

Taxonomy, ontology, and natural kinds

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Abstract When we ask what natural kinds are, there are two different things we might have in mind. The first, which I'll call the taxonomy question, is what distinguishes a category which is a natural kind from an arbitrary class. The second, which I'll call the ontology question, is what manner of stuff there is that realizes the category. Many philosophers have systematically conflated the two questions. The confusion is exhibited both by essentialists and by philosophers who pose their accounts in terms of similarity. It also leads to misreading philosophers who do make the distinction. Distinguishing the questions allows for a more subtle understanding of both natural kinds and their underlying metaphysics.

Keywords Natural kinds · Causation · Taxonomy · Ontology · John Stuart Mill · Homeostatic property clusters · HPC

1 Two questions

We sometimes want to ask whether a category which appears in a scientific account of the world reflects what the world is like or instead is just an arbitrary representational convention. For example, were astronomers in 2006 responding to the world or just deciding how they would use words when they regimented the use of the word 'planet' in a way that excluded Pluto?

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Questions like this are readily understood as being about particular natural kinds; e.g. does the natural kind *planet* include Pluto or not? Regardless of whether we answer yes, no, or maybe to questions like these, the concept of a natural kind should frame our enquiry and give us some sense of why we would give one answer rather than another.

That is how I use the phrase ‘natural kind’, anyway, and I am unconcerned with other uses of the phrase. It is important to have a concept which can answer such questions, and anyone who reserves the phrase ‘natural kind’ for other purposes still owes us an account of this.

In giving a general account of natural kinds, there are two separate issues which too often are run together. The issues, posed as two distinct questions, are these:

1. *The taxonomy question* What distinguishes a category which is a natural kind from an arbitrary class?
2. *The ontology question* What manner of stuff is that—i.e, what being has it got?

It might be tempting to see the former question as epistemological and the latter as metaphysical, but that would be a mistake. The taxonomy question is not necessarily about our knowledge. Although the answer to it might provide criteria which are readily knowable, it might provide ones which are opaque. Instead, both questions are metaphysical. They are just at different levels of depth.

Answers to the ontology question are typically given in fundamental terms, and authors invoke the primitives of their preferred fundamental metaphysics. So they promise what I call *deep realism*. I want to argue here that an answer to the ontology question does not have to be at the fundamental level, but let’s set that aside for now.

An answer to the taxonomy question characterizes natural kinds at the opposite of the fundamental level. An answer can support what I call *equity realism*: Natural kinds are legitimately part of the world, just as much as tables, trees, and electrons.¹

The distinction between these two questions is something I relied on implicitly when writing *Scientific Enquiry and Natural Kinds* (Magnus 2012). It did not start to become clear to me until very late in the process, when I was trying to explain what the last chapter was doing in the book. Even then, I did not have terms for the distinction. As I would say now, the first five chapters of the book are addressed to taxonomy. The last chapter of the book, one of the longest, gives a partial answer to the ontology question.

In what follows, I argue for three related claims. First, philosophers writing about natural kinds have systematically overlooked this distinction (Sect. 2). Second, major figures who do recognize the distinction have been systematically misread in a way that covers it over (Sect. 3). Third, we would profit by acknowledging the distinction (Sect. 4).

¹ Regarding deep and equity realism, see Magnus (2012, ch. 4).

2 How the questions are conflated or ignored

I am making the sweeping claim that almost all of the literature on natural kinds either fails to distinguish the taxonomy and ontology questions or actively conflates them. Even the exceptions, philosophers who mark the distinction, are systematically misread in a way that obscures it. Because this is a sweeping claim, my proof of it will necessarily involve some handwaving. I hope to offer enough argument to make it at least plausible.

Discussions of natural kinds now standardly borrow a metaphor from Plato and say that finding natural kinds is a matter of carving nature at its joints. The metaphor can be taken as a slogan characterizing what many philosophers mean by ‘natural kind’.²

Plato’s metaphor encourages us to elide the distinction between the taxonomy and ontology questions. The fact that natural kinds extend to the joints in nature distinguishes them as natural, and they exist in virtue of the jointedness of the world.

Some recent accounts take their cues directly from the metaphor. Lewis (1983) offers an account of natural properties as sparse universals. The reference of our terms picks out the natural properties, rather than the arbitrary ones. Lewis’ argument is that we should posit such properties (in part) precisely in order to make sense of reference. So metaphysical structure, which is directly a fact about ontology, is recruited to give an answer to the taxonomy question too.³

Hawley and Bird (2011) do distinguish the two questions: They call taxonomy the question of “naturalness” and ontology the question of “kindhood”. However, they give one uniform answer to the ontology question for all natural kinds—that natural kinds are complex universals, with universals understood as natural properties after the fashion of Lewis. Although they give some answer to the taxonomy question (in terms of supporting induction) there is a natural kind for Hawley and Bird if and only if there is a complex universal. This one-to-one fit between natural kinds and specific elements of fundamental ontology means that, ultimately, the answer to the ontology question is doing all the work.

Although this is suggestive, there are many other discussions of natural kinds besides these. Beyond Platonic catch phrases, thinkers about natural kinds draw on several different traditions. First, there are essentialists who take their inspiration from Aristotle. Second, there are thinkers who take their inspiration from Locke’s distinction between real and nominal essence. Third, there are thinkers in the tradition of Mill and Russell who take natural kinds to be defined primarily in terms of similarity. Fourth, starting with Kripke and Putnam, there are those who treat natural kinds as part of a theory of reference.

Each of these traditions or threads inform present discussions, often in a tangled way, and each too easily collapses the taxonomy and ontology questions.

² The phrase is used as the title of [Campbell et al. \(2011\)](#) and was the working title of [Magnus \(2012\)](#).

³ [Sider \(2011\)](#) talks about ‘joint-carving’ structure as the metaphysical generalization of Lewis’ idea of natural properties. But his candidates for structure, the fundamental elements of being, are too abstruse to be of much use for philosophers of science.

2.1 Essentialist accounts

For Aristotle, taxonomy is ontological. Natural kinds correspond to forms. So the presence of forms answers the taxonomy question (where the kinds are) and the ontology question (what the kinds are).

Contemporary essentialists, like Ellis (2001) and Wilkerson (1995), conceive of themselves as Aristotelean. For them, essences are entirely specified in by intrinsic, material constitution. This construes natural kinds narrowly to include only the categories of basic physics and chemistry. Indeed, it is common even among non-essentialists to distinguish the kinds of basic physics as “essence kinds”; e.g. Chakravarty (2007, p. 157).

This narrow conception of natural kinds might work if we are only interested in talking about fundamental physics. However, both Ellis and Wilkerson insist that the categories useful to science will turn out to be natural kinds. Return to the question of whether *planet* is a natural kind a propos astronomer’s decision in 2006 to define ‘planet’ in a way that excludes Pluto. The essentialist can only say that it trivially is not, because being a planet is not determined by material constitution. There are no fundamental planet particles present in Jupiter but absent from Pluto. From the point of view of taxonomy, however, astronomers were not just making an arbitrary decision about how to use words.⁴ So the essentialist seems to be taking factors relevant to the ontology question (whether planets have a different constitution than non-planets) and using them to get an answer to the taxonomy question (whether the planet category is a natural kind).

This is not the only bullet that the essentialist has to bite when faced with a conflict between what a natural kind can do and what it is. Biological species cannot be distinguished in terms of their material genetic code. So Ellis and Wilkerson end up saying that the only biological natural kinds are genetically specified individuals. Perfect genetic identity may fit tidily into their ontology but makes no biological sense whatsoever (One locus classicus here is Sober (1980); for the point applied to Ellis and Wilkerson, see Magnus (2012, p. 34–6)). It does not provide anything that looks like a natural kind.

These essentialist accounts let an answer to the ontology question shape their entire account of natural kinds. They are ultimately willing to accept as natural kinds only those categories that meet their ontological strictures, but this yields a horribly impoverished conception.

2.2 Two-essence accounts

John Locke’s distinction between *nominal essence* and *real essence* has been inspirational for recent philosophers such as Boyd (1991, 1999) and Kornblith (1993). For Locke, nominal essence is “all the *Essence* of natural Substances, that we know, or by

⁴ I discuss this example at length elsewhere Magnus (2012, ch. 2, Sect. A). The upshot is that there are at least two different natural kinds for astronomy which ‘planet’ could be used to name. One of these does include Pluto but also includes the asteroid Ceres and much else besides. The other, which retains the distinction between asteroids and planets, excludes Pluto and was the one chosen by astronomers.

which we distinguish them into Sorts.” It is distinct from the real essence, which is “that real Constitution of Substances, upon which depends this *nominal Essence*, and all the Properties of that Sort” [Essay 6.6.2].⁵

It can be tempting to think that nominal essences provide an answer to the taxonomy question and real essences provide an answer to the ontology question. However, this would misconstrue Locke’s account.

Importantly, the nominal essence of a category *just is* the abstract idea of that category. This means that there is a nominal essence for every category of things that we can think about. As Locke writes, “each abstract Idea, with a name to it, makes a distinct Species” [Essay 3.6.28]. And he further allows that we can think in arbitrary and gerrymandered categories; that “there are no Things so remote, nor so contrary, which the Mind cannot, by this art of Composition, bring into one *Idea*” [Essay 2.24.3]. So having a nominal essence cannot mark the difference between natural kinds and non-natural categories. Note that the problem is not simply that a category can only have a nominal essence if some person comes to think about it, i.e. that kinds become the workmanship of people. That consequence is one that Boyd (1999) explicitly accepts. The problem is that any sort which people recognize has a nominal essence, so that Locke has no resources to distinguish sorts which are natural or in the world from those which are contrived or arbitrary. Phosphorus and cats have nominal essences, but so do odd compositions like cats-splattered-with-phosphorus.

One might hope to divide the natural kinds from the contrived ones in terms of their real essences. The idea would be to distinguish the constitution of phosphorus and the constitution of cats, which have some unity to them, from the constitution of cats-splattered-with-phosphorus which is merely the combination of the former two. Yet there is still some configuration of things in the world when there is a cat splattered with phosphorus. So, just as our nominal essence specifies what qualities would appear to us when we encountered such a thing, that configuration would make for a corresponding real essence. Even for gruesome franken-kinds, hobbled together from wildly disparate ideas, there will be some features of the world which make some things fit the idea and others not. A real essence for such an arbitrary idea may have no more unity than the idea itself.

There is a real essence for every nominal essence, so real essence is just as ubiquitous as nominal essence. Even if we knew the real essences (which we do not) there would still be no objective basis for classification; see Jolley (1999, p. 154). As such, neither nominal essence nor real essence can ground an answer to the taxonomy question.

One might still hope that Locke has an answer to the ontology question. Imagine that an oracle provided Locke with an answer to the taxonomy question, a way of dividing the abstract ideas of natural kinds from the ideas of arbitrary kinds. He could then answer the ontology question by appealing to the real essences of the natural kinds. However, the real essences are simply defined as whatever structures in the world explain something’s fulfilling the nominal essence. Locke writes, “By this *real Essence*, I mean, that real constitution of any Thing, which is foundation of all

⁵ [Essay] citations to Locke are from the Nidditch edition Locke (1975), and references are given to book, chapter, and section.

those Properties, that are combined in, and are constantly found to co-exist with the *nominal Essence*” [Essay 3.6.6]. Importantly, he does not think we know any more about real essences than that. So the appeal to real essence would only give the trivial answer to the ontology question that the stuff which realizes a natural kind is the stuff which realizes the nominal essence of that kind. This means that Locke would not have an answer to the ontology question, even given a solution to the taxonomy question.

In the passage I just quoted, Locke does specify something about real essence—namely, it is the material constitution of a thing. It is still not clear that this will provide a general answer to the ontology question, however. Even if each individual has a constitution which determines its kind membership, it does not follow that members of the same kind share the same membership-determining constitution; see Stuart (2013, pp. 173–181). Even granting that each kind has a general real essence, this would just ally Locke with neo-essentialists like Ellis and Wilkerson.

To conclude, the historical Locke really does not have anything interesting to say about either the taxonomy question or the ontology question!

2.3 Similarity accounts

There is another tradition which treats natural kinds merely as collections of similar things. John Stuart Mill is often claimed as the fountainhead for this tradition, but unfairly so; more on Mill in Sect. 3.1.

Russell (1948) and (more recently) Chakravartty (2007) characterize natural kinds in terms of the sociability of certain properties. Aside from the picturesque metaphor of sociable properties hanging out together, the idea is just that a natural kind is a locus of similarity. The difference between natural kinds and non-natural ones is a matter of *sufficient* similarity. So the account provides answers both to the ontology question (in terms of sociability) and the taxonomy question (in terms of sufficient sociability). In so far as the latter answer adds anything to the former, it is dismissive of natural kinds as relying on a vague, subjective, and context-dependent threshold of sufficiency. Chakravartty describes the view as “somewhat deflationary about kinds themselves” (2007, p. 178). The view offered by Quine (1969), although not expressed in terms of sociability, is similar.

2.4 Kinds in the theory of reference

The use of ‘natural kind’ as a term of art in recent philosophy traces back to the 1970s and to theories of reference offered by Hilary Putnam and Saul Kripke. Subsequent work on natural kinds has often started from the question of how natural kind terms refer, framed by causal theories of reference.

At the outset, Putnam appeals to natural kinds as “classes of things that we regard as of explanatory importance; classes whose normal distinguishing characteristics are ‘held together’ or even explained by deep-lying mechanisms” (Putnam, p. 139). He relies on their place in explanations and their unifying mechanisms, so he need not accept the deflationary conclusion of the simplicity accounts

which I discussed in the previous section. But he introduces natural kinds without argument.

Putnam and Kripke both presume that natural kinds can be specified in terms of microstructure. They take it that water just is H_2O and that tigers are defined by some specification of DNA. This has the problems which I discussed in the context of essentialism. More importantly, and unlike Ellis and Wilkerson, neither Kripke nor Putnam argue for this in detail. For them, natural kinds can be whatever science finds them to be. “Water = H_2O ” is a dummy formula for whatever science tells us. Because they are concerned with the *semantics question*, they don’t give much attention to taxonomy or ontology at all!

Approaches which start from natural kind *terms* rather than with either of the two questions I have distinguished may be of value for philosophy of language. But they introduce a number of distractions, at least from the questions that interest me; see Magnus (2012 ch. 1, Sect. B.7) First, accounts often hang or fall on intuitions about things like Twin Earth cases. This creates a lot of debates about where labels should go in cases where there are plausibly multiple natural kinds in play. Second, natural kinds can fall out of the picture entirely. Things besides natural kinds can be picked out by terms that work like natural kind terms do. The original strategy after all is to say that natural kind terms work like proper names, but proper names typically refer to named individuals rather than natural kinds. Putnam later argues that terms for artifacts can work in the same way. The theory of reference alone does not pick out which of Robert Bunsen, cesium, and the bunsen burner is a natural kind.

3 How philosophers who distinguish them are misread

So far, I have distinguished two questions and argued that the major strands of thinking about natural kinds fail to address them. They either conflate the two questions or fail to answer either one.

In the next few sections, I consider John Stuart Mill and Richard Boyd. Although both recognize the distinction and give separate answers to the two questions, subsequent philosophers have systematically misread them. So the subsequent literature illustrates the general failure of philosophers to respect the distinction.

3.1 Natural categories and Kinds

The standard narrative, due to Hacking (1991, 2007), is that the similarity tradition began in the 19th century with John Stuart Mill.⁶ Although Mill never used the phrase ‘natural kind’, he introduced capital-K ‘Kind’ as a term of philosophical jargon. Although writers later in the 19th century came to use the phrase ‘natural kinds’ when discussing Mill’s account of Kinds, it is a mistake simply to read his term ‘Kind’ as our

⁶ The narrative is promulgated by Ian Hacking and widely accepted. Khalidi (2013) and Schwartz (2013) are exceptions, philosophers who take their inspiration from Mill but do not endorse Hacking’s reading.

‘natural kind’. But the standard narrative makes that mistake and so fails to recognize that Mill has separate answers to the taxonomy and ontology questions.⁷

Mill introduces Kinds in order to explain how induction is possible. He contrasts a natural kind like *phosphorus* with an arbitrary class like *white things*. We know that samples of phosphorus will be similar in ways we cannot specify yet, but all we know about white things is that they will share the property we have stipulated. This makes it possible to draw new conclusions about phosphorus, because the term ‘phosphorus’ is more than just the description which summarizes everything which we already know is common to all of those samples. It picks out a collection of things which is similar in indefinitely many degrees. And that is what Mill means by ‘Kind’: a collection of things which is similar in indefinitely many degrees.

Although Mill is prompted to posit Kinds to explain how induction is possible, Kinds are not ultimately defined in terms of induction. Rather, they are defined in terms of their ontology. A Kind corresponds to a non-causal law of nature, a law of co-existence. Because of Mill’s austere metaphysics, these laws are fundamental. So being a Kind is part of his fundamental ontology. If we read Mill’s discussion of Kinds as all he has to say about natural kinds (as the standard narrative does) then it does not allow for two separate questions.

Reading Mill more carefully, we notice that Kinds do not exhaust what he has to say about categorization. He also has a conception of *natural groups*, the categories which should figure in scientific taxonomy. All Kinds turn out to be natural groups, according to Mill, but not all natural groups are Kinds. He writes, “The distinctions between Kinds are not numerous enough to make up the whole of classification” (1874, p. 503).

Mill defines natural groups in general by their systematic importance in giving an account of the world. He recognizes that different interests might make different categories more or less important, but he insists that natural groups are those which would figure in the account a disinterested enquirer (1874, pp. 500–1). Although I am not sanguine that Mill’s approach can succeed, it is clearly independent of his account of Kinds in terms of indefinite similarity.

Kinds are Mill’s answer to the ontology question. Because the usual account focusses just on Kinds, it seems like he conflates the ontology question with the taxonomy question. Yet Mill has a separate answer to the taxonomy question which identifies categories which objectively ought to appear in science as natural groups. To reiterate, some but not all natural groups are Kinds. This means that Mill (read carefully) provides different answers to the two questions.⁸

⁷ The standard narrative makes two claims of continuity: First, that the present tradition of ‘natural kind’ talk began with Mill. Second, that the term of Mill’s system which corresponds to our ‘natural kind’ is ‘Kind’. Both are mistaken: Although Mill’s Kinds were called natural kinds in the late 19th-century, his conception is not the source for recent use of the term (MacLeod and Reydon 2013; Magnus 2014a). Moreover, it misrepresents his view to simply translate his term ‘Kind’ into our term ‘natural kind’ (Magnus forthcoming).

⁸ Providing a detailed argument for this reading of Mill is beyond the scope of this paper, but see Magnus (forthcoming).

3.2 Homeostatic property clusters

The case of Homeostatic Property Clusters (HPCs) is complicated.⁹ An HPC is a kind characterized by properties which individuals tend to possess, none of which are necessary and no list of which is sufficient for kind membership. The regular clustering of those properties is maintained by an underlying causal process. The stock example of an HPC is a biological species: a group of organisms which share a great many properties in virtue of shared reproductive history and biological functions.¹⁰

Richard Boyd was the first to offer an HPC account and coined the phrase. His own approach is to argue that many important natural kinds are HPCs. As I would put it, he offers an answer to the taxonomy question which identifies natural kinds and *then* argues for an answer to the ontology question in terms of HPCs.

It is possible to take Boyd's suggestion differently, and treat the specification of an HPC as defining what it is to be a natural kind. Call such an approach an NK = HPC account.

For NK = HPC accounts, HPCs do the work both of distinguishing which categories are natural kinds and describing what there is in virtue of which kinds exist. They thus collapse the taxonomy and ontology questions in much the same way as traditional essentialist accounts.

Most philosophers who discuss HPCs, either to praise or to bury them, address only NK = HPC. Hilary Kornblith was an early adopter of the HPC approach and read Boyd as offering an NK = HPC account; he writes, "Boyd suggests that this account of self-maintenance in organisms [i.e., homeostasis] may provide a model for all natural kinds" (Kornblith 1993, p. 35). Alexander Bird sees his own essentialist account as an ontological version of the HPC approach; he writes, "Richard Boyd... says that biological natural kinds are homeostatic property clusters. This proposal deserves to be taken seriously as an ontological claim, even if Boyd himself does not intend it in that way. We should think of natural kinds as complexes of universals" (Bird 2012, p. 108).

Critics standardly reply to HPC accounts by providing counterexamples: natural kinds which are not HPCs or HPCs which are not natural kinds. Many offer one or two counterexamples and take themselves to have dispatched HPC approaches; e.g. Chakravarty (2007), Murphy (2006), Richards (2010). This only makes sense because they take the HPC approach to be committed to NK = HPC. Allies of HPCs make similar inferences. Slater (2015) takes counterexamples as reasons to liberalize HPCs to include counterfactually stable property clusters (SPCs) and offers an NK = SPC account.¹¹ Martínez (2014) similarly responds to counterexamples by generalizing from HPCs to informationally-connected property clusters (ICPCs) and offering what is recognizably an NK = ICPC account. A single counterexample is a decisive objec-

⁹ The argument of this section follows Magnus (2014b).

¹⁰ Taken narrowly, the property cluster might be a single list of properties which are typical for all members of the kind. Taken more broadly, the properties can be structured into a complex of related clusters. The broader construal allows polymorphic kinds to be understood as HPCs. (Magnus 2011)

¹¹ Slater endorsed 'NK = SPC' as shorthand for his account at the Paris workshop, even writing the formula on the chalkboard during his own talk.

tion to $NK = HPC$ but is not a direct response to the claim that (as a matter of ontology) many natural kinds turn out to be HPCs.¹²

Thomas Reydon distinguishes a metaphysical, essentialist tradition of thinking about natural kinds from an epistemological, inductivist tradition. This is importantly a different distinction than the distinction between the taxonomy and ontology questions, because he sees the two traditions as trying to answer the same question. He writes, “HPC theory, then, can only account for kinds whose extensions have already been fixed independently by other means. ... In other words, HPC theory is not a theory of natural kinds—rather, it is a theory of property clustering” (Reydon 2009, p. 729). The HPC account cannot serve as a general definition of what it is to be a natural kind, so he takes it not to be theory of natural kinds at all. To put this in my terms, he reads failure to answer the taxonomy question as failure to account for natural kinds *full stop*.¹³

4 Why the distinction matters

One might accept everything I have said to this point and reply, So what? One can admit that questions of taxonomy and ontology are collapsed together both in the tradition and in popular accounts of natural kinds, but that does not matter unless the distinction can be made to do some work.

There are many advantages to having separate questions. I conclude by suggesting four of them.

First: By focussing on the taxonomy question, it is possible to characterize natural kinds without doing deep metaphysics. As I suggested at the outset, this allows for a modest *equity realism*: natural kinds are as much features of the world as tables, trees, electrons, and the moon. (Magnus 2012, ch. 4) When scientists introduce a category, they are responding to the world—rather than making an arbitrary decision about how to use words—just insofar as the category is a natural kind. All this requires is that the world constrains the moves that scientists can make. The constraint must be realized by some underlying ontology, but the equity realist can be neutral about the details of its nature.

Second: By distinguishing taxonomy from ontology, it is possible to enquire into the metaphysics of natural kinds without presuming that all natural kinds have the same metaphysical basis. Many natural kinds turn out to be HPCs, but not all of them do. For the kinds which are HPCs, recognizing that they are is an important step in discovering the structure of the world. It is easier to recognize that and how (some) natural kinds are causal when we do not presume that causality defines what it is for them to be natural kinds.

Third: Even among natural kinds which have a causal basis, they do not all have a causal basis in the same way. A biological species or a work of music is not just unified by causal similarity, but by each instance of the kind being a causal descendent

¹² Although it might require a different counterexample, $NK = SPC$ or $NK = ICPC$ accounts are similarly vulnerable. The approaches of Slater and Martínez thus launch us into the familiar analytic regress of monster-barring and counterexamples.

¹³ Reydon goes on to argue that HPCs should not be understood merely as collections of things that exhibit intrinsic similarity. I agree. More than crude similarity is require to make sense of polymorphic kinds (Magnus 2011). My disagreement here is with Reydon’s framing of the problem.

of a single historical origin. I call these *token-HPCs*, because the causal forces holding the kind together are the specific token history of the whole kind. Material kinds (like water) or phase kinds (like gas) can have instances that are historically unconnected. Each sample of water has a similar causal structure which explains why it behaves in a watery way, but the causes at work in two samples are different tokens of the same type. I call these *type-HPCs*. It is easier to identify and elaborate token-HPC kinds, because further members cannot possibly show up in parts of the universe that are causally isolated from known members. Characterizing a type-HPC kind requires not only that we trace out a particular token history but also that we identify what would count as the relevant type of history. In specific cases, we may be able to specify the type of thing well enough to distinguish members, so that we can recognize different bodies of water (for example) as belonging to the same HPC kind. But the challenge is more daunting than for token-HPCs. (Magnus 2012, ch. 6) Even entertaining this distinction requires posing the ontology question explicitly, so that there might be different answers to it for different natural kinds.

The ontological heterogeneity of different categories in actual science sunders an account of natural kinds if we suppose that all natural kinds must have the same metaphysical basis. Yet, as Miles MacLeod and Thomas Reydon write, “the natural kind concept needn’t be an attempt to unify divergent scientific concepts in terms of the physical relations between elements of a kind and their properties...” (MacLeod and Reydon 2013, p. 96). They call for more attention to how scientists actually distinguish natural from artificial categorization. Such enquiry might provide us a fuller answer to the taxonomy question. We could later ask the ontology question in a piecemeal fashion for different natural kinds in various sciences.

Fourth: An answer to the ontology question does not need to be in terms of fundamental ontology. We can elaborate natural kinds in terms of characteristic properties, but we are under no obligation to provide a fundamental metaphysical account of properties. We can recognize that many natural kinds are HPCs, while being silent on the ultimate nature of causation.

I have tended to think of deep realism as being an account in terms of fundamental constituents like universals. Often, I am pessimistic about the prospects for fundamental metaphysics. Even when I am more optimistic, questions of fundamental reality become untethered from considerations of actual science. Fortunately, we can provide an answer to the ontology question in terms of what there is that holds kinds together without providing an ultimate account in terms of fundamental realizers. Realism can be a little bit deep without having to be fundamental.

Although ‘metaphysics’ is sometimes taken to just mean fundamental metaphysics, I do not know of any term for less-than-fundamental metaphysics. Keeping the distinction between taxonomy and ontology in mind allows us to recognize this middle range, something more metaphysical than equity realism but not at the fundamental level of deep realism. Since no other term exists, let’s call this *middle range ontology*.¹⁴

¹⁴ The phrase is meant to pleasantly riff on Robert Merton’s *theories of the middle range* (Merton 1968). Although ‘ontology’ is not presumptively fundamental in my idiolect, some readers might find the term as problematic as ‘metaphysics’. Van Inwagen (2013) suggests that the word ‘ontology’ was itself invented to mean “the science of being as such” when the term ‘metaphysics’ started to be used more generally.

Understanding the relation between causation and natural kinds is a matter of middle range ontology. It requires distinguishing what I have called the taxonomy and ontology questions, a distinction which has been actively obscured too often.

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