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MILL, QUINE AND NATURAL KINDS

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Why do philosophers classify some kinds of things as "natural kinds"? A typical way of discussing this question is to analyze the term "natural kinds", using a few paradigm examples and some related philosophical terms, and attempting to bring consistency to the conceptual field.[1] What this sort of analysis misses are the reasons why philosophers feel the concept is important. In order to explore the importance of "natural kinds", we should look at the reasons why philosophers feel the need to introduce the concept into their philosophical systems. Such an analysis will show that the concept of "natural kinds" is not an independent, isolated concept, but one that plays a crucial role in linking a specific group of concepts. This analysis will also show that, because of an incoherence internal to the concept itself, the concept of "natural kinds" cannot legitimately fulfill the needs for which it is pressed into service. Toward these ends, I will examine the role the concept of natural kinds plays in the philosophies of John Stuart Mill and W. V. O. Quine.

In spite of the historical and philosophical distance between them, Mill and Quine hold strikingly similar views on "natural kinds". For two reasons, this is a remarkable fact. First, the century which separated their work witnessed extraordinary advances in science and logic. Second, although Mill and Quine are empiricists, their empiricisms are in many ways diametrically opposed. For Mill, experience consists of states of consciousness and feelings, mentalistic entities of the sort that Quine, as a behaviorist, resolutely rejects. Quine's empiricism revolves around his epistemological holism, a doctrine alien to Mill. Nevertheless, Mill and Quine hold to precisely the same concept of natural kinds. The purpose of this paper is to explore their use of this concept and explain the convergence of their systems at this point.

Sections I and II of this paper are partly historical; sections III and IV are analytical. In the historical sections, I will set out the problems which led Mill and Quine to introduce "natural kinds" into their systems. (I call this their "general problem".) I will also look at the problem which each faces which threatens the coherence of the concept (what I call the "specific problem") and the attempts made by each to overcome this problem.

In the analytical sections, I will lay out the five elements contained in

[1] Wilkerson, "Natural Kinds", *Philosophy*, 63 (1988), pp. 29–42; Teller, "Essential Properties: Some Problems and Conjectures", *Journal of Philosophy*, 72 (1975), pp. 233–248; Copi, "Essence and Accident", in Schwartz, ed., *Naming, Necessity, and Natural Kinds* (Ithaca: Cornell University Press, 1977), pp. 176–91.

Mill's and Quine's description of natural kinds. I will argue that these elements contain a conceptual "gap" which explains the difficulties in the concept. I will then argue in two ways that this gap cannot be overcome: first, by appropriating arguments which have been made in the scientific realism debate; second, by propounding a paradox which arises from the self-referentiality of the concept. Finally, I will argue that this analysis shows why contrary to the claims which have been made on its behalf, Kripke's theory of reference doesn't support the concept of natural kinds, but instead is merely part of the same intuitively appealing but unsupportable conceptual picture.

I. Natural Kinds in Mill's System of Logic

A. The Late Introduction of Natural Kinds

Mill's *System of Logic* is an attempt to set forth rules for scientific method. In his theory of the syllogism, Mill argues that deductive logic cannot produce knowledge because any fact proven in the conclusion must already be contained in the premises. Because science does produce knowledge, inductive rather than deductive inference must be at the center of scientific method. The description of induction as the method of science is at the heart of Mill's *System of Logic*.

In that Mill believes that there is *a* method for science, he believes that there is unity to science. Mill takes the physical and biological sciences as paradigmatic examples of inductive success, but he believes that the social sciences can attain the status of "science" if they apply his method. The honorific status of "science" is thus a privileged status to which each branch of knowledge aspires.[2]

Mill introduced the concept of natural kinds into his *System* at a late stage in its composition. In 1832, Mill wrote his theory of the syllogism, which became the second book of the *System*, and then he wrote a draft of the first book. Mill wrote, concerning this draft,

> What I now wrote became the basis of that part of the subsequent treatise; except that it did not contain the Theory of Kinds, which was a later addition suggested by otherwise inextricable difficulties which met me in my first attempt to work out the subject of some concluding chapters of the Third Book.[3]

We can find Mill's general problem, which he tried to resolve by introducing natural kinds into his system, by first looking at their appearance in Book III.

[2] Mill, *A System of Logic*, 9th edn., 2 vols (London: Longman, Green, Reader, and Dyer, 1875). Book VI, ch. 1, sec. 1; Vol. 2, p. 27. All references to Mill's *System* will be designated by book, chapter, and section number, followed by volume and page number.

[3] Mill, *Autobiography*, quoted by Ernest Nagel in "Introduction", Nagel, ed., *John Stuart Mill's Philosophy of Scientific Method* (New York: Hafner Press, 1950), p. xxvi.

B. The General Problem for Mill

Mill had hoped to ground induction entirely in the law of universal causation. This law states that every event has an unconditional, invariable antecedent and presumes that nature is lawful – that what happens once will happen again under similar circumstances.[4] It is the attempt to solidify the notion of "similar circumstances" which requires the notion of natural kinds. Mill is unable to appeal to a notion of resemblance because in Book I he had analyzed similarity and difference as feelings or states of consciousness in the observer.[5] This view is partly an expression of Mill's belief that all knowledge of objects stems from states of consciousness. But Mill is also guided by the knowledge of the errors which can befall us when we are constrained by the use of ordinary classification: one name might unknowingly be used to refer to several phenomena and more than one name might unknowingly be used to refer to the same thing. For Mill, similarity and difference are sui generis, based on states of consciousness which are peculiar, unresolvable and inexplicable.[6]

For Mill, the purpose of science is to prove general, preferably universal, statements. These are the laws, or uniformities, of nature. Mill divides these uniformities into those of time (uniformities of succession) and those of space (uniformities of coexistence). Uniformities of succession are explained by the law of universal causation. Only some uniformities of coexistence are so explained. If an event causes more than one effect, and these effects exist simultaneously, then these effects are uniformities of coexistence. (Mill's example here is that the highest point in the tides is both at the point of the earth closest and the point farthest from the moon.) However, there are other uniformities of coexistence; these are the similar properties of types or kinds of things.[7] Mill uses "All crows are black" as an example of this sort of uniformity. For Mill, to predicate something of a natural kind is to state a uniformity of coexistence – that is, a law of nature.

As so far stated, the argument for natural kinds merely recapitulates the problem of scientific realism generally, only for classes instead of objects. This is true, but it is only half the story. Here we must keep in mind the privileged position of science for Mill and in particular the centrality of the law of universal causation. If the fundamental principle of nature is the law of universal causation, then only those kinds of things are "natural" which play a role in this law. Other kinds of things

[4] Mill, *System* (Bk III, ch. 3, s 1) (vol. 1, p. 354).

[5] Mill, *System* (Bk I, ch. 3, s 11) (vol. 1, p. 75).

[6] *Ibid.*

[7] Mill, *System* (Bk III, ch. 22, ss 1–3) (vol. 2, pp. 112–16).

"really exist" in some sense, but they are relegated to a distinctly lower status.[8] Thus, only natural kinds, and not other classes of things, are uniformities of coexistence.

C. *The Specific Problem for Mill*

The particular problem which Mill explicitly faces when he sets out his theory of natural kinds is the one discussed immediately above: how to differentiate natural kinds from other kinds. The general problem, that of establishing the objective reality of classes, a problem for Mill because he defines our experience in completely subjective terms, hangs in abeyance.[9] If we assume as Mill does when setting forth his theory of Kinds that all similarities and differences relate to objects, and not just to ideas, we are still a long way from establishing that some kinds are "natural". As Mill succinctly puts the problem,

> It is a fundamental principle in logic, that the power of framing classes is unlimited, as long as there is any (even the smallest) difference to found a distinction upon.[10]

The general problem was to determine which classes participate in the uniformities of coexistence. Because a class can be set for *every* difference, not every class will be a natural kind. We noted above that some classes are completely unhelpful in filling in the universal law of causation. These classes, according to Mill, are founded on "definite distinctions" and not on difference of natural kind.[11]

The instrumental value of the classification is in fact the key aspect Mill seizes on in describing natural kinds. Classification according to some attributes, such as color, according to Mill completely exhausts the similarity between the objects so classified, whereas classification according to others allows one to discover many (perhaps an indefinite number of) other similarities. This latter classification is a classification according to natural kind. The other elements of Mill's description of natural kinds will be analyzed in section III, following the discussion of Quine's views.

[8] Mill, *System* (Bk I, ch. 7, s 4) (vol. 1, pp. 138–39).

[9] The problem of the objective existence of objects outside of experience haunts Mill's *System*. Mill tries to avoid this problem by claiming that the belief in external objects is a subject for psychology and not logic (Bk I, ch. 3, s 4) (vol. 1, p. 58). The working assumption of the *System* is that names refer to things and not just to ideas (Bk I, ch. 2, s 1) (vol. 1, pp. 23–24). Mill returns to this question in his *Examination of Sir William Hamilton's Philosophy*. See Nagel, ed., *John Stuart Mill's Philosophy of Scientific Method*, pp. 364–92.

[10] Mill, *System* (Bk I, ch. 7, s 4) (vol. 1, p. 137).

[11] Mill, *System* (Bk IV, ch. 7, s 4) (vol. 2, p. 280).

II. *Quine's Use of Natural Kinds*

A. *The Late Introduction of Natural Kinds*

Quine, like Mill, is a systematic philosopher, and *Word and Object* is the heart of his system. His essay "Natural Kinds" was published almost a decade after *Word and Object*. It is important to see that Quine is not turning to an entirely new topic in this essay. Instead, Quine uses natural kinds in an attempt to solve a problem which had already appeared in *Word and Object* and which threatened the heart of his philosophy. This problem arises from the principal argument of *Word and Object* – the radical indeterminacy of translation.

The simplest way to understand the radical indeterminacy of translation is as a variation on the underdetermination of theory by data.[12] The data are the behavior of the native speakers of the language to be translated; the theory is the set of analytical hypotheses which guide the translation. The indeterminacy arises because all of the data could fit radically different sets of analytical hypotheses. As Quine says,

> The indefinability of synonymy by reference to the methodology of analytical hypotheses is formally the same as the indefinability of truth by reference to scientific method (sec. 5). Also the consequences are parallel. . . . May we conclude that translational synonymy is no worse off than truth in physics?[13]

Quine does not want to treat these two indeterminacies the same; his answer at this point in *Word and Object* is that science is in a better position to find the truth because the "parameters of truth" are relatively fixed when one is working within a theory or language one knows well.[14] This answer is clearly inadequate for two reasons. First, Quine argues that the radical indeterminacy of translation holds even for someone who has learned the foreign language as a baby would. This bilingual is thus working with two languages both of which he or she knows well.[15] Second, Quine's answer leaves him with no reality independent of theory and makes every new theory incommensurable with every other. This latter point is not one that Quine accepts.[16]

It is precisely at this point in Quine's scheme that he will insert natural

[12] For a thorough argument that the indeterminacy of translation and the underdetermination of theory are variants of the same skeptical argument, and a review of the literature on this point, see my unpublished paper "The Skeptical Force of the Indeterminacy Argument", presented at Northwestern University, 29 January 1991.

[13] Quine, *Word and Object* (Cambridge: MIT Press, 1960), p. 75.

[14] *Ibid.*, p. 76.

[15] *Ibid.*, p. 74.

[16] Quine refers to Kuhn as an epistemological nihilist. Quine, "Epistemology Naturalized", in *Ontological Relativity and Other Essays* (New York: Columbia University Press, 1969), p. 87.

kinds, explaining how science can find the truth and why there is a truth independent of theory for science to find. Thus science can avoid the fate of radical translation, where there simply is no fact of the matter (according to Quine) as to which set of analytical hypotheses is right. Natural kinds permit Quine to prevent scientific truth from going the way of meaning.[17]

B. The General Problem for Quine

Quine cannot allow the findings of science to be undermined because his firm belief in scientific truth guides his entire philosophy. "What reality is like is the business of scientists, in the broadest sense, painstakingly to surmise," Quine says.[18] Although he broadens the class of scientists to include himself, he sees his work not merely as continuous with science, but also as an extension of science. For example, he begins an essay on epistemology by saying that "[e]pistemology is concerned with the foundations of science. Conceived thus broadly . . ."[19] And in a glowing review of J. J. C. Smart's *Philosophy and Scientific Realism*, Quine approvingly quotes Smart's line that "the physicist's language gives us a *truer* picture of the world than does the language of common sense."[20]

This view of science accounts for Quine's behaviorism, which along with his epistemological holism, guides his philosophy. Quine's project is to explain ontology, epistemology and meaning through behavior (Quine calls this a "behavioristic reconstruction"[21]), and for Quine behavior means neural response to stimulation at sensory surface. This project will make no sense unless it is accepted that the scientific picture of the world is more basic than that which is to be explained.

It is of fundamental importance in understanding Quine to realize that, for Quine, behaviorism is more fundamental than holism. Interpretations of Quine tend to focus on his holism and ignore his behaviorism entirely. This reading stems from the fact that most of Quine's extraordinary influence resulted from his two early essays "On What There Is" and "Two Dogmas of Empiricism," published more than a decade before *Word and Object*. In these essays Quine espouses a strong holism combined with a mild pragmatism. In *Word and Object*,

[17] I am not suggesting that Quine was completely happy with this solution. He returns to the problem of underdetermination in "On Empirically Equivalent Systems of the World", *Erkenntnis*, 9 (1975), pp. 313–28.

[18] Quine, *Word and Object*, p. 22.

[19] Quine, "Epistemology Naturalized", p. 69.

[20] Quine, "Smart's *Philosophy and Scientific Realism*", in *Theories and Things* (Cambridge: Harvard University Press, 1981), p. 92.

[21] Quine, *Word and Object*, p. 66. It is often forgotten that Quine's arguments against reductionism in his early essays are levelled against phenomenalistic reductions and not against reductionism *per se*.

Quine has already sharply reduced his holism,[22] and his behaviorism almost entirely supercedes his pragmatism.

An example of this kind of reading is to be found in Rorty's essay on Quine's treatment of the two indeterminacies.[23] Rorty prominently mentions Quine's holism, but the term "behaviorism" never appears in his essay. Rorty concludes, as I do, that Quine is wrong to treat the underdeterminations of translation and science differently, but Rorty supplies no explanation for why Quine makes this mistake. What Rorty's analysis misses is the tension which exists between Quine's holism and his behaviorism. This becomes clear if we look again at the radical indeterminacy of translation, this time in the context of Quine's holism and his behaviorism.

Quine's argument for the radical indeterminacy of translation turns on the interrelations of bits and/or areas of knowledge. Because epistemological fields are conceived of as wholes, we must keep in mind the possibility that the speaker of a foreign language may divide up his or her conceptual field differently than we do. When we point to an object which we call a rabbit, the foreign language speaker may say "gavagai", which (for all we know) means "rabbit-stage". Pointing or any other verbal behavior may be exactly the same even though the meanings of the words are radically different. Because the meanings will not be uniquely fixed by the totality of verbal behavior and dispositions of the foreign language speaker, his/her behavior and dispositions will always underdetermine the possible systems of translations.

The critical point is that the meaning of our word "rabbit" is circumscribed by concepts of sameness and difference which might not be the same in a foreign language. As Quine summarizes the point, "the very use of terms and the very positing of objects are unrecognizable to begin with except as keyed in with idioms of sameness and difference."[24] If we turn this principle on the enterprise of radical translation, the conclusion becomes clear. We have been unable to establish an absolute concept of sameness of meaning for words in different languages. This is why Quine refers to the indeterminacy of translation as the "indefinability of synonymy" in the passage quoted above. If the positing of entities and the use of terms makes no sense without a similarity concept, then the concept of meaning is ontologically illegitimate.

Why does Quine wish to do away with meaning? He tells us that "Meanings, therefore, those very models of mental entities, end up as grist for the behaviorist's mill."[25] Here we can see that Quine is not

[22] *Ibid.*, p. 13n.

[23] Rorty, "Indeterminacy of Translation and of Truth", *Synthese*, 23 (1972), pp. 443–62.

[24] Quine, "Speaking of Objects", in *Ontological Relativity and Other Essays*, p. 19.

[25] Quine, "Ontological Relativity", in *Ontological Relativity and Other Essays*, p. 19.

trying to show that the underdetermination of theory by data applies in a new area; rather he is trying to delegitimize meanings because they are mental entities. In arguing for the radical indeterminacy of translation, Quine uses his epistemological holism to further his behaviorist project.

The problem, as we noted earlier, is that the same holism attacks the objective truth of the scientific theories which underlies his behaviorism. If the underdetermination of meaning shows that we have no adequate similarity concept for meaning, then the underdetermination of current scientific theory will invalidate the similarity concepts for the objects (neurons, atoms, etc.) posited by it. Hence it will make no sense to affirm the existence of electrons and neurons. But as we saw earlier, Quine is unwilling to accept the conclusion that the objects accepted by science are ontologically illegitimate in the way he believes meanings to be. Physical objects are not secondary to language, he says, for physics would "never condone defining physical identity in terms of verbal behavior."[26] And for Quine, the truths of physics are the "literal truth."[27] The challenge for Quine is to come up with a workable similarity concept for scientific theories.

C. *The Specific Problem for Quine*

As is apparent in the preceding section, Quine is much more aware of the close relationship between the privileged position he awards science and the concepts of similarity and difference than Mill is. In his essay "Natural Kinds", Quine explicitly connects the concepts of similarity and natural kind as substantially the same. He goes on to tie both concepts to the aspect of induction which Mill calls "uniformities of coexistence" in the following discussion of Goodman's riddle of induction:

> To get back to the emeralds, why do we expect the next one to be green rather than grue? The intuitive answer lies in similarity, however subjective. Two green emeralds are more similar than two grue ones would be if only one of the grue ones were green. Green things, or at least green emeralds, are a kind. A projectible predicate is one that is true of all and only the things of a kind. What makes Goodman's example a puzzle, however, is the dubious scientific standing of a general notion of similarity, or of kind.[28]

Quine then establishes that the correlative notions of similarity and kind cannot be defined by logic, set theory or comparative similarity. In spite of the advances in logic in the century which separates them, Mill's dictum of logic – that classes can be differentiated based on any

[26] Quine, "Speaking of Objects", p. 20.
[27] Quine, *Word and Object*, p. 253.
[28] Quine, "Natural Kinds", in *Ontological Relativity and Other Essays*, p. 116.

distinction – remains true. "Kinds can be seen as sets, determined by their members. It is just that not all sets are kinds."[29]

In order to distinguish natural kinds – those which are projectible – from ordinary classes, Quine postulates a "cosmic similarity concept" and concludes that this concept is unscientific.[30] Summing up the essay to this point, Quine says,

> We have noticed that the notion of kind, or similarity, is crucially relevant to the notion of disposition, to the subjunctive conditional, and to singular causal statements. From a scientific point of view these are a pretty disreputable lot. The notion of kind, or similarity, is equally disreputable. Yet some such notion, some similarity sense was seen to be crucial to all learning, and central in particular to the processes of inductive generalization and prediction which are the very life of science. It appears that science is rotten to the core.[31]

Quine is, of course, trying to jest. He says that, given the enormous instrumental success of science, "rot" is not the best model for science. "A better model is human progress."[32] With the advance of science, Quine believes that natural kinds have become respectable in some areas, as have the similarity concepts needed to pick them out. When science has advanced to the point where it can explain causal structures and thus explain disposition statements, scientific similarity concepts have been developed, and the natural kinds can be picked out.

For Quine, progress in science allows us to remove all subjective aspects of classification – a remnant of our animal origin – and to ground our scientific theories in an objective notion of kinds. A few eddies in our conceptual field are thus solidified into the ultimate structures of reality – which Quine said were the business of scientists to determine – as belief advances from "unreason to science."[33]

III. *What are Natural Kinds?*

So far I have not attempted to define "natural kinds", and at this point it is easy to see why. Quine not only provides no definition, he shows why a definition is impossible. Mill comes closer to providing a definition in

[29] *Ibid.*, p. 118. For those not convinced by Quine's arguments against modal logic, an argument that "natural kinds" can't be defined in terms of modal logic is given by Paul Teller, "Essential Properties: Some Problems and Conjectures," *Journal of Philosophy*, 72 (1975), pp. 233–41.
[30] Quine, "Natural Kinds," p. 136.
[31] *Ibid.*, p. 133.
[32] *Ibid.*, p. 133. Quine's appeal to progress is surprising in its analytic context. For an explanation of why positivism relies on a philosophy of history, see Jurgen Habermas, *Knowledge and Human Interests* (Boston: Beacon Press, 1971), pp. 67–90.
[33] Quine, "Natural Kinds", p. 138.

terms of the large number of properties shared by the individuals which make up the kind. But Mill never applies this definition very precisely, and more importantly, he qualifies it with elements which are by no means clearly compatible with it. For these reasons, Mill and Quine describe the concept of "natural kinds" but do not define it.

Both Mill's and Quine's descriptions of "natural kinds" contain the five elements set forth below. Any one of these elements, it might be claimed, is merely accidental and in no way essential to the concept. The fact that each of these elements is found in both Mill's and Quine's descriptions strongly suggests that each is an important aspect of the concept. Further, with one exception, these five elements exhaust the descriptions offered by Mill and Quine of natural kinds.[34]

(1) *Classification according to natural kinds is the most useful way to classify objects.* The purpose of classification, according to Mill, is to "give us the greatest command over our knowledge already acquired, and lead most directly to the acquisition of more."[35] As noted earlier, Mill takes as the most distinctive aspect of classification according to natural kind the fact that such classification allows us to discover large, perhaps inexhaustible, numbers of similarities among the objects so classified. Similarly, Quine appeals to the fact that science "reveals hidden mysteries, predicts successfully, and works technological wonders" when he reaches the critical place where the impossibility of defining "natural kinds" becomes clear.[36] As noted earlier, the natural kinds become clear, according to Quine, when the understanding of causal structures becomes clear enough to allow predictive success.

(2) *Natural kinds occur on many different levels.* For Mill, some natural kinds include others to which they relate as genus to species.[37] Mill thus distinguishes between derivative and ultimate uniformities of coexistence, derivative regularities being those in which the properties of objects of a natural kind are resolvable into the properties of the objects' elements. Even the kinds which are thus derivative remain natural kinds.[38] Quine terms this aspect of natural kinds the "superficiality" aspect of natural kinds, in a "good sense" of "superficiality".[39] The similarity notions of different sciences thus qualify as natural kinds – Quine mentions chemistry and zoology – even if they are not the basic kinds of particle physics.

[34] Mill's notion that there are "deep chasms" or "impassible barriers" separating natural kinds has no correlate in Quine's discussion. Mill, *System*, (Bk I, ch. 7, s 4) (vol. 1, p. 139) and (Bk IV, ch. 7, s 3) (vol. 2, p. 280).
[35] Mill, *System* (Bk IV, ch. 7, s 1) (vol. 2, p. 270).
[36] Quine, "Natural Kinds", p. 133.
[37] Mill, *System* (Bk IV, ch. 7, s 1) (vol. 1, pp. 140–42).
[38] *Ibid.* (Bk III, ch. 22 s 3) (vol. 2, pp. 115–16).
[39] Quine, "Natural Kinds", p. 136.

(3) *The classifications of natural kinds are independent of purpose.* The instrumental usefulness (1) of natural kinds is not sufficient to set them off from all other classes, since these may be useful as well. Mill tells us that natural kinds are those discovered "when we are studying objects not for any special, practical end, but for the sake of extending our knowledge of the whole of their properties and relations . . ."[40] Quine echoes this point when he says that the development of better similarity standards in science "is a development away from the immediate, subjective, animal sense of similarity to the remoter objectivity of a similarity determined by scientific hypotheses and posits and constructs."[41]

(4) *Natural kinds represent a value judgment.* Mill says that "the classification of objects should follow those of their properties which indicate not only the most numerous but also the most important peculiarities."[42] Quine, after discussing the relative unimportance of color for inductive success, refers to natural kinds as the "more significant regularities."[43]

(5) *Classification according to natural kind relies on a personification of nature.* Natural kinds are those kinds of objects, according to Mill, which are classed according to those attributes "which fill, as it were, the largest space in their existence and would most impress the attention of a spectator who knew all of their properties but was not specially interested in any."[44] Quine's image is almost precisely the same. After discussing how similar learning processes can explain the similarity in different persons' similarity concepts, which Quine calls "quality spaces," Quine says:

> To trust induction as a way of access to the truths of nature, on the other hand, is to suppose, more nearly, that our quality space matches that of the cosmos.[45]

IV. Analysis

A. The Gap in the Description of Natural Kinds

The five aspects of natural kinds seem to involve two distinct principles. (1) and (2) involve an appeal to the instrumental success of science; (3)–(5) describe a privileged epistemological position. "Natural kinds", as a privileged ontological category, mediates between these two principles.

In (1), we saw that Mill and Quine appeal to the instrumental success

[40] Mill, *System* (Bk IV, ch. 7, s 2) (vol. 2, p. 275).
[41] Quine, "Natural Kinds", p. 133.
[42] Mill, *System* (Bk IV, ch. 7, s 2) (vol. 2, p. 274).
[43] Quine, "Natural Kinds", p. 128.
[44] Mill, *System* (Bk IV, ch. 7, s 2) (vol. 2, p. 275).
[45] Quine, "Natural Kinds", p. 125.

of science as an argument for privileging scientific classification. Neither makes the argument in a rigorous way; the privileged position of science is the fundamental principle for each, and it is too obvious to them to require serious grounding. (2) stems from the fact that science has been successful at different levels, and thus follows from (1).

The interrelation of (3), (4) and (5) is explicit in Mill's *System*. All three are found in the same passage, a passage in which Mill qualifies his description of natural kinds, previously limited to (1). He says that classification according to kind must be made not only on the basis of the sheer number of properties shared but also according to their most "important" attributes. He then uses (3) and (5) as a means of explicating the meaning of "importance" in (4). Quine does not explicitly link the three together, but he uses them for the same purposes. So that "importance" is not merely "importance for science," and so that scientific truth is not merely pragmatically defined, Quine relies on (3)–(5).

The unity of (3)–(5) arises because they define a privileged epistemological position, one which correlates with an absolute notion of importance. As we saw in the earlier section, a privileging of science grounds the philosophies of Mill and Quine. Now we can see more clearly in what this privileging consists – it is the superior epistemological position of (3)–(5), a position which confers a privileged ontological status to scientific kinds.

We have now seen what the *privileging* of science means for Mill and Quine. But what does "science" mean for them? For Mill, the univocity of the concept is a function of the unity of scientific method – the setting out of which is the purpose of the *System of Logic*. Mill takes physics and chemistry as paradigm examples of scientific success, although biology is more than respectable, at least with respect to classification. Quine's view of science is roughly the same although his privileging of physics is far more extreme than Mill's. Quine does not deal at length with the methodology of science, but his belief in the univocity of "science" can be seen in the privileged position he gives to the term.

This unity attributed to science is, to say the least, problematic. Two problems immediately present themselves. First, scientists in any given field disagree on many points at any given time, including questions involving fundamentals.[46] Second, and more relevant here, is the fact that science consists of many different fields. Aren't paleontology and linguistics sciences? And as Rorty points out, if linguistics is a science, then to be consistent, Quine should consider meanings ontologically legitimate.[47]

[46] Even in physics. See Stephen Hawking's discussion of singularities in *A Brief History of Time* (New York: Bantam, 1988).

[47] Rorty, "Indeterminacy of Translation and of Truth", *Synthese* 23 (1972), p. 452.

This problem of the unity of science is especially glaring in Quine's later work. In his earlier articles, especially "Two Dogmas," the continuity of science with all knowledge – such as geography and history – is stressed.[48] This point is to some extent retained throughout Quine's writings in his claim that the method of science is an extension of common sense. But in the essay on natural kinds, as we saw, science is sharply contrasted to common sense. In that essay, common sense, with its reliance on "unimportant" properties of objects, has become "unreason".

The problem results from the tension between Quine's holism and his physicalism. Because his physicalism is pre-eminent in his concept of natural kinds, he must exclude from the status of "science" many of the sciences, and is left with an inability to differentiate between the relative epistemological positions of the "real" and the "immature" sciences. How we have advanced from unreason to science is an open question in Quine's work. If we recall that it is the privileged concept of science which creates the general problem which leads Quine (and Mill) to introduce "natural kinds" into their systems, then it would seem that the problem is written into the concept of natural kinds in characteristics (3)–(5), rather than solved by it. In the next section I will look at some arguments which suggest that the problems cannot be legitimately solved through the use of "natural kinds".

B. Natural Kinds and Scientific Realism

Previously, I noted the similarity between some of the problems involving natural kinds and the debate over scientific realism. In this section I'd like to draw out this analogy a bit more and then to appropriate some of the arguments which have been made in that debate to support my claim that the concept of natural kinds cannot legitimately play the role for which it is used by Quine and Mill.

We saw at work in the first two sections of this paper a double ontological problematic. The first (general) problem concerned objective existence generally and arose in different ways. For Mill, the question is whether objects exist independently of experience; for Quine, the problem is whether objects exist independently of theory. The second (specific) problem concerned the superior ontological status of natural kinds relative to other classes. The two problems overlap, although as we saw, only Quine explicitly saw this and linked them together.

[48] Quine, "Two Dogmas of Empiricism", in *From a Logical Point of View*, 2d edn. (Cambridge University Press, 1980), pp. 42–46; see also "On What There Is", in *From a Logical Point of View*, pp. 17–19. Even in "Two Dogmas" Quine considers the laws of physics, mathematics and logic "profound" and matters of history and geography "casual", foreshadowing his later position. "Two Dogmas", p. 42.

This double ontological problematic also occurs in the debate over scientific realism. Sometimes that debate is described as concerning whether the entities postulated by scientific theories exist *at all*;[49] sometimes the debate is described as concerning the superior ontological status of scientific entities relative to ordinary objects.[50] Nor should we be surprised by this parallel given the interdependence of the positing of objects and the concepts of similarity and difference pointed out by Quine and discussed earlier.

Arguments against the concept of the privileged epistemological position described in (3)–(5) have been given by Putnam and Rorty in the realism debate.[51] I don't have space to review their arguments here, but the idea of a privileged epistemological position seems even less plausible in the context of natural kinds. Only a conscious entity can make judgments concerning the relative importance of similarities and differences. The metaphor of (5) simultaneously points to the truth of this fact and the inability of Mill and Quine to get around it.

Some philosophers in the realism debate attempt to use the notion of approximate truth to make sense of the purported superior ontological status of scientific entities.[52] Successive scientific theories are closer approximations to the truth on this view. This idea is suggested by Quine's belief in the truths of physics as the "literal truth." But this conception of approximate truth is implausible. Historical statements (e.g., "George Washington was the first President of the U.S.") can be as literally true as any scientific theory.

The notion of approximate truth relies on one theory being more like "the truth" than another theory. If one presupposes a privileged epistemological position from which to judge the importance of the similarities and differences between *one* theory and the truth, then the argument has become circular. Otherwise, as Richard Miller has shown, any conception of the "approximate truth" of a theory will be relative to the other theory against which one measures it, and thus to one's particular, practical interests.[53] There is no way to tell whether a theory is approximately true by comparing it to the truth, since the differences may be more important than the similarities. Thus any non-circular

[49] Van Fraasen, *The Scientific Image* (Oxford: Clarendon Press, 1980); Fine, "The Natural Ontological Attitude," in *The Shaky Game* (Chicago: University of Chicago Press, 1986), pp. 112–35.

[50] Smart, *Philosophy and Scientific Realism*. See text *supra*, at fn. 19.

[51] Putnam, *The Many Faces of Realism* (LaSalle: Open Court, 1987), and *Reason, Truth and History* (Cambridge: Cambridge University Press, 1981); Rorty, *Philosophy and the Mirror of Nature* (Oxford: Basil Blackwell, 1980), and "Introduction", *Consequences of Pragmatism* (Minneapolis: University of Minnesota Press, 1982).

[52] Boyd, "The Current Status of Scientific Realism", in J. Leplin, ed., *Scientific Realism* (Berkeley: University of California Press, 1984), pp. 41–82.

[53] Miller, *Fact and Method* (Princeton: Princeton University Press, 1987), pp. 405–11.

notion of approximate truth would violate aspect (3) of natural kinds.[54]

Finally, some philosophers in the realism debate attempt to extrapolate directly from the instrumental success of science (1) to the existence of the privileged epistemological position (3)–(5). Boyd has put forward one version of this position, arguing that the best explanation of the success of science is the real existence of the posited scientific entities.[55] But Boyd assumes that there are only two possible explanations for the success of science: the existence or non-existence of the postulated entities. But as Arthur Fine has pointed out, if one does not circularly presuppose a privileged ontological position which defines "truth", there is always a third explanation – that truth is instrumentally defined.[56] Fine argues that the instrumentalist conception of truth is always a better explanation than the realist conception because it always fits the facts (i.e., the instrumental success) better than the realist explanation. Thus, instrumental success of science will only take one as far as instrumentalism, and never to a privileged ontological status for the existence of the entities posited.

In the context of the discussion of natural kinds, Fine's argument shows that the positing of the privileged ontological status of natural kinds based on the instrumental success of science is illegitimate unless one circularly presupposes the existence of the privileged epistemological position. It appears that the gap which we noticed in the previous section between (1)–(2) and (3)–(5) is actually an unbridgeable chasm.

C. *The Paradox of "Natural Kinds"*

In the previous section we have seen some reasons why the concept of natural kinds fails to fulfill the purposes for which it was introduced. In this section I would like to recast these reasons in another form by raising what I will call the paradox of natural kinds. This paradox arises from the self-referentiality of the concept of natural kinds.

"Natural kinds" is an ontological status conferred on certain classes of objects. In addition, the concept of natural kinds is itself a classificatory concept. The class of "natural kinds" divides classes into two kinds – those which are "natural" and those which are not. Thus, for the concept to be valid, its analysis must apply to itself: "natural kind" must

[54] For other arguments against the use of "approximate truth" as a "truth surrogate", see David Resnick, "Convergent Realism and Approximate Truth," in Hull, Forbes & Okruhlik, eds., *PSA 1992: Proceedings of the 1992 Biennial Meeting of the Philosophy of Science Association*, vol. 1 (East Lansing: Philosophy of Science Assoc., 1992), pp. 421–34.

[55] Boyd, "The Current Status of Scientific Realism" in J. Leplin, ed., *Scientific Realism* (Berkeley: University of California Press, 1984), pp. 41–82.

[56] Fine, "Unnatural Attitudes: Realist and Instrumental Attachments to Science," *Mind*, 95 (1986), pp. 149–79, esp. pp. 154–56.

be a natural kind. The analysis up to this point suggests three reasons why "natural kinds" are not a natural kind.

First, the analysis of the concept of natural kinds above shows that the concept breaks into two discrete concepts: instrumental success and privileged epistemological position. The conceptual break between these two concepts shows that "natural kinds", as it appears in the philosophies of Mill and Quine, is more like the concepts of "grue" and "bleen" than it is like green or blue.

Second, kind terms are supposed to be projectible. Is "natural kinds" in practice projectible? One fact which suggests the contrary is that both Mill and Quine accept biological species as natural kinds. It is now becoming generally accepted that biological species are not natural kinds.[57] Further, neither Mill nor Quine deal with problems such as the following one raised by Ronald de Sousa:

> H_2O is a *chemical* characterization of water, not a *physical* one. Physically it turns out that water is a mixture of several sorts of molecules: ones containing Oxygen-16 and ones containing the isotope Oxygen-18, as well as ones containing isotopes of hydrogen (deuterium or tritium).[58]

Even the paradigm case of water presents structural complexity. Neither Mill nor Quine gives us criteria by which to decide whether the chemical or the physical structure is more important in determining kind.

In fact, neither Mill nor Quine is particularly interested in defending any particular example of a natural kind, and in this they are not alone. Generally the problems involved in any particular example being designated have little effect on those who attempt to explicate the concept. This is a function of the crucial role natural kinds play in upholding the privileged position of science. Mill and Quine (and others) are more committed to the notion that science is a unity which maintains the privileged epistemological position than to the properties of any particular natural kind because, as we saw, this privileging of science is the fundamental tenet of their systems.

This latter point suggests the third reason why "natural kinds" is not itself a natural kind. Natural kinds are supposed to be those kinds which are classified independently of purpose. Yet Mill and Quine introduce "natural kinds" into their systems for a particular purpose – to support a view of science which was threatened by the analytical recalcitrance of

[57] See Hull, "Historical Entities and Historical Narratives," in Hookway, ed., *Minds, Machines and Evolution* (Cambridge: Cambridge University Press, 1984), pp. 17–42; Lakoff, *Women, Fire, and Dangerous Things* (Chicago: University of Chicago Press, 1987), pp. 185–95; Dupre, "Natural Kinds and Biological Taxa", *Philosophical Review*, 90 (1981), pp. 66–90.

[58] De Sousa, "The Natural Shiftiness of Natural Kinds", *Canadian Journal of Philosophy*, 14 (1984), p. 571.

concepts of similarity and difference. To argue that they introduce "natural kinds" into their systems merely to state "how things are" is to beg the question by assuming that stating "how things are" is done from a privileged epistemological position, one that is independent of purpose. If one does not beg the question, then it appears that the concept of natural kinds is brought in as a deus ex machina to save a metaphysical view of science which received emotional grounding, but not analytical support, from the instrumental success of science.

D. To What Do Natural Kinds Owe Their Intuitive Appeal?

At this point we should take the personification of nature found in Mill and Quine in aspect (5) seriously. By seriously, I do not mean that we should attribute its literal meaning to Mill and Quine; it is clearly a metaphor. But it is not *just* a metaphor. It expresses an important aspect of natural kinds and is an essential element of the privileged epistemological position. It also provides a clue to the privileged position of science which plays a foundational role in the philosophies of Mill and Quine.

We saw in our preliminary analysis the critical role played by natural kinds in laws of nature. They are themselves Mill's "uniformities of coexistence", and they supply the requisite similarity concept for causal laws to have the privileged position accorded theme by Mill and Quine. The concepts of natural law and natural kind are interdependent concepts.

Here it is important to recall that, as Joseph Needham has pointed out, modern science was founded on the belief (and *because* of the belief) that the laws of nature were laws that had been literally decreed by God.[59] By the nineteenth century, as belief in God waned, the term "natural law" came to be seen as a metaphor and not literally true. Now, presumably, "natural law" lacks all metaphorical content.[60]

Nietzsche warned against the metaphysical errors which might result from continued use of the metaphor:

> Let us beware of saying that there are laws in nature. There are only necessities: there is nobody who commands, nobody who obeys, nobody who trespasses.[61]

In this same passage, Nietzsche connects the personification with the religious world view. "When will all these shadows of God cease to darken our minds? When will we complete our dedeification of

[59] Needham, "Human Law and Laws of Nature," *The Grand Titration* (Toronto: University of Toronto Press, 1969), pp. 299–331.

[60] *Ibid.*

[61] Nietzsche, *The Gay Science*, trans. Walter Kaufmann (New York: Vintage Books, 1974), sec. 109, p. 168. See also *The Will to Power* (New York: Vintage Books, 1967), sec. 634, and Schacht, *Nietzsche* (London: Routledge & Kegan Paul, 1983), pp. 172–77.

nature?"[62] The concept of natural kinds, relying as it does on the personification of nature and the privileged epistemological position, is perhaps a vestige of the deification of nature which remains in the systems of Mill and Quine.

The fruitfulness of this analysis can be seen if one turns to Kripke's theory of naming and natural kinds.[63] Concerning Kripke's theory of reference, Stephen Schwartz says,

> Probably the most important contribution the new theory [of reference] makes is to increase our understanding of natural kinds and the terms that purport to refer to them. Both Quine and Copi express views about natural kinds that receive tremendous support from the new theory.[64]

Kripke's theory of reference treats natural kind terms as rigid designators – in other words, as proper names.[65] No wonder it appears that Kripke's theory supports Quine's view on natural kinds; Kripke's view merely extends the metaphor of the personification of nature. Natural kind terms are those which the omniscient spectator gives as names to the kinds which are most important in the cosmos' own quality space. Treating natural kind terms as proper names merely fills in the theological conceptual scheme taken over from religion. Rather than reading Kripke to increase our understanding of natural kinds, my analysis suggests that we should read Mill and Quine – if we read them as I do in this essay – to understand the metaphysical shortcomings of Kripke's theory.

The point I am making is not quite the same as that made by Ronald de Sousa at the end of his criticism of Kripke's views on natural kinds. De Sousa says that Kripke's view of natural kinds "is just nostalgia for the intellectual abandon of theology."[66] It is not *just* nostalgia; the concept of natural kinds has a close conceptual link with the theological view. We have seen how this link is a part of the concept of natural kinds in terms of the privileged epistemological position accorded to science by Mill and Quine, and how this privileged position of sciences forms the basis of the philosophical systems of these two philosophers. We have also seen why the concept of natural kinds cannot legitimately perform the function which it is assigned in upholding this privileged view of science.

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[62] Nietzsche, *The Gay Science*, pp. 168–169.
[63] Kripke, *Naming and Necessity*, p. 127.
[64] Schwartz, "Preface" to Schwartz, ed., *Naming, Necessity and Natural Kinds* (Ithaca: Cornell University Press, 1977), p. 10.
[65] Kripke, *Naming and Necessity*, p. 127.
[66] De Sousa, "The Natural Shiftiness of Natural Kinds", p. 580.