redundant (on the premiss that typically, higher-level laws have exceptions), and that the second restriction, namely that of robustness, is inefficient. In this section I propose to show that *some* restrictive condition is indeed needed if the theory is to be able to account for the fact that natural kind concepts have a well-determined content. In particular, as long as the theory contains only the core condition (1), it is unable to predict that the content of a typical natural kind concept is a "natural kind" in the scientific sense of this term. It turns out that if such a concept is acquired in extra-scientific circumstances, its extension is a class of objects (in the case of "count-concepts", like *cow*) or of stuff (in the case of "mass concepts", like *gold*) which have a *phenomenological* property in common, but not necessarily a scientific one. Yet, this doesn't show the concept to be disjunctive, as Fodor (1990a, p. 104) claims, except in virtue of the question-begging stipulation that the extension of such a concept *must* be determined in terms of scientific predicates.

Let me argue for this thesis with the help of the following example involving the concept F. I shall present a story in which Fodor's theory is bound to predict that the content (in the sense of extension) of that concept is a phenomenologically specified class of objects. Confronted with this kind of situation, Fodor (1990a, p. 115) advances the view that a concept can become a natural kind concept solely in virtue of *the intention* on behalf of the subject entertaining it that it should denote a natural kind. Presumably, the "default intention" when entertaining a general concept is that it should denote a class of phenomenologically similar objects⁹. I shall argue that such intentions are powerless to constrain the content of a concept.

Imagine that Laura has acquired the concept F in contexts in which the perceptually salient object was a whale. The important feature of the concept F thus acquired is that it does not take the difference between fish and whales into account. Were Laura to encounter a fish during the period of learning the concept F (and a word expressing the concept in Laura's natural language - for ease of exposition I shall take the language to be English, and the word to be "fish") she would apply the same concept to it. The concept F is *de facto* applied according to a phenomenological taxonomy¹⁰.

⁹This view seems to be implied in Fodor's (1990a, pp. 103-106) discussion of a hypothetical situation, presented by Baker (1991), in which someone learns the concept *cat* exclusively from robot-cats.

¹⁰Note that the restriction to a culture is not essential to my argument. I try to examine what determines the content of a *concept* Laura acquires, exclusively in terms of her interactions with the environment. In particular, this issue is different from the question of what determines the content of *words in a shared natural language*. As Burge (1979) has shown, the determination of the content of words cannot be analyzed in such an individualistic manner. This is precisely because they are part of a shared language. My argument rests on the assumption that there is no argument analogous to Burge's for (mentally represented) concepts.

Now imagine Laura encountering for the first time a fish (i.e. one that we would call a fish, according to our scientific classification of species) and reacting with the utterance

(3) "That fish is pretty small".

We can conclude from her using the word "fish" that she applies the concept acquired as previously described, which she has learnt to associate with the word "fish". Now, it seems as if there were three possibilities of judging the truth-value of the proposition expressed by her utterance (3), depending on what the concept she has acquired¹¹ denotes¹²:

1. Either the concept (token) F she expresses with the word "fish" denotes the property of being a whale (or equivalently, of being a marine mammal), i.e. does not contain fish in its extension,

2. or the concept (token) F denotes the property of being a fish, i.e. has as its extension the class of objects sharing the property of being a fish, which implies that the animals perceived

¹¹It is a notorious problem for naturalistic theories of content which consider the meaning of a concept to be definitively fixed during a limited learning period, that there is no objective criterion to fix the end of the learning period for a given concept, except in the laboratory. This is in particular a problem for Dretske's (1981) account of misrepresentation which has been criticized by Fodor (1984, pp. 40f.) for that reason. This problem does not, however, arise in the present context because we shall consider exclusively the moment in which the concept "fish" is for the first time applied to (what we judge to be) a genuine fish. Whether a subsequent change in meaning is to be expected is a different question which we can leave aside in the present context.

¹²Dretske (1983, p. 18, note 6) expresses the view presupposed here that the truth-value of a proposition is to be evaluated with respect to the *concept* expressed, and not with respect to the standard sense of the *word* as it is used in the shared natural language. The two fall apart only in exceptional situations like the one imagined here. Whether this is the only legitimate way of evaluating propositions or not, it will be presupposed in the following discussion.

during her ostensive learning of the concept were not part of its extension;

3. or the concept F acquired by Laura is not a natural kind concept (in a scientific sense), but is rather denoting a phenomenological property G¹³ shared by fish and whales.

How does a theory which makes mental content depend on nomic relations, rather than on actual causal links¹⁴, decide between these options ? As to option 1, it can plausibly be ruled out for the following reason: the point in replacing actual causal relations as the factor which determines content, with nomic relations between properties, is precisely to be able to take relevant counterfactuals into account (Dretske 1983; Fodor 1984, p. 40). If Laura had encountered (genuine) fish during the learning period, she would have applied the same concept F to them. That the actual causal history consists exclusively in encounters with whales is just accidental.

The same is true for option 2. This is because, on the nomological account, the situation is perfectly symmetrical between fish and whales. In terms of counterfactuals, the situation is such that encounters with fish and whales would have had exactly the same effect on Laura. Therefore, such an account cannot favor one class of objects over the other, as making up the extension of the concept acquired.

¹³In order not to beg the question of the content of Laura's concept, it seems preferable to use this artificial label for referring to it. "G" is meant to express a phenomenal quality equally possessed by fish and whales. The concept in question is supposed to be more primitive than both the concepts *fish* and *whale*, and thus it would be misleading to denote it by means of a term containing one of the words "fish" or "whale" which express those more elaborate concepts.

¹⁴A theory relying exclusively on the actual causal relations leading to the acquisition of the concept, has no means of preferring, as to the content acquired by Laura in the situation described, either option 1 or 3. Thus, on a (purely) causal theory, Laura's concept has no determinate content at all.

It might appear as if we were led into a dilemma, for option 3 seems equally unacceptable in light of the following consideration: it is plausible to suppose that in case Laura finds out later on that the animals encountered first were mammals and not fish, she would conclude that she had made a mistake in applying the same concept to all of them. That seems to be evidence that she already misapplied the concept when applying it to whales, and that the concept is not phenomenological in the end, but denotes *only* fish. From her own subsequent conviction of having committed an error, we may conclude that she had the intention to use the concept as a natural kind concept. But the moment at which she first applies the concept to a fish precedes her discovery that there is no unique natural kind including both whales and fish. At that prior moment, the situation turns out to be rather complex: with respect to the phenomenological concept acquired, she is correct. She doesn't make the mistake of applying the concept to something not in its extension; nevertheless she is mistaken in a different way, namely in supposing that there is a common property shared by whales and fish and which corresponds to a scientific kind. In other words, according to her own conceptual system, she applies the acquired concept correctly; she is wrong only in that the concept she expresses with the word "fish" is not the same as the concept we express with that word.

After all, 3 turns out to be the only acceptable solution among those we considered. From Fodor's analysis of a similar case¹⁵ we can guess that he would reject solutions 1 and 2, but that his response would nevertheless differ from how we presented solution 3. Analyzing a situation described by Baker (1989) in

¹⁵Cf. Fodor (1984, p. 41; 1990a, pp. 103-6), Baker (1991), and Fodor (1991).

which a person learns the meaning of a symbol "cat" in the Language of Thought exclusively through encounters with robot-cats, Fodor says: "It is OK for *some* predicates to be disjunctive as long as not all of them are." (Fodor 1990a, p. 104)¹⁶. But the analogous reply to our case would beg the question against the hypothesis that Laura learns a structurally simple concept which stands for a simple phenomenological property G.

Fodor himself doesn't seem satisfied with his answer that the concepts (or, respectively, mental symbols) acquired in such circumstances are always disjunctive. Cases like Baker's, Fodor argues, are underdescribed precisely because *usually* concepts are acquired with an intention, appropriate to constrain their content, e.g. to natural kinds in a scientific sense. But if this reasoning was correct, Fodor would have to conclude in our case that the concept actually acquired by Laura has no definite content at all. For Laura's *intention* to acquire a natural kind concept is deceived: there in fact exists no one natural kind whose members share one nondisjunctive property to which her mental symbol could be nomically related.

For her to be able to exert an influence on the determination of the content of her concept, what kind of means does she have at her disposal? There seems to be only one way in which she can contribute actively to constrain or modify the content of a concept she acquires. It is her capacity *to act* in a way that leads to bringing her in fact in touch with objects or stuff having different properties, and thus linking the concept being acquired with these different properties. Laura could have explored her environment more thoroughly, eventually with the

¹⁶Cf. Fodor (1984, pp. 40/1), Dretske (1983, pp. 17).

consequence of encountering a fish. But this variation in her possible experiences is already taken into account within the nomological theory. It already takes into account all the *possible* causal relations which could occur during Laura's acquisition of the concept.

The analysis of this case brings out two respects in which our account differs from Fodor's. Firstly, the content of the concept Laura acquires is *independent* of any possible semantic intentions. Her intentions to act can *indirectly* contribute to shape the content of a concept she acquires, but only through lawful interactions with her environment, which is what the nomological theory takes into account from the beginning. But in the absence of a naturalistic theory *of intention*, an account of the acquisition of content could not possibly remain naturalistic if it drew directly on intentions for fixing the content of a given concept.

Secondly, Laura's concept is structurally simple. The decisive constraints on content acquisition are of a cognitive sort. What counts for a psychological, i.e. empirical, theory of content, is the representational structure actually acquired: in the way the story is presented, Laura acquires a *simple* (i.e. non-disjunctive) concept, which means that we can identify its content only on what we consider to be the phenomenological level. If the representing structure itself is simple (i.e. not disjunctive or otherwise logically complex), laws of nature can only link it to an equally simple property. Without begging the question, there is no reason not to consider the content as equally simple as the representational structure itself. And there is such a simple, i.e. non-disjunctive, property which we can attribute to the

acquired concept F, namely a phenomenological property G shared by fish and whales. According to our *scientific* taxonomy, the content of Laura's concept F *appears* as disjunctive. But nothing forces us to hold that the property which constitutes the content of F is a natural kind of any particular science. The appearance of disjunctivity is due to a perspective whose adoption is not imposed by the learning situation, namely that of scientific biological taxonomy.

The distinction between concepts belonging to common sense on the one hand and scientific taxonomy on the other is not as fundamental as it might seem. First, the extension of natural kind concepts belonging to common sense can vary considerably depending on contextual factors. The variation of the extension of a concept like *water* is due to a functional component in its content; that is why a given sample of liquid can count as belonging to the extension of *water* when the contextually relevant feature is "flowing in a river", whereas the same sample wouldn't count as belonging to the extension of the same concept when the contextually relevant feature is "being drinkable"¹⁷.

Second, if it makes sense to credit non-human cognitive systems, e.g. animals, with the possession of concepts, these are neither common sense nor scientific; yet, their content is determined by constraints analogous to those which are relevant

¹⁷See Putnam (1975, pp. 238/9). In a similar way, Moravcsik (1990, pp. 231ff.; 1993) distinguishes four factors determining the meaning of natural kind terms, which can all contribute to variations of extension, depending on the explanatory context in which such a term is used. Within the meaning structure of a word, the *m-factor* (The label is meant to be reminiscent of the Aristotelian concept of matter.) is concerned with the ontological category of the items falling in its extension: abstract, material entity, event or state, etc. The *s-factor* distinguishes elements within the same ontological category, according to their structure, i.e. in terms of criteria for their individuation and persistence, and in terms of qualitative differences. The *f-factor* determines the items in the extension of a word, in terms of their function. Finally, the *a-factor* ("a" should be reminiscent of agency.) ranges over the causal properties of the entities in the extension. Although the meaning structure of all words contains an *m-* and an *s-factor*, only some have also an *f-factor* and/or an *a-factor*.

for our own concepts. I shall discuss the frog's concept of (what we would call) a fly in the next section.

Third, even if we assume that the content of a "natural kind" concept (as represented by a human subject) be determined according to a scientific standard of what a natural kind is, the requirement alone that there exist a nomic relation between the concept and a property exemplified in standard samples alone is in general insufficient to single out a unique content¹⁸. Even on scientific criteria, the same sample of stuff (or of paradigmatic objects) is part of *different* natural kinds, depending on which particular scientific taxonomy is considered relevant. We must, for example, distinguish the (phenomenologically determined) content of *water* as a common-sense concept from the content of at least two different scientific concepts: according to chemical taxonomy, "heavy water", i.e. water molecules containing the hydrogen isotopes D and T, belongs to the extension of the (chemical) concept *water*, but not to the concept of *water* of nuclear physics. This issue will be discussed in section 4.

3. The content of an animal's concept

What is the content of a concept entertained by a non-human cognitive system? Take the frog's concept of his prey¹⁹. In this

¹⁸Putnam (1975) distinguishes between different senses of the "same-relation" which determines, according to his account, the meaning of a natural kind word, introduced ostensively; but he considers the *scientific* criterion of "hidden structure" as fixing a unique meaning.

¹⁹The frog can be said to possess this "concept" in the sense intended throughout this paper, namely that of a structure (in the frog's case, the activation of certain ganglion cells in the retina) covarying lawfully with a property of the environment, namely a pattern of light. To be sure, the content of a concept in this sense can't be identified with a "conceptual role" because it is presumably not part of a larger network; therefore, there are no interactions according to which such roles could be defined. For present purposes, I share Fodor's assumption (for an explicit defense, see Fodor and LePore 1991, Fodor 1994) that concepts can be individually individuated, even if the process of their *acquisition*, during the individual's ontogenesis, is holistic (for evidence on the latter fact, see Bloom 1994). Compare Block

case, the cognitive structure of the concept-forming subject - the individual frog - is too inflexible to be able to learn about the difference between flies and artificial objects looking like moving black dots. The frog doesn't ever learn to distinguish fake spots from flies, either its perceptual or its conceptual processes not being fine-grained enough. As it *can't in principle, in virtue of its being a frog*, find out that there are in fact two different kinds of object, it is necessary *for it* to represent them in a uniform manner, by means of a unique representing structure, namely the activation of certain ganglion cells in its retina²⁰, having both flies and other objects looking like moving black spots in its extension. Let us assume that this concept is always perceptually triggered, i.e. that the perceptual mechanism implements the *only* law implying it. In particular, it seems plausible that there are no laws of "thought" linking that concept to other concepts possessed by the frog. Furthermore, an activation of the *fly*-concept is a necessary (though not sufficient²¹) condition for the frog's flicking its tongue, but it is not linked to any other type of behavior. This simplicity of structure gives us immediate empirical access to the content of

according to whom it is a plus for a theory of what meaning is if it also tells us what it is to know and learn meanings (Block 1990, p. 150). It is a plus that Fodor's theory certainly lacks: it shares this feature with all atomistic theories of meaning.

Note that the fact that the frog's concept of a fly is not part of a conceptual network (and thus cannot be defined in virtue of its conceptual role) is compatible with the possibility to define it functionally, in particular in virtue of its linking visual input to a specific behavioral pattern. The detector's function doesn't give it a *conceptual* role because the detector does not interact with other representations, only with sensory input and motor output (cf. Block 1990, pp. 153/4).

²⁰"Any small moving object will evoke this behaviour [of flicking its tongue towards the perceived spot; M.K.], and there is no indication of any form of discrimination. In fact, 'on-off' units seem to possess the whole of the discriminatory mechanism needed to account for this rather simple behavior. The receptive field of an 'on-off' unit would be nicely filled by the image of a fly at 2 in. distance and it is difficult to avoid the conclusion that the 'on-off' units are matched to this stimulus and act as 'fly-detectors'." (Barlow, 1953, p. 86).

²¹Cf. Barlow (1972).

the concept mediating between the frog's perception and its flicking the tongue (by holding the additional factors required for triggering the flicking behavior constant). The content of the frog's concept which is triggered by its perception of, e.g., flies, is determined by *the frog's* capacity of determination. The relevant psycho-physical law is linking a phenomenal quality - being a dark spot of a size between 0.3 and 0.6mm in diameter, moving with a speed within a limited range - to the type of representing structure (concept) in question. It is not linking the frog to a natural kind (in any scientific sense), because to distinguish the members of that kind goes beyond the frog's recognitional capacities. As the latter are too weak to accomplish discrimination between flies and other objects looking like moving black dots, his concept appears as disjunctive, *by our lights*, i.e. relative to *our* distinctive capacities.

To anticipate an issue which will be discussed in section 5, the frog example permits us to show in a particularly clear way that the nomological theory of the content of concepts is not, despite appearances, necessarily verificationist. In this example, the cognitive system and its *fly*-concept under examination are radically different from the examining subject and his corresponding concept. The theory would be verificationist if the content of *the frog's* concept turned out to depend on *our* (we = the constructors of the theory) capacity to find out (in principle) about the nature of the objects the frog's concept denotes. But what determines the content according to the nomological story is what *the frog* could in principle find out about the objects denoted. The frog's concept is disjunctive for us, but not for itself. Another way to express the same idea is by

saying that natural kinds are relative to sciences: with respect to human biology, the content of the frog's concept of a *fly* is disjunctive, but relative to froggy phenomenology (if that were a science) it is simple²².

4. Indeterminacy of content due to the existence of various scientific taxonomies

I propose to return now to the question of the content of human representations, in order to defend the following claim. Even if it is granted that a concept denotes a natural kind property in a scientific sense, this still leaves open the question of which particular scientific taxonomy is to be considered relevant.

Let me use Putnam's (1973, pp.121ff.) famous example of Oscar and twin-Oscar on their respective planets, being in perceptual contact with H₂O and XYZ respectively. Note first that on a nomological but not on a purely causal account (i.e. an account relying exclusively on actual causal relations), the situation comes out the same before and after the discovery of the chemical structure of water. What counts on the nomological account is how the conditionals come out: *if* Oscar (living before 1750) came to twin-earth and *if* he knew a method to tell H₂O and XYZ apart, would he represent XYZ as water? On the causal account there can be a

²²From a realist point of view on properties, it makes sense to consider a perfect conceptual system, capturing all and only relevant differences, i.e. which really cuts nature at its joints. Presumably, such a system is more fine-grained than ours; and the frog's concept comes out disjunctive, not only relatively to actual human science, but also relatively to an ideal or 'divine' conceptual system.

difference in representation only *after* the discovery of some differentiating effect by at least someone in the community²³.

Let us see whether some hypothetical sample of XYZ should be considered part of the extension of Oscar's concept *water*. The answer depends crucially, in a way analogous to Laura's concept *F*, on whether his concept *water* actually denotes a natural kind or a phenomenologically identified kind of stuff. But for the sake of the argument, let us assume that Oscar possesses a scientific concept, i.e. a concept whose content is constituted by a natural kind property in a scientific sense.

Now, I think that the example of *water* permits us to see that this constraint, together with our general presupposition that content is determined by a nomic link between the concept and a property, is in general still not sufficient to select one definite extension. The reason for this ambiguity in content is that different sciences apply different taxonomies to a given sample of stuff. Consider only chemistry and physics. The content of the chemical concept *water* (H_2O) is a structurally complex natural kind, by virtue of chemical taxonomy. Yet it is different from the content of the corresponding concept *water* (H_2O) as it appears in the taxonomy of nuclear physics. More precisely, the property which plays the decisive role in the construction of the chemical taxonomy is the electronic configuration, responsible for

²³This shows that a "direct reference" account of natural kind terms (and the concepts they express) is *not* (i.e. not only) a causal theory. On the direct reference theory, a term captures *all* the properties of the substance it names, independently of whether all of these properties have been efficient in some causal (perceptual) link with any one subject entertaining the concept (or using the term expressing it). That theory implies in particular that no reference change occurs in 1750 when new properties of water are discovered. The fact that the properties specifying the chemical structure of that substance became integrated in the human concept of water only then, on the basis of new causal interactions with water in the laboratory, is irrelevant to the direct reference theory, but essential for a (purely) causal theory. On the difference between the causal theory and the standard theory of direct reference (according to which a directly referential term is, by definition, contributing *its referent* to the proposition expressed by the sentence in which it figures), cf. Devitt (1989).

chemical reactions and the constitution of molecules. Nuclear physics cuts its kinds according to a finer criterion: it distinguishes, within each chemical kind, several physical kinds, namely the isotopes. In the taxonomy of nuclear physics, H_2O , D_2O and T_2O are different kinds. The extension of the narrower physical concept *water* consists only of H_2O , while it excludes heavy water, i.e. D_2O and T_2O .

Given this fact, we have to choose between the following options: either we conclude that the contents of natural kind concepts as possessed by human subjects are ambiguous, and determined only relatively to one or the other natural science; or we look for an additional constraint permitting contents to be determined uniquely. The latter option seems preferable for it aims at the discovery of an objective ground for choosing between the alternatives the first option leaves open. But we can only chose that option if we can justify the idea that the content of a given concept is determined according to the taxonomy of one science rather than others. Such a justification can be given on the basis of a scientific investigation of the interactions of that subject (i.e. of a typical human) with its environment. With respect to these interactions, it is reasonable to expect that there exists precisely one scientific taxonomy which is the most relevant for describing and analyzing them in nomological terms. It is an empirical question which taxonomy fulfils this criterion for each type of interaction. The criterion may be less clear-cut than we could have desired, but it reflects the fact that psychologically, the content of a mental symbol is not fixed in an absolute manner; rather, it depends on the way the subject in question lives. As to the interaction of a typical human with

water, it seems plausible to take chemical taxonomy as being the most relevant for it is precisely the chemical properties of water (as opposed to, for example, the cross-section of water-molecules for their interactions with neutrinos) which are decisive for the role this substance plays for human physiology²⁴. As a consequence, the *physical* concept *water* (H_2O) which excludes heavy water (D_2O and T_2O) from its extension, should be considered a different concept from the commonly held one whose content is determined according to the *chemical* taxonomy. The physical concept is the most specific one only in circumstances where these differences play some role *for* the subject (as might happen, e.g., to an engineer in a nuclear power plant).

On the other hand, from the fact that the chemical level is the most relevant for the commonly held natural kind concept *water* (remember our assumption that Oscar possesses a natural kind concept in a scientific sense, but without deciding in advance according to which particular science), we can conclude that the discovery of the H_2O -nature of water didn't lead to the creation of a new concept (admitting that before the discovery, there already existed a natural kind concept, as opposed to the corresponding phenomenological one); rather, it permitted us to refine the knowledge of the identity conditions of the kind already picked out. On the basis of our criterion, XYZ can be excluded from the extension of *water* because, by hypothesis of that thought experiment, there exists a (chemical) difference: different elements are by definition chemically distinct, and so are molecules constituted by atoms of different elements. Whether this

²⁴I may of course be wrong in judging chemistry to be the most relevant science for the study of the interactions of humans with water. Maybe fluid mechanics is as important or even more than chemistry. This is precisely what is meant by saying that the determination of the most relevant level is an empirical question to which only science is authorized to respond.

difference is already discovered in a given situation is not decisive in the framework of the nomological account.

5. The threat of verificationism

The content of a concept as it is represented in a cognitive system is contingent upon the categorizing mechanisms of that system. In this last section, I would like to show that Fodor's (and Boghossian's 1991) conviction that a nomological theory of content is necessarily *verificationist* is due to a misunderstanding of the implications of this contingency. It is a matter of empirical research to find out about the content of a given (represented) concept, but that doesn't make its content itself depend on the finding out. This becomes clear if one takes care to distinguish the representational system under examination from the representational system of the researcher who is trying to find out about the content of a concept entertained by the former. The content of the former's concept does not depend on the latter's finding out about it, yet the theory would be verificationist only if it predicted that this were the case.

I propose to take a closer look into why this is so by comparing the hypothetical substances XYZ and ABC. Boghossian (1991) proposes to imagine a situation which is slightly different from that imagined by Putnam (and which Fodor 1991, p.274, finds "*much* more outré", his emphasis): what should we say in the counterfactual situation where there is a substance whose behavior is so similar to that of water that it can *in principle* never be detected by humans as differing from usual water (this

impossibility may be due to the limited capacities of the human body).

The criterion we stated above was the following: the content of a concept is to be determined by an ideal taxonomy at the level of the science which is most specific for the interactions of the examined subject with its environment. On the basis of this criterion the ABC thought experiment should be analyzed as follows: as it is described by Boghossian, the difference between H₂O and ABC can only be physical. (In fact, he proposes that the only circumstances on which ABC behaves differently from H₂O be realized in black holes, which are actually places where physical differences show up, even among substances without chemical differences.) This means that ABC is in the extension of the concept *water* because, at the level most relevant for humans in ordinary life conditions, water is a "chemical" concept. Chemical discoveries about the stuff it denotes are relevant for the delimitation of its content, but physical discoveries about eventual variations *within* the chemically individuated kind aren't.

Boghossian argues that this case brings out the verificationist implications of the nomological theory. According to him, we should want to exclude ABC as well as XYZ from the extension of *water*; yet he holds that a nomological theory doesn't have this option open to it, for there is, in that case, no possibility of verification and thus no *possible* difference in the concepts formed upon encounter of H₂O on the one hand, and ABC on the other.

I have already explained why I think it is wrong to assume that we should want to exclude ABC from the extension of our

concept *water*. But concerning the alleged verificationist character of a theory of mental content, there is a more general lesson to be drawn. Not all of what we - as constructors of a psychological theory - find out about *water*, and especially about further distinctions and sub-taxonomies within that kind, counts for the determination of the content of the examined subjects' representations. This may be slightly confusing because here object and subject of examination are of the same (human) kind, and possess the same capacities of discrimination. The difference comes from the fact that as a theory constructor the psychologist (or, for that matter, the semanticist) has access to natural kind concepts figuring in different sciences - there being more than one concept of *water*, according to whether the relevant taxonomy is considered to be physics, chemistry or still another science. But, to be able to escape ambiguity it suffices to note that the content of the natural kind concept *water* is completely determined by the (actual and possible) *chemical* behavior of the substance with which a typical human is causally interacting.

Both Fodor and Boghossian are convinced that the nomological theory has a verificationist character because it determines the content of concepts as they are represented by a subject, in terms of the capacity of discrimination the subject can possibly acquire (given the social and historical circumstances of his life), concerning the objects (or the stuff) in its extension. They take it that this means that what we may find out about those objects is relevant for the determination of the class of objects denoted by the concept as possessed *by the examined subject*. But that suspicion of verificationism is due to a confusion between the two discriminatory capacities, of the categorizing mechanism linked to

the concept of the *examined* cognitive system and of the corresponding concept of the *examining* subject.

Let me briefly comment on a move Fodor makes in this context, and which has some relevance to the topic discussed in section 1 of this paper. Whereas Boghossian thinks that the alleged verificationist implications make the theory hopeless, Fodor tries to amend it in the following way. He tries to attenuate (what appears to him as) the verificationist aspect of the theory by introducing a supplementary condition for a concept C to denote a property P: *some* of the objects instantiating P - which make up C's extension - must *actually* figure in C's causal history. According to this new version of an AHC²⁵, at least one C-token must have been entertained as a causal consequence of triggering by (perception of) a P in the environment. The "mixed" theory resulting from the addition of the AHC to the pure nomological theory²⁶, is still, according to Fodor, "a soupçon verificationist", yet to a degree he finds tolerable.

But if the theory actually were (necessarily) verificationist - which I think it is not - the introduction of the AHC could not provide a cure against this fact. At this point, Boghossian correctly remarks that the AHC "doesn't ultimately help with the problem about verificationism" (Boghossian 1991, p. 76f.). It restricts the possible extension of a symbol to objects of a kind

²⁵"Some 'X's are actually caused by Xs." Fodor (1990a, p. 121). This is the second occasion in which Fodor helps himself to a condition in terms of actual causal relations, the first being the definition of robustness, discussed in section 1. Note the difference between the two versions of an AHC: for a concept C to be robust, it is necessary that it has actually been caused by an object *not belonging* to C's extension. In the present context of trying to overcome the presumed verificationist aspect of the theory, Fodor requires that C must have been caused (at least once) by an object *belonging* to C's extension.

²⁶Actually, Fodor and Boghossian talk of a "pure informational theory" in this context. This is slightly misleading because, according to both the original mathematical theory of information flow (Shannon and Weaver 1949) and Dretske's (1981) account of cognitive states based on it, for information to flow between two series of events, only reliable statistical covariance is required. But this requirement is weaker than that of the existence of a nomic link.

which has actually come in causal contact with the subject entertaining this symbol. But, first, such a fact from the personal history is highly accidental and leads to the consequence that we don't actually possess any primitive concepts of kinds we have not yet directly observed. However it should not depend on my having been to the zoo whether my concept *penguin* is primitive or not, or (if we admit that it is primitive) whether I can even possess that concept at all before having been to the zoo. Second, the AHC doesn't appear to be relevant to the point about verificationism. It suffices to imagine that there be ABC (or, for that matter, D₂O) molecules in our actual environment - then we have been in actual contact with these non-standard particles of "water"; but that doesn't change anything with respect to the question of whether we should or should not count them as falling in the extension of *water*, i.e. whether their presence has any influence on the content of this concept.

5. Conclusion

I have been supposing throughout this paper that the search for a nomological account of what determines the content of natural kind concepts is an interesting part of the general project of "naturalizing" intentional phenomena, i.e. explaining them in naturalistic terms. If the content of the concepts possessed by a cognitive system were completely determined by the actual causal relations to which that system is exposed, that would make the content of its concepts depend on the accidental circumstances of its experiences. Fodor is right in trying to formulate a theory of the content of concepts at a nomological

level. But so far, he has stated only a core condition of a nomological theory which doesn't contain sufficient constraints to let the content of a concept like *water* come out non-ambiguous. First, his proposal for the way of handling the disjunction problem, namely the asymmetry condition, is in fact not a new constraint, but a consequence of the analysis of denotation as a nomic relation. Second, I have tried to show that Fodor is unsuccessful in adding conditions of actual causal history as further constraints. They are not able to resolve the indeterminacy of content which remains once it is assumed that laws of nature fix the content of a concept.

There are two kinds of indeterminacy. First, a "natural kind" concept, whether of countable objects like fish or of a substance like water, can, in a human conceptual system, pick out either a phenomenological property or a scientific one. Second, even on the assumption that some constraint can be found which selects one of these options, the content of the concept is still indeterminate. In the case of a scientific natural kind concept, a given sample will come out as falling into different natural kinds, according to the taxonomy of each particular science of which it constitutes an object. Both chemistry and physics contain concepts which are scientific counterparts of the common sense concept *water*, yet their extensions differ.

I suggest that what actually provides sufficient constraints to make the denotation of concepts (as they are represented in a particular cognitive system) non-ambiguous, is the categorizing mechanism to which they are linked. The categorizing device linking the concept to the property which is constitutive of its content, is essentially a triggering mechanism sensitive to this

specific property, or combination of properties, such that its capacity of discrimination is a matter of objective fact. It is the implementation of the nomic link by such a categorizing mechanism which determines content non-ambiguously.

Finally I tried to show that a nomological theory is not necessarily verificationist, if it is understood as a (framework for a) psychological theory. As such, it is empirical and its truth has to be evaluated with respect to particular (human or animal) subjects. *Their* discriminative capacity in virtue of which they can eventually detect differences within the class of objects which one of their concepts denotes, plays a role for the determination of the content of this concept; but what would make the theory verificationist and what is not the case, is that *our* (as subjects of psychological research) possibilities to do so count for the determination of the content of the concept *possessed by the examined cognitive system.*²⁷

²⁷I would like to express my thanks for helpful comments and discussion to Julius Moravcsik, Joëlle Proust, François Recanati, and William Taschek, to my auditors in Saarbrücken, Germany, and Karlovy Vary, Czech Republic, where I have presented parts of an earlier version of this paper, and to Marcel Lieberman who kindly corrected my English.

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