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JOHN STUART MILL ON TAXONOMY AND NATURAL KINDS

P. D. Magnus

The accepted narrative treats John Stuart Mill's Kinds as the historical prototype for our natural kinds, but Mill actually employs two separate notions: Kinds and natural groups. Considering these, along with the accounts of Mill's nineteenth-century interlocutors, forces us to recognize two distinct questions. First, what marks a natural kind as worthy of inclusion in taxonomy? Second, what exists in the world that makes a category meet that criterion? Mill's two notions offer separate answers to the two questions: natural groups for taxonomy and Kinds for ontology. This distinction is ignored in many contemporary debates about natural kinds and is obscured by the standard narrative that treats our natural kinds just as a development of Mill's Kinds.

This article concerns debates about classification in the nineteenth century between William Whewell (sec. 2), John Stuart Mill (sec. 3), and some lesser known critics (sec. 4). I aim to show that Mill provides separate answers to two important questions in the neighborhood of what we would now call natural kinds: the *taxonomy* question, about what distinguishes categories that are natural kinds from categories that are not, and the *ontology* question, about what there is in the world that sustains that difference. Mill distinguishes *natural groups* as an answer to the taxonomy question and *Kinds* as an answer to the ontology question for some—but importantly not all—natural groups. This overturns the usual story, according to which Mill's Kinds map neatly onto our natural kinds, and it also reveals a distinction we would do well to remember.

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1. The Standard Story

The standard narrative, promulgated by Ian Hacking (1991), is that the philosophical conception of *natural kinds* descends from John Stuart Mill's notion of *Kinds* (with a capital 'K'). According to Hacking, this was a central piece of a promising research program in the mid-nineteenth century that has since degenerated. He argues that the concept is no longer fruitful, and so natural kinds should be abandoned. In Hacking's metaphor, Mill's contribution was the "rosy dawn" for natural kinds, current debates are a "scholastic twilight," and the day for thinking in terms of natural kinds has come to an end (Hacking 2007).

Hacking's narrative is widely accepted. For example, John Dupré gestures to the history of natural kinds by writing, "Ian Hacking reminded us that the contemporary tradition of natural kinds arose . . . in the nineteenth century" (2011, vii). The story has become sufficiently commonplace that writers even attribute the phrase 'natural kind' to Mill; for example, Alexander Bird and Emma Tobin write, "J. S. Mill . . . was one of the first to use the phrase 'natural kind'" (2009). Mill never used the phrase, however, even though his critics use the phrase consistently later in the nineteenth century.[1]

So the narrative involves two claims of continuity: first, that recent debates are continuations of ones that began with Mill and, second, that the term of Mill's system that maps onto our 'natural kind' is his 'Kind'. Both these claims are mistaken, but my focus here is on the second.[2] Mill's terms do not map one-to-one onto ours. In addition to Kinds, Mill has an account of *natural groups*. Mill's natural groups and Kinds answer two different questions about what we call natural kinds.[3]

The first question is about what, as a matter of taxonomy, distinguishes natural kinds from arbitrary categories: What criteria must a category satisfy to count as a natural kind? This is not particularly an epistemic matter, because we might not and perhaps could never be in a position to apply the criteria. However, it is metaphysically somewhat thin. An answer to it specifies what a

1. It is unclear exactly when Mill's Kinds came to be called 'natural kinds' as a matter of jargon. Hacking (1991) attributes the phrase 'natural kinds' to John Venn, and the attribution is part of the standard narrative; e.g., it is repeated uncritically by Laura Snyder (2006, 157 n. 2). Although Venn uses the words 'natural' and 'kind' together, it is unclear that Venn was responsible for 'natural kind' as a fixed phrase; see Khalidi (2013, 3) and Magnus (2014b, 2–3).

2. In prior work (Magnus 2014b), I debunk the first claim of continuity by showing that the recent vogue for *natural kinds* is not a continuation of nineteenth-century debates that used the same phrase.

3. Hawley and Bird (2011) call these the 'naturalness' and 'kindhood' questions, respectively, and point out that the distinction is not typically made.

category must do in order to fulfill the natural kind role, but it need not specify the fundamental ontology of such categories.

The second question concerns ontology: What kind of being has a natural kind got? Answers might appeal to causal structure, universals, or primitive similarity. Call these the *taxonomy* and *ontology* question, respectively.[4]

The two questions are conflated in many recent discussions of natural kinds. If we answer the taxonomy question by saying that natural kinds are those that carve nature at its joints, then we answer the ontology question in terms of nature's joints. We discharge both questions at once, and so it would be gratuitous to distinguish them. The same elision occurs in more sophisticated accounts. For David Lewis and followers, natural properties are "an élite minority of special properties" (Lewis 1983, 346), and that eliteness is a matter of fundamental metaphysics. A category is a natural kind if and only if it corresponds to a natural property, providing taxonomy and ontology altogether. Similar elision follows for any essentialist account in which natural kinds stand in a one-to-one relationship with essences.

My central claim here is that Mill gives the two questions importantly different answers. As a matter of history, Mill's categories cannot be neatly mapped onto contemporary terms. At the end, I briefly suggest how we might profit by minding the distinction that Mill made in the nineteenth century but that was lost in the twentieth.

2. Whewell

This section briefly considers some features of William Whewell's account of classification. As we will see, Mill explicitly engages Whewell, and the contrast between their views highlights Mill's innovation.[5]

Whewell claims that the aim of taxonomy is to provide a natural classification, to divide things into *kinds* or—as he more often writes—*natural classes*. These are the categories that will support systematic induction. He writes that

4. Even though the labels are mine, rather than Mill's, it is clear that natural groups and Kinds play two different roles in his system. So (I argue) it is not anachronistic to see them as answers to different questions.

5. Mill explicitly acknowledges Whewell as providing him the crucial clue to Kinds. Mill had stopped working on the *Logic* for 5 years, because he was unable to make sense of induction. But Whewell's 1837 *History of the Inductive Sciences* provided Mill with the comprehensive survey of physical science that he needed to move ahead (Mill 1873/2003). Although Mill found much to disagree with in Whewell's philosophy, there are considerable similarities in their accounts of natural classification. Mill quotes Whewell approvingly on the topic (Mill 1874, 488) and, where he disagrees, still quotes Whewell at some length (501–2). For more on the relation between Whewell and Mill on classification, see Snyder (2006) and McOuat (2009).

"since the truths we are to attend to are scientific truths, governed by precise and homogeneous relations, we must not found our scientific Classification on casual, indefinite, and unconnected considerations" (Whewell 1858, 115).

Importantly, for Whewell, natural classes will support scientific inference because they reflect the underlying construction of the world. So taxonomy aims not merely to organize things for science but also to discover the world's construction. Discussing mineralogy, Whewell writes, "The science which we require is a complete and consistent classified system of all inorganic bodies. For chemistry proceeds upon the principle that the constitution of a body invariably determines its properties; and consequently, its kind" (1837, 189). Discussing botany, he writes similarly, "No person, however, who wishes to know botany as a science, that is, as a body of general truths, can be content with making names his ultimate object. Such a person will be constantly and irresistibly led on to attempt to catch sight of the natural arrangement of plants, even before he discovers, as he will discover by pursuing such a course of study, that the knowledge of the natural arrangement is the knowledge of the essential construction and vital mechanism of plants" (319–20). So what makes kinds natural for Whewell is ultimately the "constitution" and "construction" of things. The taxonomy and ontology questions are answered together.

3. Mill

Initially in book 1 of the *Logic*, Mill distinguishes Kinds (with a capital K) from arbitrary classes. A class can be indicated by any property or list of properties. For example, the class of *white* things corresponds to the property of being white, and the class of *red round* things corresponds to the properties of being red and of being round. Because there is a class corresponding to any property or list of properties, no such class is more natural than any other. White things have nothing in common beyond their whiteness and its necessary consequences (e.g., that all white things are nontransparent). In contrast, Kinds are classes of things that share indefinitely many properties. There are some diagnostic criteria that we associate with a chemical kind or biological species, but the members share many properties apart from those that we use to mark the Kind. On Mill's view, a Kind "is distinguished from all other classes by an indeterminate multitude of properties not derivable from one another" (1874, 99).

For Mill, Kinds are crucial for inductive generalization. Suppose we subject a sample of phosphorus to an experimental condition in the lab and we infer that other samples of phosphorus will react similarly. This relies on the other phosphorus, the stuff outside the lab, sharing enough properties with our sam-

ple that the condition happening to them counts as an instance of the same cause. We identify other samples of phosphorus merely by diagnostic criteria, so how can we rely on distinct bits of phosphorus sharing further properties beyond those used to diagnose them as phosphorus? We can do so, Mill would say, because phosphorus is a Kind. The diagnostic criteria identify samples as members of the Kind, assuring that they share indefinitely many other features.

In this example, the fact that all lumps of phosphorus are the same Kind is crucial to a causal inference about what things like this will do. Yet, because of Mill's conception of causation, Kinds cannot themselves be held together by causes. Mill thinks of causal inference as guided by the *law of causation*, which states that every event is preceded by some circumstances that necessitate it: when those circumstances occur, the effect invariably follows (1874, 410). This means that causes are regularities that obtain between prior and subsequent events.

Kinds are also regularities, but they obtain between different things at the same time (e.g., all the samples of phosphorus) rather than between events at different times (e.g., heating of phosphorus and subsequent ignitions). For a Kind, Mill writes, the shared properties are an "invariable co-existent, in the same manner as an event must have an invariable antecedent" (1874, 410). Kinds are structures of noncausal regularities.

Laura Snyder describes Mill as "*denying* that kinds are natural" and writes that Mill's Kinds "are not real kinds." What she means by this is that, for Mill, there is no underlying mechanism "causally responsible for the production of . . . shared superficial qualities" (Snyder 2006, 164). She is correct that Mill's Kinds do not have a real essence in Locke's sense, that there is no deeper and more fundamental process that causally produces the regularity observed in members of the Kind. Unlike Whewell, Mill refuses to talk about the constitution or essential construction of things. However, Mill's Kinds are not inquiry dependent or merely nominal.[6] Each corresponds to a law of nature, a law of coexistence that has the same reality as diachronic causal laws. They are defined in terms of how things are, rather than in terms of actual or possible science.

In book 4, Mill takes up "operations subsidiary to induction" such as observation, abstraction, naming, and classification. In discussing naming, Mill explicitly invokes the conception of Kinds that he developed in book 1.[7] In

6. Mill writes that "there are in nature distinctions of Kind; distinctions not consisting in a given number of definite properties *plus* the effects which follow from those properties, but running through the whole nature . . . of the things so distinguished" (1874, 502).

7. Mill calls a system of names for Kinds 'nomenclature', in contrast to mere 'terminology'. Lavoisier's new chemistry and Linnaeus's system of biology, he writes, provided nomenclature. The taxonomic innovations allowed inquiry to move beyond parochial concerns, to chart Kinds rather than mere cat-

discussing classification, Mill makes a different distinction between natural groups and merely technical or artificial ones. He says some natural groups will be Kinds but that not all of them will be. Natural groups—in contrast to Kinds—are characterized by their function in scientific inquiry.

Properly scientific classification, in order to be as general as possible, should reflect the causal structure of things. It is best "when the objects are formed into groups respecting which a greater number of general propositions can be made. . . . The properties, therefore, according to which objects are classified should, if possible, be those which are causes of many other properties" (Mill 1874, 499). He distinguishes properly natural classification from artificial classification: "A classification thus formed is properly scientific or philosophical, and is commonly called a Natural, in contradistinction to Technical or Artificial, classification or arrangement" (499). The categories that figure in a natural classification he calls *natural groups*. Mill uses the adjective 'natural' here to discuss natural classification and natural groups, but he never uses it to modify Kinds. The phrase 'natural kind' was not part of his vocabulary.

Mill insists that science will need names for more than just Kinds. He does think that Kinds should appear in a proper scientific classification, and so Kinds qualify as natural groups—but he insists that a complete classification will require more categories than there are Kinds. He writes, "The distinctions between Kinds are not numerous enough to make up the whole of classification" (Mill 1874, 503).

The natural groups that are not Kinds distinguish the important qualities of things. This is subject to the worry that importance depends on human concerns. Mill recognizes this worry, acknowledging that farmers divide plants differently than botanists and that geologists divide fossils differently than zoologists (1874, 500). If this were the end of it, then natural groups (apart from those that correspond to Kinds) would not be real features of the world. They would be determined by our sense of what is important, shaped by our projects and interests. Different concerns could make for different taxa.

Mill avoids this result by saying that the natural groups are those that would figure in the science of a disinterested inquirer. He writes that "when we are studying objects not for any special practical end, but for the sake of extending

egories of interest. Having a nomenclature is the mark scientific progress, Mill thinks, and in other fields a lack of nomenclature "is now the principle cause which retards the progress of the science" (1874, 492). Mill defines 'nomenclature' explicitly by reference to Kinds, as "the collection of names of all the Kinds with which any branch of knowledge is conversant" (492). He takes this distinction from Whewell. Mill writes, "The words Nomenclature and Terminology are employed by most authors almost indiscriminately; Dr. Whewell being, as far as I am aware, the first writer who has regularly assigned to the two words different meanings" (492).

our knowledge of the whole of their properties and relations, we must consider as the most important attributes those which . . . would most impress the attention of a spectator who knew all their properties but was not especially interested in any. Classes formed on this principle may be called, in a more emphatic manner than any others, natural groups" (Mill 1874, 500–501). Natural groups would be identified by an ideal, neutral observer. So they are objective in the sense of not being dependent on any particular subjective standpoint.

Mill's characterization of natural groups as the categories of an intersubjectively warranted taxonomy diverges from his characterization of Kinds as determined by objective laws of coexistence. The two characterizations do not pick out the same categories, and their rationale is importantly different. Natural groups are defined in terms of possible or ideal inquiry, whereas Kinds are defined just in terms of how the world is.

By contrast, although Whewell provides characterizations of Natural Classes both as objects of possible inquiry and as features of the world, for him the difference is just one of exposition. As we saw, Whewell thought that ideal scientific inquiry should divide things by their essential constitutions.

To put the difference in our terms, we might approach natural kinds by way of taxonomy or by way of ontology. For Whewell, this makes no difference, and any legitimate scientific categories can be approached from either direction. For Mill, the two do not perfectly coincide. Beginning with taxonomy, we get a wealth of natural groups. Beginning with ontology, we get just the Kinds.

4. Mill's Critics

In an 1887 attack on Mill's "doctrine of natural kinds," M. H. Towry enumerates four objections to Mill's account.[8] For our purposes, we can treat them as raising two broader worries.[9]

One worry is epistemic and semantic. According to Mill, we frame an arbitrary class by stipulating properties that hold of its members. The class of *white*

8. Although Franklin and Franklin (whom I discuss below) address their reply to "Mr. Towry," it seems likely that the author was Mary Helen Towry White. She published on a range of topics—from the history of Scottish clans to stories of famous children—and was credited under different variations of her name. My inability to decisively confirm that this is the same Towry is an example of how women who contributed to philosophical debates are made to disappear from our retelling of them.

9. Towry begins with a fair and concise summary of Mill's view: "Mill says that a Kind is one of those classes which are distinguished from all others, not by one or a few definite properties, but by an unknown multitude of them; the combination of properties on which the class is grounded being a mere index to an indefinite number of other distinctive attributes, and instances Plant, Animal, Sulphur, Horse, &c., as Kinds" (1887, 435).

things is specified just by the property *white*. Towry accepts this and argues that the same is true for all classes and kinds. She writes: "Nature has in reality neither the class White Things nor the class Horse. We made both. . . . There are a quantity of things in the universe, alike in point of being white; there are a quantity of things alike in points *a b c*, &c. = Horses. The properties are not found by the Kind, but the Kinds are formed by the properties" (Towry 1887, 436). So, Towry writes, "one class is no whit less a merely intellectual creation than the other" (436).

Another worry is metaphysical. Mill posits a difference in kind between Kinds and mere classes, but Towry objects that there is at most a difference in degree. There are anomalies and intermediate cases. Towry invokes Whewell, writing that "Whewell's type-theory seems to me nearer the truth than Mill's impassable barriers, because it recognizes infinite gradations and interminglings" (1887, 438). But Towry dissents from both Whewell and Mill by insisting that Kinds are just nominal classes. She writes, "When we advance beyond Singulars to many individuals or substances forming a 'natural Kind,' we have made an arbitrary and conventional combination" (438). That is to say, the Kind does not correspond to anything in nature.

I think that Mill can fairly be seen to anticipate the first worry. He recognizes that the semantics for Kinds must be different from the semantics for stipulated groups, and so he holds that the term for a Kind has a different connotation than the term for an arbitrary class. The term for an arbitrary class consists merely of some stipulated attributes. The term for a Kind consists of some attributes that distinguish the class along with the commitment to that class's being a Kind.[10]

I think that Mill also has a ready response to Towry's second worry, because he only introduces Kinds as a way to understand how inductive generalization is possible. If Towry's worry were legitimate, then there would be no difference in the world between real groups (like phosphorus) and an arbitrarily concatenated group (like the union of phosphorus and sandwiches)—but then there would be no more ground to generalize from samples of phosphorus than from samples of phosphorus-or-sandwiches. This point is especially clear in hind-

10. Regarding terms for Kinds, Mill writes, "besides connoting certain attributes, they also connote that those attributes are distinctive of a Kind" (1874, 493). This is an explicit point of contrast with Whewell. On Whewell's account, we identify an exemplary individual as the type, and the Kind is the class of things that are sufficiently similar to the type specimen. On Mill's account, we identify a list of properties that are diagnostic of the Kind, and the Kind is the class of things that share the diagnostic properties and indefinitely many more. As Whewell would have it, we read the diagnostic properties off of a designated type specimen. Mill allows that we can imagine a type specimen, but he thinks that we do so by imagining a thing with all of the diagnostic properties (501–5). Schwartz (2013) provides an extended discussion of Mill's semantics for Kind terms.

sight, because we are familiar with Goodman's new riddle of induction. Even though philosophers may disagree about what distinguishes 'emerald' from 'emerose' (where 'emerose' picks out all the observed emeralds and all the unobserved roses), it is clear that something does. To put the point in terms that were available to Mill's nineteenth-century critics: making sense of science requires that there be some distinction between arbitrary and nonarbitrary classes. Insofar as Mill is aiming at that distinction, there is something right about his notion of Kinds.[11]

There are two published replies to Towry.[12] In the second of these, Fabian Franklin and Christine Ladd Franklin concede to Towry that there may be no fundamental difference between the mental operations by which we come to think of arbitrary classes and natural kinds but insist that there is nonetheless an important difference between them in the world. They begin, "The doctrine of Kinds, as laid down by Mill, does not seem to be tenable . . . yet there is, we think, a real difference between such classes and mere arbitrary classes; and the nature of that difference may be stated very nearly as Mill stated it" (Franklin and Franklin 1888, 83). Although they accept that any category is "an intellectual creation," they maintain that it could not be "a *merely* intellectual creation" (84).

Mill's mistake, the Franklins suggest, was to suppose that what holds a Kind together is a fundamental noncausal regularity that cannot be explained. Rather, they suggest that the connection can be explained by either a causal regularity or a historical connection between different members of the Kind. They write: "When a certain set of qualities entails the presence of others, and the supposition cannot be entertained that there is a causal connexion of a general nature between them, the conclusion is inevitable . . . that there is *a certain community of origin* among the objects possessing that set of qualities" (Franklin and Franklin 1888, 84). By 'community of origin' they mean some common cause; that is, that members of a natural kind have a shared history that explains their shared features.

Common cause provides a way to explain regularity, without it being the unconditional result of causal or noncausal laws. Because of their common his-

11. One might worry that my reading of Mill describes Kinds as independent of inquiry, but the reply to Towry defends Kinds by appealing to the possibility of inquiry. Such a worry is easily defused: although making sense of inquiry provides Mill's reason for positing Kinds, Kinds are not defined in terms of inquiry.

12. In the first of these, Monck (1887) insists that taxonomy is not a subject that should be addressed by a logician at all, since it concerns knowledge of what the world is actually like. This objection is oddly hidebound. It is obvious in the sections on Kinds and categories that Mill, like Whewell before him, is doing philosophy of science.

tory, the members of such a Kind will share features beyond those that we initially notice or by which we diagnose membership in the Kind; when "we regard the invariable concomitance of certain qualities with certain other marks as proof of a common origin in the objects possessing those marks, there is no reason for setting any limit to the number of ways in which that common origin will be betrayed" (Franklin and Franklin 1888, 85).

A consequence of this proposal is that Mill's exemplary Kinds turn out to be a disparate lot. Biological species are groups of common descent, and so they can be explained by community of origin. Yet chemical kinds do not seem to be. Rather, it seems more likely that chemical regularities are a matter of causal law. Considering the example of sodium, Franklin and Franklin write, "there is not . . . any external evidence that all the sodium . . . in the universe was derived from a common stock; but it seems highly probable that either this is the case or else that all the properties of sodium are deducible by general laws from a few of them . . . [that] the properties of sodium are deductions from its molecular constitution" (1888, 85). The only general thing to say about Kinds is that their unity can be explained either by general laws or by common causes—that is, "either the qualities or the objects have a real connexion with each other" (85).

This furthers the division between taxonomy and ontology that we saw already in Mill's account. For Mill, some but not all natural groups correspond to Kinds in the world. So the characterization of the criteria for what makes a category natural is separate from the metaphysical description of what it is in the world that satisfies those criteria. Franklin and Franklin drive the wedge further, by suggesting that different categories might be realized in the world in fundamentally different ways. Some natural groups, like chemical elements, are unified because members of the kind have a similar composition and so behave similarly according to general, causal laws. Others, like biological species, are unified by sharing a historical source and so behave similarly because of their common cause.

5. Conclusion

If we treat the nineteenth-century discussions as an anticipation of debates about natural kinds in the last 50 years, Mill has two separate notions that might be mapped onto our current term 'natural kind': Kinds and natural groups. As is usual in the history of philosophy, it would be a gross oversimplification to treat this simply as a matter of translation. The fact that there is not one clear counterpart to our term 'natural kind' suggests that, in some sense, Mill was not thinking about natural kinds the way that we do.

We should not pretend that Mill had two entangled notions where we now simply have one. Quite the contrary, we can distinguish the taxonomy and ontology questions about what we call natural kinds. First, what criteria distinguish natural kinds from arbitrary categories? Second, what features of the world make some categories but not others satisfy these criteria?

Failure to mind this distinction can be seen to lead to confusion in recent debates. Establishing this is beyond the scope of this article, but I will point to one suggestive illustration: the idea that natural kinds are homeostatic property clusters (HPCs) is most plausible if we treat it as an answer to the ontology question for many but not all natural kinds. Yet many authors respond to HPC accounts just by providing examples of natural kinds that are not HPCs or of HPCs that are not natural kinds. Those counterexamples are only relevant if we take HPCs as an answer to both questions, to define both what it is to be a natural kind and what a natural kind is in the world.[13]

We should reject the usual historical account, according to which Mill's Kinds matured into our natural kinds. We understand Mill better if we recognize that he was struggling with separate issues and that he introduced several notions to resolve them. To revisit Hacking's metaphor: the scholastic darkness that shadows present discussions of natural kinds may be dissolved not by abandoning natural kinds altogether but by recognizing complexities too often overlooked. We would do well to let a Millian flower bloom.

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13. I discuss this example at greater length in Magnus (2014a).

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