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NATURAL KINDS AND CLASSIFICATION IN SCIENTIFIC PRACTICE

CATHERINE KENDIG

Reviewed by Muhammad Ali Khalidi

Natural Kinds and Classification in Scientific Practice

Catherine Kendig (*ed.*)

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Philosophers once thought that natural kinds were a manageable bunch, and that they could be grouped into a few taxonomic systems associated with the traditional natural sciences: physics, chemistry, and biology. When pressed for examples of natural kinds, they would wheel out the reliable ones: chemical elements, chemical compounds, and biological species. An outside observer would have been forgiven for accusing us of having an inordinate fondness for gold, water, and tigers. But as we have emerged from our studies and armchairs, we have come to discover a much wider array of candidates for kinds, pertaining to an ever-increasing number of scientific disciplines and sub-disciplines, including those that study the social or human realms. Nowadays, the sciences seem to issue in a continuous supply of taxonomic categories and the learned journals introduce new ones on a quarterly basis. What is an empirically minded philosopher to do?

Lately, some of the philosophers who have done most to develop and move forward the discussion of natural kinds (for example, Ian Hacking^[1]) have, ironically, also called for the abolition of the whole notion of natural kind. Yet, talk of natural kinds continues. Indeed, arguably, there is more interest in the topic nowadays than ever

before in the history of analytic philosophy. Natural kinds are not just mentioned in discussions of metaphysics and philosophy of science (or for that matter, the emerging sub-field of metaphysics of science), they crop up regularly in philosophy of mind, meta-ethics, philosophy of law, and other areas. Indeed, this collection is living proof that the topic of natural kinds refuses to die. Increased philosophical interest does not by itself indicate that the topic is worth discussing, since philosophers are not particularly good at recognizing a dead horse when they see one, but the rich and insightful papers collected in this volume are a testament to the continued importance of natural kinds.

This book contains thirteen original essays, written by a broad cross-section of philosophers working on these topics, in addition to an introduction by the editor, Catherine Kendig (who also contributed an essay), and a preface by John Dupré. There are some common denominators running through the volume, though the contributors certainly don't speak with one voice when it comes to saying what natural kinds are, or indeed whether they should remain in our ontology. Still, with one or two exceptions, most papers fit into an emerging naturalist approach to the topic of natural kinds. This approach tends to examine specific scientific case studies and derive philosophical morals from them, and that is the methodology adopted by most papers in this volume. Moreover, many papers purport to focus on the classificatory practices of working scientists, whether in the past or present, rather than looking merely at their theoretical categories. And the variety of scientific disciplines and sub-disciplines represented is very impressive indeed: physical chemistry, engineering, critical race theory, mathematics, developmental biology, molecular biology, computational neuroscience, cognitive science, linguistics, cartography, and sex and gender studies (to paraphrase the editor's introduction).

As for what philosophical morals they draw, some of these papers could be classified as mildly realist and others as downright sceptical, if not anti-realist, while yet others gesture towards a halfway house between realism and conventionalism. But it is safe to say that most of them are united by a commitment to a weak or anti-essentialist realism, which finds talk of 'mind-independent' kinds problematic, partly because it threatens to exclude social and psychological kinds, and partly because it suggests that we have a way of ascertaining what these kinds are, independent of our successful epistemic practices. Instead, the majority of papers hold that our best guide to which kinds exist are the epistemically efficacious categories of scientific practice. But precisely for that reason, some of the papers in the volume could have done a better job of distinguishing categories from kinds. If naturalists think that looking at the results of science is our most reliable means of determining what kinds there are in the world, then they are implicitly committed to a distinction between the kinds that are found in the universe and the categories or concepts that are used to identify them, in line with Richard Boyd's 'accommodation thesis'.^[2] Occasionally, that distinction is not sufficiently heeded by some of the papers in this volume; a few examples should suffice to illustrate the point:

Natural kinds are those categories and classifications that fit the knowledge-seeking questions we ask and aim to answer. (Kendig, p. 2)

I propose that we regard a classificatory concept as a natural kind if it is sufficiently effective in aiding inquiry in the natural sciences. (Chang, p. 42)

[...] I want to point out that kinds—as categories and categorization practices—are inseparably symbolic and social, and are thus encoded, regulated, and applied. (Cat, p. 88)

To be sure, many such claims can be rephrased in such a way as to preserve the distinction between categories and kinds; but without reformulation, naturalists are liable to leave the unfortunate impression that they are collapsing the distinction and are therefore anti-realists. As I mentioned, some essays in this volume do indeed

seem to fall on the anti-realist, or at least sceptical side of the divide, but most of them do not (including those that lapse into this way of speaking on occasion). Notwithstanding this quibble, the papers in this volume amply demonstrate that the naturalist approach is capable of yielding numerous insights and in what follows, I will attempt to highlight some of them, while making a few criticisms along the way. Given space constraints, I have had to be selective, focusing on just over half of the chapters and neglecting a number of very valuable contributions in the process.

Hasok Chang's chapter reconstructs three episodes in the history of chemistry (concerning the elements, phlogiston, and acidity) in order to raise difficult questions about which concepts correspond to natural kinds. He eventually makes a positive proposal according to which a classificatory concept is a natural kind concept when it exhibits what he calls 'resilience', which is to say that 'it can renew and improve itself coherently in the face of novelty and adversity' (p. 44). His historical reconstructions are particularly revealing in that he avoids a kind of naïve realism, according to which our concepts automatically capture the kinds in nature. Instead, he allows that some concepts have the resources to withstand theory change, while others fall by the wayside as knowledge increases. Yet, he also seems to undermine his own conclusion by entertaining the possibility that we might have changed the definition of phlogiston to refer to 'easy-to-remove electrons' and that if we had, we would 'now be saying that "phlogiston" is of course a natural-kind term [...] just like any other venerable old scientific concept' (p. 40). To this reader, that sounded like an implicit admission that the notion of resilience cannot do the job for which it was introduced.

In her chapter on classificatory practices in the cognitive neurosciences, Jacqueline Sullivan finds more pluralism than other observers have tended to admit. For instance, under the apparently unitary construct 'spatial memory' are lumped such diverse phenomena as rats navigating mazes, birds remembering where their nests are located, and taxi drivers navigating London streets. In addition, neighbouring research programmes sometimes deploy slightly different labels, with different means of operationalizing their constructs and different ways to measure them. Rather than consistent deployment of terms and concepts across investigators, laboratories, and research programmes, Sullivan detects diversity and a proliferation of means of stabilizing and validating constructs. She concludes that there is no coordination among these different actors and hence that there is no real effort to locate natural kinds of cognitive capacities and their mechanisms. This chapter is less realist than some of the others and poses an important challenge to naturalist philosophers who think that the notion of natural kind is vindicated by scientific practice. One might object that this conceptual profligacy in cognitive neuroscience is just a sign of methodological immaturity or theoretical turmoil, but Sullivan argues not only that this is the current state of play, but that investigators show no sign that they are aiming to unify their constructs and identify natural kinds.

The chapter by Thomas Reydon puts forward an ambitious position that is meant to provide an alternative to strong realism about natural kinds. Rather than a model of 'zooming in' on natural kinds, he proposes the idea of 'co-creation', whereby kinds are co-determined by nature and investigators working in concert. He illustrates this by looking at the classification of genes, which is based on a variety of factors, including function, location in the genome, and lineage of descent. To illustrate, the *diaphanous* gene in *Drosophila melanogaster* is grouped together with the *DFNA1* gene in humans according to the criterion of descent, but not when it comes to the criteria of location or function. He concludes that these different criteria reflect different investigative contexts, and are hence mind-dependent. Whether or not these genes belong to the same kind is dependent both on human investigators and on natural boundaries. Hence, the emphasis on co-creation rather than zooming in. But one might take away a different lesson from this example, namely, that one can zoom in on different causal processes for different purposes, and what human investigators are doing is not so much co-creation but selection. Admittedly, if there are a plethora of different joints in nature and human investigators are selecting

just a tiny portion of them, the human factor can be considered to play a starring role, but that role would still seem to be one of picking and choosing among kinds rather than creating them.

A very similar picture emerges from Joyce Havstad's chapter on the classification of proteins, which argues that different classification systems 'track different sets of properties and capabilities of the proteins' (p. 84). For instance, some classifications emphasize intracellular location properties (or biochemical capabilities), while others focus on intercellular transcriptional, physiological, and functional properties (or physiological capabilities). She cautions against inferring 'total conventionalism' from this 'intractable pluralism', though she does think that it leads to some form of conventionalism. But here again, it seems as though the human role consists mainly in selecting the properties to track, rather than a conventional determination of what is to count as a property in the first place. As if to confirm this suspicion, Havstad also calls her position 'a sort of choosy, or selective, naturalism' (p. 84).

Kendig's contribution takes a new look at the superordinate kind, homology, that biologists use to classify different organismic traits. After examining the way in which the concept of homology changed from pre-evolutionary to post-evolutionary biology, she explicates the dominant view that homology is all-or-nothing, and is distinguished from analogy on the grounds that the former but not the latter is based on common ancestry. Though this sharp distinction between homology and analogy is attractive for its simplicity, Kendig shows carefully that on a multidimensional view of the evolutionary process, homology may be partial rather than all-or-nothing, depending on whether common descent includes genes, tissues, proteins, ontogenetic pathways, and so on. To illustrate, although octopus eyes and human eyes are usually regarded as analogous, they can be considered partially homologous due to their use of similar tissues, genes, cells, and proteins, and partially analogous due to their different ontogenetic pathways. Her nuanced treatment aims to show that a sharp distinction is no longer tenable, though she does not entertain the possibility of retaining a graded distinction or one that is indexed to certain dimensions or axes (for example, genes, pathways).

In Samuli Pöyhönen's chapter, he considers cognitive kinds like memory and proposes that causal groundedness is what all natural kinds have in common, but he balks at this, since 'it no longer sustains the contrast to partly mind-dependent kinds, social kinds, and artifact kinds, all of which can be causally sustained categories as well' (p. 150). However, he never fully explains why such kinds should be excluded from the class of natural kinds. He goes on to conclude that natural kinds 'in a strong ontological sense' (p. 153) are not a necessary condition for the inductive reliability of scientific concepts, and suggests loosening the link between a theory of scientific concepts and metaphysically oriented theories of natural kinds. But an alternative would be to adopt a different metaphysical theory of natural kinds, according to which causal groundedness is precisely what all natural kinds share, and what also explains the epistemic efficacy of natural kind concepts.^[3]

Quayshawn Spencer's chapter is also about mind-dependent kinds, including such kinds as type 2 diabetes and the Native American private allele.^[4] As he argues, the existence of an allele unique to indigenous populations in the Americas depends on human classifying activities, since this hinges on Native Americans self-identifying as such and assortatively mating according to those self-identifications. Clearly, there can be such mind-dependent kinds in the biological domain, not just in the social domain. This leads Spencer to propose that 'a genuine kind is a valid kind in a well-ordered scientific research program' (p. 165). Setting aside the categories-kinds issue mentioned above, it would seem as though what makes a kind genuine is something about the kind itself (perhaps its causal groundedness, as Pöyhönen suggests) and that, in turn, is what explains the epistemic success of the relevant natural kind concept within a scientific research programme.

In her introduction, Kendig indicates that 'The aim of the volume is to turn past discussions of natural kinds on their head', in the sense that it begins from scientific practice rather than an 'unempirical' metaphysical vantage point (p. 6). It delivers on that promise abundantly, though it would seem as though things have already moved pretty far in the direction of naturalism, thanks to the efforts of Boyd, Dupré, Hacking, and a number of other philosophers in the past couple of decades. But taken collectively, these essays certainly lend further impetus to this trend, and they should therefore give pause to a certain type of metaphysician, according to whom philosophy first dictates what natural kinds ought to be, and then science tells us what (if anything?) lives up to that standard. Rather, it makes far more sense to pay heed to the deliverances of science and take them as our best (corrigible) guide to the kinds that exist in nature. It may be objected that this naturalist alternative delivers a profligate extravaganza of natural kinds, but it is high time that philosophers give up on the dream of a select few privileged kinds that satisfy our preconceived notions of what a natural kind should be, and wallow instead in the decadent lushness of the universe.

Muhammad Ali Khalidi

Department of Philosophy and Cognitive Science Program

York University

khalidi@yorku.ca

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Notes

[1] See, for example, (Hacking [2007]).

[2] Boyd ([1999], p. 69) writes that there is a 'fit or accommodation between natural kind categories and induction-supporting causal powers of things'.

[3] Compare, for example, (Khalidi [2013]).

[4] A private allele is one that is found in just one population (here, the population of Native Americans) in a broader collection of populations.