

RESEARCH

The Realism of Taxonomic Pluralism

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In this paper, I present a critique of taxonomic pluralism, namely the view that there are multiple correct ways to classify entities into natural kinds within a given scientific domain. I argue that taxonomic pluralism, as an anti-essentialist position, fails to provide a realist alternative to taxonomic monism, i.e., the view that there is only one correct way to classify entities into natural kinds within a given scientific domain. To establish my argument, I first explain why the naturalist approach to natural kinds adopted by pluralists requires them to give up the mind-independence criterion of reality presupposed by monists. Next, I survey two types of pluralist account. I argue that, while the modest pluralist account is not pluralistic enough, the radical pluralist account fails to come up with an alternative criterion of reality that is robust enough to differentiate its position from anti-realism about natural kinds. I conclude by drawing out the implications of my critique for the essentialism/anti-essentialism debate about natural kinds.

Keywords: Natural Kind Realism; Taxonomic Pluralism; Natural Kind Essentialism; epistemic aims; naturalness

I. Introduction

Natural kind realism is the view that *natural kinds are real*. Its proponents can be divided into *taxonomic monists* and *taxonomic pluralists*.¹ The former believe that there is only one correct way to classify entities into natural kinds within a given scientific domain; the latter contend that there are different ways, and they all correctly reflect the divisions in the world.

A central motivation for taxonomic monism is natural kind essentialism, the view that natural kinds are defined by their essential properties or essences. For instance, one may grant that the essence of gold is that gold has atomic number 79 (assuming that *gold* is a natural kind).² According to natural kind essentialism, essence of a given natural kind informs us what kind of thing its members really are, as well as allows us to explain, predict, and infer their behaviors.³ So if natural kind essentialism is true, then there should only be one correct classification for a given scientific domain, namely the classification that classify things according to the definitional essences of natural kinds.⁴

¹ For simplicity, I will hereafter refer to taxonomic monists as 'monists,' taxonomic pluralists as 'pluralists,' taxonomic monism as 'monism' and taxonomic pluralism as 'pluralism,' unless specified otherwise.

² Essence here should be understood as 'real essence,' in contrast to "nominal essence", in the Lockean sense. Unlike nominal essence, which is 'nothing but that abstract idea to which the name is annexed,' real essence is 'the real constitution of substances' (Locke 1689/1975: III. vi. 2).

³ Natural kind essentialism, i.e., the claim that natural kinds themselves have essential properties, should be carefully distinguished from another closely related essentialist position, namely individual essentialism. Individual essentialism claims that the membership in the natural kind that a particular entity belongs to is essential to that particular entity. Natural kind essentialism does not entail individual essentialism: one may maintain that chemical elements have essences (i.e., their atomic numbers), but at the same time allowing an atom to retain its identity in undergoing beta decay, in which its atomic number increases by one. Although I am concerned with natural kind essentialism rather than individual essentialism in the current paper, it is hard to see how one may motivate individual essentialism without accepting natural kind essentialism (Bird and Tobin 2018). For simplicity, I will hereafter refer to natural kind essentialism and its proponents simply as 'essentialism' and 'essentialists,' unless specified otherwise.

⁴ As the second reviewer of this article points out, taxonomic pluralism may be compatible with natural kind essentialism. One may, on the one hand, hold that there is an ontologically privileged way in which a given domain is divided into kinds, i.e., the classification according to the real essences of the entities in that domain, and on the other hand, maintain that our scientific taxonomies

Since natural kind essentialism entails monism, taxonomic pluralism contradicts natural kind essentialism. Nevertheless, like monism, taxonomic pluralism is a realist position. As Helen Longino indicates, 'pluralism only has the bite it has in the context of realism' (Longino 2002: 142). Therefore, taxonomic pluralism should also be distinguished from another anti-essentialist position, namely conventionalism. This is because conventionalism, in contending that boundaries between kinds are fixed by us rather than grounded in real kinds, is an anti-realist position. In this regard, pluralism promises to offer a middle ground between monism and conventionalism. On the one hand, it acknowledges the reality of the multifarious classifications in natural science. On the other hand, it is not an 'anything goes' position: it maintains that only classifications that correctly capture the structures of reality should be privileged.

In this paper, I am going to demonstrate that taxonomic pluralism in fact fails to provide a *realist* alternative to taxonomic monism. I will first explain what I mean by 'natural kinds.' Then, in section III, I will illustrate in what sense the reality of natural kinds is central to the debate between monists and pluralists. In section IV, I will expound on how the *naturalist approach* to natural kinds adopted by pluralists requires them to give up the mind-independence criterion of reality presupposed by monists. In sections V and IV, I will survey Muhammad Ali Khalidi's modest pluralist account and explain its problems. In section IIV and IIIIV, I will discuss.

Richard Boyd's radical pluralist account and demonstrate why it fails to come up with an alternative criterion of reality that is robust enough to differentiate taxonomic pluralism from conventionalism, i.e., anti-realism, about natural kinds. In section IX, I will point out what is at stake in natural kind realism. I will conclude by indicating what implication my critique has for the essentialism-anti-essentialism debate about natural kinds.

II. 'Natural Kinds'

To begin with, let me clarify what I mean by 'natural kinds.' To ensure that I am on the same page with pluralists, I adopt their *naturalist* reading of 'naturalness.' Such a reading is to be contrasted with a socio-psychological reading on the one hand, and a metaphysical reading on the other hand.

When W.V.O. Quine (1969) and Ian Hacking (1993, 2007) suggest that 'natural kinds' would eventually be replaced by theoretical kinds, they are referring to pre-theoretical, folk groupings. These groupings are 'natural' from a socio-psychological point of view: we customarily or instinctively classify things according to them, given our 'natural,' i.e., inborn, propensity. For example, given that color is a striking feature in our visual field, it seems more 'natural' to classify flowers in the wild according to their colors, instead of according to the ways they pollinate (which are far from obvious to a common observer). Since our current concern is natural kind realism, I will simply dismiss this reading, for it is doubtful that these intuitive, pre-theoretical groupings can serve as reliable indicators of the structures of reality.

'Being natural' can also be interpreted *metaphysically*. In contending that there is no 'natural' kind because no genuine distinction can be drawn between 'natural' and 'unnatural' properties, Bence Nanay (2011) takes 'naturalness' to be an objective feature of the world, understood in terms of David Lewis' conception of sparseness. Alexander Bird presupposes a similar reading of 'naturalness' when he asks, '[i]s the world such that there are genuinely *natural* divisions and distinctions, i.e., that there are natural differences and similarities between things?' (Bird 2018: 1398 original italics) This *metaphysical* reading of 'naturalness,' however, is also unsatisfactory. Given that natural kind realism is the view that *natural kinds are real*, two different questions are involved in defending this position. First, the question of *naturalness*: what kinds are *natural*? Second, the question of *reality*: are these kinds *real*? The metaphysical reading does not differentiate these two questions, which deserve separate treatments.

On the contrary, a *naturalist* reading of 'naturalness' construes it as an *epistemic* feature. Accordingly, natural kinds are identified as theoretical kinds that play crucial roles in scientific investigations, such as underwriting our practices of explanation, prediction, and inference. These groupings are 'natural' because they are sanctioned by *natural science*. In this regard, being natural is contrasted with being *arbitrary* or *gerrymandered*, rather than being artificial or unreal.

Once we have decided that we are going to focus on theoretical groupings in science, the monism-pluralism debate becomes a debate about whether these groupings can all be integrated into a single system of classification. Assuming that both monists and pluralists agree upon what criteria govern successful

at best gesture inexactly at those privileged divisions. However, such a pluralist account is not realist about natural kinds. This is because, according to this account, the groupings posited by our scientific taxonomies do not truly represent the natural kind structure(s) of the world. Thus I will not consider such pluralist account in this paper.

integration, their debate could then be confined to the *reality* of those conflicting theoretical kinds, i.e., kinds that cannot be successfully integrated into a single classificatory framework. Here is the logic: for monists, since there is only one correct classification, these conflicting kinds cannot all be *real*, as they do not fit into a single classification; for pluralists, since these conflicting kinds are all sanctioned by natural science, they are all *real*; if they do not fit into a single classification, then they must belong to different classifications.

III. Taxonomic Pluralism and the Naturalist Approach

The divergent ways monists and pluralists deal with theoretical groupings that do not fit into a single classification suggest that they analyze natural kinds from different perspectives. According to pluralists, their monist opponents, in attempting to spell out the distinction between natural kinds and non-natural kinds in *metaphysical* terms, lose sight of the real issue. This is because, in order to draw this distinction, monists must take a position on questions concerning the nature of natural kinds. For instance, are natural kinds genuine *entities*? If yes, what sort of entities are they? Are they sets, universals or *sui generis* entities (Bird 2018)? Yet pluralists such as Khalidi (2013) and Magnus (2015) complain that answering these metaphysically loaded questions would not help us to distinguish natural kinds from non-natural kinds in a way that is relevant to actual scientific practice. As Ingo Brigandt remarks, 'a purely metaphysical construal of what a natural kind is is of very limited use' (Brigandt 2011: 175).

In contrast, pluralists espouse a *naturalist* approach to natural kinds, which formulates the difference between natural groupings and non-natural groupings in *epistemic* terms. Accordingly, natural kinds are groupings that underwrite successful practices such as explanation, induction, and prediction. As Boyd suggests, natural kinds are 'solutions to problems... about how to sort things so as to facilitate reliable induction and explanation' (Boyd 1999: 72). Brigandt in particular points out that a naturalist account has to answer *epistemological* questions such as 'what inferential and explanatory aims scientists pursue with the study of a certain natural kind' and 'how well a grouping of objects into a kind meets such inferential and explanatory aims' (Brigandt 2011: 173–174). Thomas Reydon indicates that a naturalist approach is more promising than the monists' metaphysical approach since 'we do not have direct access to the natural kind structure of the world (if there is such a structure)' (Reydon 2010: 185).

Once we shift our focus from the metaphysical question 'what *are* natural kinds' to the epistemological question 'what *are* natural kinds *for*,' pluralism emerges as a plausible alternative to monism. As Brigandt points out, answering this epistemological question requires us to study natural kinds 'based on the empirical details pertaining to each kind... [which] may differ from case to case' (Brigandt 2011: 175). These empirical details depend on what epistemic goals a given classification is supposed to fulfill in a scientific investigation. Pluralists argue that scientists target different epistemic goals in different investigative contexts, and it is unreasonable to expect a single classification to successfully meet all of these different epistemic goals.

Apart from rejecting the metaphysical approach to natural kinds taken by monists, pluralists are further dissatisfied with the metaphysical assumptions monists make. From the point of view of pluralists, the metaphysical assumptions endorsed by monists are incompatible with well-confirmed scientific findings. An example of such monist-leaning metaphysical assumption is the *hierarchy assumption*. According to this assumption, genuine natural kinds form a single hierarchical structure. More specifically, this assumption states that no two genuine natural kinds overlap unless they overlap completely, i.e., all the members of one kind are at the same time members of another kind. Yet, many natural kinds posited by scientific classifications violate this assumption: they *crosscut* each other.

Whether or not the hierarchy assumption is correct is beyond the scope of this paper. Nonetheless, it is crucial to see how a metaphysical assumption like it plays out in the monism-pluralism debate. As I have indicated above, the monism-pluralism debate revolves around the reality of groupings that cannot be integrated into a single classificatory framework. Under the hierarchy assumption, this single classificatory framework should have a nested hierarchical structure. The groupings in question are therefore those that cannot be subsumed into a single nested hierarchy. Following the naturalist approach, pluralists criticize monism by calling the hierarchy assumption into question. For instance, they argue that a monist picture in biological classification is untenable because empirical evidence shows that biological kinds do not form a single hierarchy: many well-founded biological taxa crosscut each other.⁵ Conversely, monists respond to

⁵ Some of these cases in biology are: the crosscutting of the phylogenetic categories with the Linnaean taxa (Hennig 1999: 5); the crosscutting of the kinds *enzyme* and *protein* revealed by Thomas C. Cech's discovery of RNA's (ribonucleic acid) catalyzing power in the 80s (Tobin 2010). Pluralists also cite cases of crosscutting in other scientific disciplines as evidence against the hierarchy

the challenge posed by the appearance of widespread crosscutting by claiming that biological kinds are not natural kinds, precisely because they violate the hierarchy assumption in question (Ellis 2001).⁶

So, in this example, with regard to groupings that cannot be integrated into a single classificatory framework, there is no dispute about whether they really violate the hierarchy assumption or whether these kinds have any important epistemic role to play in their specific disciplines. Both monists and pluralists agree on these two issues. What they disagree on is which of these two issues, namely the metaphysical assumption made by monists or the epistemic roles emphasized by pluralists, should decide whether a grouping is real. On the one hand, pluralists back the reality of the crosscutting kinds with the empirical fact that these kinds are indispensable to scientific investigations; on the other hand, monists believe that these crosscutting kinds should be dismissed as unreal, since they violate the hierarchy assumption. The dispute turns into a conceptual one concerning the very criterion of reality. The question at stake is: in what sense are natural kinds *real*, if they are real at all? In the following sections, I will survey different answers monists and pluralists respectively assume in the debate between them.

IV. Mind-Independence and Natural Kind Realism

In upholding various metaphysical assumptions, monists construe the world as possessing a *mind-independent* natural-kind structure. This structure is mind-independent in the sense that it 'does not depend for its existence and nature on the cognitive activities and capacities of our minds' (Devitt 2005: 768). This mind-independent character is obvious in the hierarchy assumption endorsed by monists, as it maintains that the hierarchical structure in question is *independent* of human classificatory practice. For instance, as Ellis (2001: 2014) argues, crosscutting kinds are problematic because they disobey the requirement that divisions between genuine kinds have to be categorically distinct. According to Ellis, two kinds are categorically distinct when there is no gradual transition from one kind to another such that it is indeterminate to which kind a thing belongs. If kinds were not categorically distinct from each other, then, in Ellis' view, any distinction between such kinds would be drawn by us, rather than by nature.

Although many philosophers accept mind-independence as a self-evident criterion of reality (e.g., Devitt 2011; Franklin-Hall 2015; Lowe 2014; Tahko 2012, 2015; Varzi 2011), pluralists who adopt the naturalist approach towards natural kinds suggest otherwise. Apparently, the traditional reading of realism dismisses from the outset a significant portion of theoretical groupings in various scientific disciplines as unreal, even though these groupings are no less sanctioned by empirical evidence than other alleged mind-independent groupings. Despite the fact that many groupings in biology, psychology, sociology, etc., are not strictly mind-independent, pluralists still want to maintain a realist stance towards them, given the epistemic roles they play in their respective disciplines. For example, the 24 synthetic elements on the periodic table that would not have existed on our planet without being created artificially in the laboratory; psychiatric kinds such as mental disorders that are by nature mind-dependent (Beebee and Sabbarton-Leary 2010; Haslam 2002; Tsou 2016); and social categories such as race and gender, which are uniquely human (Bach 2012, 2016; Haslanger 2000; Sveinsdóttir 2011).⁷ Indeed, it is often the reality of these kinds that are in dispute

assumption. For example, Hacking (2007) points out that crosscutting is common in chemistry. A case in point is the crosscutting between the kind *rubidium* and the kind *boson*. Neither of them is a species of the other: it is not the case that all members of the kind *rubidium* are members of the kind *boson*; nor is it the case that all members of the kind *boson* are members of the kind *rubidium*. Nonetheless, *rubidium-87* is a species of both of them (Hacking 2007: 214).

⁶ Quite often, in addition to the hierarchy assumption, monists also appeal to the *essentialist assumption* in dismissing the crosscutting kinds as unreal. According to the essentialist assumption, members of a given natural kind share a set of (unchanging) intrinsic properties that is both necessary and sufficient for membership in that particular kind. For example, Ghiselin (1987), in supporting his view that biological species are not classes/kinds but individuals, adds that this is because species evolve but classes/kinds do not change, along with the difficulties in constructing a nested hierarchy for species. Likewise, in arguing that biological kinds are not natural kinds, Ellis (2001) suggests that biological species, apart from violating the hierarchy assumption, also run afoul of the essentialist assumption. Indeed, the hierarchy assumption is partly implicated in this essentialist assumption. For those who uphold the essentialist assumption usually further commit themselves to the view that each individual entity has a set of essential attributes (i.e., its essence) that makes it the type of entity it is; and a classification that mirrors the structure of reality should be constructed according to the essences of things. Thus, an entity should not belong to more than one kind when those kinds are not hierarchically ordered. For this would mean that we do not know what that entity is, given that membership of a kind stands for an entity's identity.

⁷ The types of mind-dependence involved in these examples are different. For example, synthetic elements are regarded as occupying the empty slots on the periodic table. In this case, the existence of the kinds themselves does not depend on us, but the existence of their members is causally dependent on us, at least locally, i.e., on Earth. On the contrary, our conceptualization seems to take a *constitutive* role in the formation of social kinds such as race and gender. Khalidi (2016) discerns four different categories of dependence/independence; Franklin-Hall (2015) also distinguishes mind-dependence in terms of content and status. Since mind-independence is irrelevant to the reality of natural kinds (as I will soon show), I will not get into the details of these distinctions here.

in the monism-pluralism debate. It would thus be unfair to adopt a criterion that rules out their reality at the outset.

Pluralists therefore call for a realist account that emphasizes the epistemological aspects of natural kinds. Instead of requiring real kinds to be strictly mind-independent, they argue that natural kind realism should endorse a conception of reality that would allow us to account for the epistemic roles of natural kinds in scientific investigations, i.e., the fact that natural kinds underwrite successful practices such as explanation, induction, and generalization (Boyd 1999, 2010, 2019; Brigandt 2009, 2011; Haslanger 2016; Khalidi 2013, 2016; Koslicki 2008; Magnus 2012).

Thus Boyd writes:

Here's an important sense in which natural kinds and their naturalness are not independent of human purposes, interests, aims and practices. If we adopt the standard realist and naturalist conception of natural kinds as vehicles for the identification of projectible generalizations, *then practice dependence is entailed* (Boyd 1999: 7 emphasis added).

And Khalidi writes:

It is common for philosophers to express realism about kinds in terms of the claim that kinds are human- or mind-independent, but I reject this way of grounding realism since it threatens to rule out all psychological and social kinds. More importantly, to be real, a kind need not be independent of human beings or their minds; it must simply be manifested in the world (a world that includes the human mind). The surest way to ensure that our categories identify real kinds is to pursue a scientific method that serves epistemic purposes (Khalidi 2013: xiv).

Although the mind-independence criterion is too restrictive in explicating the reality of natural kinds, there is a clear tension between the mind-dependent aspect of an entity and its reality. Obviously, many mind-dependent objects, such as the dagger Macbeth hallucinated, are not real. So what conception of reality would allow taxonomic pluralists to preserve the reality of mind-dependent natural kinds?

One attempt to ease the tension between the mind-dependent character of many natural kinds and their alleged reality is to limit the application of the mind-independence criterion. For example, we may confine the mind-independence criterion to non-mental entities only, thus allowing mental kinds such as psychiatric kinds and emotions to be real even they are mind-dependent. As Khalidi points out, apart from being unparsimonious, this strategy still excludes artificial groupings such as synthetic biological and chemical kinds, as well as many groupings in the social sciences. Further granting exception to these entities can at best be *ad hoc* (Khalidi 2016: 225). Another attempt to refine the notion of mind-dependence is to separate the harmless types of mind-dependence from the problematic types. For example, Boyd (1991) argues that only constitutive dependence, as opposed to causal dependence, is incompatible with the reality of natural kinds. Yet, as Khalidi (2013) indicates, Boyd's explication of the difference between constitutive and causal dependence, and other similar proposals, are far from satisfactory.⁸

I agree with Khalidi that the strategy of bracketing certain harmless types of mind-dependence is doomed to fail. In particular, this strategy fails to explain why there are two different standards of reality, despite the fact that there is only one world. Does applying a different standard of reality to entities that are mind-dependent imply that these entities are less *real* than entities that are mind-independent? If yes, then in what sense are these mind-dependent entities *really* real? But if the answer is no, then the need to introduce a separate standard of reality for mind-dependent entities only suggests that a more fundamental standard of reality is in play. This more fundamental standard would construe the reality of both mind-independent and mind-dependent items in the same way, rather than positing one criterion of reality for the former and a different criterion of reality for the latter. As Haslanger argues, even the mind-independence requirement 'provides good reason for rejecting one conception of "objective reality," this does not force us into either skepticism or idealism, for there are other ways of conceiving what it means to be real and other ways of conceiving an "independent" reality' (Haslanger 1995: 97). I thereby side with Khalidi (2016) in seeing that mind-independence is merely a 'red-herring' in the discussion of natural kind realism.

⁸ For a detailed assessment of different versions of 'mind-dependence,' see Khalidi (2016).

V. Khalidi's Modest Pluralist Account: Epistemic Purposes

In dismissing the notion of mind-dependence as a red-herring, Khalidi attempts to draw the line between real kinds and unreal kinds elsewhere. He proposes that we should look at the very purpose a given classification aims to serve in evaluating the reality of the groupings it posits. Khalidi concurs with Dupré (1993) that there does not exist any 'pure' classification, i.e., classification that is completely independent of our interests. Yet, he distances himself from Dupré's all-too-liberal 'promiscuous realism.'⁹ For Khalidi, not all (practically useful) classifications have realist import. While Dupré believes that the very intention behind a classification has no bearing on the ontological status of its groupings, Khalidi maintains that only classifications that are introduced primarily to serve *epistemic* purposes would capture the real structures of the world. As Khalidi argues, '[t]he surest way to ensure that our categories identify real kinds is to pursue a scientific method that serves epistemic purposes' (Khalidi 2013: xiv). And 'what distinguishes epistemic purposes from other purposes is that our best epistemic practices aim to uncover the divisions that exist in nature' (Khalidi 2013: 63).

So in what sense natural kinds reveal the 'divisions that exist in nature'? According to Khalidi, '[o]ur best guides to nature's divisions are those categories that enable us to explain and predict natural occurrences by tracking causal patterns. Hence, categories that serve this epistemic purpose denote natural kinds' (Khalidi 2013: 160). Assuming that Khalidi is correct that epistemic practices should aim at uncovering the causal structures of the world, then natural kinds have realist import precisely because they track the causal structures of the world. For Khalidi, the reason for believing that natural kinds successfully track the causal structures of the world is that natural kinds are *projectible*.¹⁰ Khalidi believes that this epistemic feature is not only 'the most widely agreed upon characteristic of natural kinds' (Khalidi 2013: 18), but also, more importantly, it leads 'naturally to a metaphysical account in terms of causality' (Khalidi 2013: xii). As Khalidi sums up,

Science aims to identify projectible properties, particularly clusters of properties that point reliably to yet other property clusters. The fact that these properties are projectibly clustered indicates that there are causal links between them. Hence projectibility is the epistemic marker for the metaphysical relation of causality (Khalidi 2013: 80).

Behind this realism about natural kinds is a more general realist stance towards science. As Khalidi claims, 'once we adopt a realist stance towards science... we thereby accept that the categories that science devises in order to understand nature provide the best insight into the kinds that really exist' (Khalidi 2013: 65–66). Now the crucial question is: what justifies this 'realist stance towards science,' which allows Khalidi to proceed from the *projectibility* of natural kinds to their reality?

VI. Problems of Khalidi's natural kind realism

Khalidi does not explicitly put forward any concrete argument in justifying this 'realist stance towards science.' I think that the 'No Miracle' argument that is traditionally used to support scientific realism is most relevant here. The 'No Miracle' argument, as Stathis Psillos summarizes, contends that 'the impressive predictive and explanatory successes of scientific theories would remain unaccounted for, unless we accept that the entities, processes and causal mechanisms they posit to operate behind the phenomena are real' (Psillos 2005: xx). Natural kinds in Khalidi's account are exactly these entities posited by different scientific theories: they 'enter into new generalizations, are explanatorily fertile, and generate novel predictions' (Khalidi 2013: 44).

Providing a thorough assessment of the 'No Miracle' argument is beyond the scope of this paper. Yet, even if the 'No Miracle' argument is cogent, it is doubtful whether Khalidi can directly apply it to justify his realist stance towards natural kinds. According to the 'No Miracle' argument, the unobservable theoretical entities postulated by our best scientific theories cannot merely be our subjective projections onto the world. They

⁹ Dupré argues that theoretical groupings in science are no more 'natural' than prescientific or vernacular groupings found in ordinary discourse. By referring to classificatory practices in biology, Dupré contends that it is inaccurate to say that prescientific classifications are partial and subjective, while scientific classifications are impartial and objective. According to Dupré, the latter are no less anthropocentric than the former because there exists inescapable 'uncertainty about what constitutes the distinct existence of similar but related species' (Dupré 1993: 35–36). Thus any standard or criterion we use to classify things into kinds can only be chosen for practical reasons, such as human application (Dupré, 1993: 36). Moreover, due to the multifarious interests of scientists, scientific classifications fare no better than prescientific classifications in presenting a systematic, orderly picture of the world.

¹⁰ While projectibility is usually understood as a property of predicates, here projectibility designates an epistemic feature of natural kinds.

must correspond to an objective, mind-independent reality; for otherwise it would be impossible to explain the extraordinary success of our explanatory, inferential and predictive practices made possible by these theoretical posits. Therefore, the 'No Miracle' argument maps the real/unreal distinction onto the mind-independent/mind-dependent distinction. But once we allow kinds that depend on our own conceptualizations to be counted as real, as Khalidi does, we can no longer rely on this very distinction to account for the reality of natural kinds. So Khalidi owes us an argument as to why the epistemic feature of *projectibility* is sufficient to vindicate the reality of natural kinds.

In fact, the problem of Khalidi's realist account about natural kinds goes deeper. Apart from the issue of justification I have just pointed out, there are two other conceptual issues. These two conceptual issues are concerned with the notion of epistemic purposes, which is supposed to distinguish real kinds from unreal kinds in Khalidi's account.

First, it is difficult to separate the epistemic from the non-epistemic (Longino 1996; Kitcher 2001). Consider an investigation that aspires to discover the causal structure of the chemical world. While this is a legitimate epistemic purpose according to Khalidi, it is doubtful how this investigation, in order to accomplish its goal, can be isolated from other types of research in chemistry that are more practice-oriented, e.g., pharmaceutical or medical research. If 'epistemic purposes' are understood as those that 'aim to uncover the divisions that exist in nature,' then quite often fulfilling these 'epistemic purposes' is not an end but a means for us to advance other 'non-epistemic' goals, such as administering more efficient strategies or achieving better control over the external world. Indeed, research in chemistry is strongly driven by all sorts of application-related considerations. Furthermore, even securing such a 'purely epistemic' goal often requires practices that are embedded in a broader investigative context that is not free of non-epistemic or practical interests. For instance, Baetu indicates that the discovery of biological mechanisms 'involves the piecing together of experimental results from interventions' (Baetu 2016: 3311). While such interventions target multiple variables in a controlled fashion, they are chosen for their practical benefits instead of any abstract, purely epistemic purpose. Reydon (2016) also points out that classifications in actual scientific practice are multifarious, and it is the investigators who ultimately decide which criteria are adopted. Their decisions rely on the given investigative agenda, which is not necessarily 'epistemic' in the narrow sense described by Khalidi. For example, in the classification of gene types, scientists shift between different criteria such as sameness of locus in the genome, lineage of descent, or functional similarity, depending on what goal they try to achieve (Reydon 2016). These epistemic and non-epistemic agendas intertwine in scientific investigations, whether the investigators ultimately aim to fulfill epistemic or non-epistemic purposes. Thus it is unclear precisely where we should draw the line between the epistemic and the non-epistemic. More importantly, it is questionable which of these goals are prior to the other.

Second, even if we can stipulate such a distinction, confining epistemic purposes to tracking causal patterns does not seem to provide a complete picture of how classificatory practices are deployed in actual scientific investigations. In criticizing Laudan's (1984, 2004) distinction between epistemic and cognitive values or virtues, Reiss and Sprenger argues that '[n]eat distinctions between strictly truth-conducive and purely cognitive scientific values are hard to come by' (Reiss and Sprenger 2017). Some philosophers, such as McMullin (1982, 1996, 2014), similarly advocate a broader notion of 'epistemic values' based on the assumption that truth is not always the only goal of scientific inquiry; other goals, such as creating understanding, are also important. Likewise, Waters (2017) contends that scientists normally do not aim at answering questions such as 'what is a biological individual,' 'what is a gene'—questions that are, according to Khalidi, 'purely epistemic' and 'aim to secure knowledge of real features of the universe' (Khalidi 2013: 216). Should this be the case, Khalidi owes us a more refined definition as to what genuine natural kinds are, rather than just kinds aiming to serve 'epistemic purposes' or kinds being posited by scientific investigations. Yet, the precise challenge is whether such a definition can be formulated in sheer epistemic terms, given Khalidi's naturalist approach to natural kinds.¹¹

Interestingly, these two objections against Khalidi's account are not based on any monist assumption. Instead, they are anchored in a more radical version of taxonomic pluralism. Proponents of this radical version of pluralism contend that not only is it very difficult to draw a line between epistemic and non-epistemic

¹¹ I believe that the proposal of the second reviewer will face a similar challenge. As the second reviewer suggests, even if epistemic purposes are generally parasitic on interest-oriented, non-epistemic purposes, the 'causal-nexus' based realism championed by Khalidi is not thus disproved, for one may maintain that kinds endorsed by non-epistemic purposes can be reduced to genuine, real kinds, i.e., kinds endorsed by epistemic purposes. However, without a neat distinction of epistemic purposes and non-epistemic purposes, it is unclear how such a reduction is possible without appealing to any metaphysical principle.

goals, but it is also undesirable to do so. This is because even if we can successfully extricate the ‘epistemic’ from the ‘non-epistemic,’ confining realist import to groupings that aim to serve epistemic purposes presupposes too narrow a conception of what scientific investigations are. Thus, the real issue is not whether Khalidi could devise a more realistic way to characterize natural kinds without committing to epistemic purity, such as identifying natural kinds with groupings that intend to uncover causal structures of the world rather than statistical patterns.¹² According to the more radical pluralists, it is incorrect to say that genuine scientific classifications all aspire to a definite set of ‘epistemic purposes’ or they all aim to capture the causal structures of the world. Instead, we can only adequately assess a given classification by specifying the various contextual factors with which it is connected, such as the specific purposes it is supposed to serve. As Ereshefsky and Reydon put it, ‘though many philosophers are keen on science revealing the causal structure of the world, such enthusiasm for causality is far from universal among scientists’ (Ereshefsky and Reydon 2015: 974).¹³

VII. Boyd’s Radical Pluralist Account: ‘Accommodationism’

In identifying natural kinds as ‘nodes in causal networks’ (Khalidi 2013: 207), Khalidi deduces his pluralist conclusion by alluding to the fact that ‘there is no single causal template that fits all instances of natural kinds or relates natural kinds to their associated properties’ (Khalidi 2013: 80). Since different sciences seek explanations on different levels, it is unlikely that groupings posited by these different special sciences would all fit harmoniously into a single classification. Yet, as we have seen, scientists do not always aim at tracking causal patterns with their classifications. Thus if the naturalist approach to natural kinds is correct, there should be more natural kinds than groupings that stand for ‘nodes in causal networks,’ as Khalidi believes. In other words, Khalidi’s notion of *natural* kinds is too restrictive. Given his partial understanding of ‘epistemic purposes,’ Khalidi fails to acknowledge many genuine scientific groupings as natural kinds. So, if we accept that Khalidi is at least correct in drawing a pluralist conclusion from his restrictive notion of natural kinds, expanding the notion of natural kinds to include categories posited by classifications that do not aim at tracking causal patterns will probably result in a more radical version of taxonomic pluralism.

This radical version of taxonomic pluralism faces an immediate issue. Although it is unclear where we should draw the line between the epistemic and the non-epistemic, it is inadvisable for taxonomic pluralists to give up such distinction completely. As I mentioned before, taxonomic pluralism is not an ‘anything goes’ position. As an alternative not only to taxonomic monism but also to conventionalism, taxonomic pluralism upholds the conviction that some classifications are more *natural* than the other. Without any distinction between the epistemic and the non-epistemic (or a distinction of a similar sort), it is hard to see how we can provide an adequate answer to the question of *naturalness*. As Kellert et al. (2006) point out, an extreme pluralist position such as Dupré’s ‘promiscuous realism,’ which treats scientific and non-scientific classifications as equally correct, is basically indistinguishable from a relativist position.

So, how can this radical version of taxonomic pluralism be made viable; in other words, how can we reformulate the distinction between the epistemic and the non-epistemic without running into the same troubles of Khalidi’s account on the one hand, and without relapsing into complete conventionalism on the other hand? Perhaps the only way out is not to assume a hard and fast line between the epistemic and the non-epistemic (or any distinction of a similar sort) in the first place, but embrace a more flexible notion of *naturalness*. To examine the feasibility of this strategy, I will now turn to a leading example of this more radical version of taxonomic pluralism, namely the ‘accommodationist’ account of natural kinds Boyd has pursued and developed in the past 30 years.

Boyd argues that not only doesn’t mind-dependence conflict with the realism of natural kinds, but also, more importantly, ‘natural kinds and their definitions are discipline-or-practice relative and are thus not “mind independent”’ (Boyd 2019). As he indicates (Boyd 1999):

The lesson we should draw from the accommodation[ist] thesis is that the theory of natural kinds *just is* (nothing but) the theory of how accommodation is (sometimes) achieved between our linguistic, classificatory and inferential practices and the causal structure of the world. A natural kind

¹² The first reviewer raises this concern.

¹³ Ereshefsky and Reydon (2015) provide a useful example here. They point out that many of the empirical parameters scientists employ to group microbes together according to the Phylo-Phenetic Species Concept (PPSC) are not purely ‘epistemic’ (in Khalidi’s sense). These parameters, such as phenotypic and genotypic similarities, are not chosen for the sake of tracing the causal mechanisms underlying bacterial species. Instead, they are chosen because they allow ready and stable identification, which is crucial for scientific investigation. Interestingly, this is far from the exception, if we take into the consideration the fact that not only is PPSC the most widely accepted species concept in microbiology, but also that most living organisms are microbial.

just is the implementation, in language and in conceptual, experimental and inferential practice, of a (component of) a way of satisfying the accommodation demands of a disciplinary matrix. Natural kinds are features, not of the world outside our practice, but of the ways in which that practice engages with the rest of the world.

So in what sense are natural kinds, being mind-dependent (or practice-dependent), still real in Boyd's account? Boyd argues that although natural kinds are the 'workmanship of women and men,' it is incorrect to say that the boundaries between them 'are as Men, not as Nature makes them' (Locke 1690). On the contrary, Boyd suggests that 'accommodation' is 'bicameralist' in nature, as 'the (causal structure of the) world [also] plays a heavy legislative role' in the definition of natural kinds. Now the question is: what exactly is this relation of 'accommodation,' which is 'intended to capture the basic realist element in the naturalist realist conception of natural kinds' (Boyd 1999)?

Similar to Khalidi's, Boyd's realist account also capitalizes on the epistemic reliability of natural kinds in delivering successful scientific practices such as explanation, induction, and prediction. Thus, at its core, we find again a naturalist answer to the question of *naturalness*. While Khalidi, as we have seen, does not fully elucidate his 'realist stance' towards natural kinds, Boyd introduces the notion of 'accommodation' to account for why the epistemic reliability of natural kinds serves as a hallmark for their reality. According to Boyd, the naturalness of natural kinds 'consists in a certain accommodation between the relevant conceptual and classificatory practices and independently existing causal structures' (Boyd 1999).

Yet, for Boyd, 'accommodation' is not just a relation between natural kinds and the causal structure of the world. Instead, 'accommodation' designates a relation between the 'inferential architecture' of a given 'disciplinary matrix' and the relevant causal structures of the world.¹⁴ 'Inferential architecture' encompasses a wide range of activities in a scientific community such as perceptual, cognitive, behavioral, classificatory, and referencing practices. Moreover, an 'inferential architecture' is embedded in a 'disciplinary matrix,' which comprises 'a family of inductive and explanatory aims and practices, together with the conceptual resources and vocabulary within which they are implemented' (Boyd 1999: 7).

While it is difficult to neatly list out all the different components that constitute the inferential architecture of a given disciplinary matrix,¹⁵ the epistemic aims of a given disciplinary matrix play a key role in successful accommodation. In acknowledging that the classificatory practices in a disciplinary matrix are tied to the specific epistemic-scientific aims they may serve, Boyd's accommodationism at the same time abandons the view that these practices always aim to achieve a universal, 'pure' epistemic goal, such as tracking the causal patterns of the world, as Khalidi maintains. While a particular scientific-epistemic goal may determine what classification scientists would adopt in a given disciplinary matrix, what scientific-epistemic goals may deem reasonable or realistic also depends on what inferential and inductive resources are available in the disciplinary matrix in question. And of course, these resources are provided by the background theories that make up the disciplinary matrix.

As a result, Boyd adds a contextual spin to the notion of naturalness. In the 'accommodationist' framework, the *naturalness* of a kind is no longer determined exclusively by any single epistemic parameter such as *projectibility*. On the contrary, the naturalness of a given kind is 'relative to the role reference to it [i.e., a given natural kind] plays in a disciplinary matrix' (Boyd 1999).¹⁶ Thus although Boyd still refers to the *projectibility*

¹⁴ The term 'disciplinary matrix' is originated from Kuhn (2012). According to Kuhn, a disciplinary matrix of a given scientific community includes: (1) 'symbolic generalization,' i.e., 'formal or readily formalizable components of the disciplinary matrix' (Kuhn 2012: 182); (2) 'the metaphysical parts of paradigm,' i.e., 'beliefs in particular model,' which supplies the community with 'preferred or permissible analogies and metaphors' as well as determines 'what will be accepted as an explanation and as a puzzle-solution' (Kuhn 2012: 183); (3) 'values' such as accuracy, consistency, margin of permissible error (Kuhn 2012: 183), the application of which 'is sometimes considerably affected by the features of individual personality and biography that differentiate the members of the group' (Kuhn 2012: 185); and 'paradigm,' i.e., 'concrete problem-solutions that students encounter from the start of their scientific education' (Kuhn 2012: 186).

¹⁵ In fact, Boyd also admits, 'accommodation covers cases of the epistemically valuable hunches and trained methodological judgments that you go to graduate school to acquire (the inexplicit parts of what Kuhn calls "paradigms")' (Boyd 2019).

¹⁶ It is worth quoting the passage in length (Boyd 1999: emphasis original),

Thus the fundamental notion in the theory of theoretical natural kinds is not the notion of such a kind, *simpliciter*, but instead the notion of a kind's being natural with respect to a particular *inferential architecture*. When we talk simply of a natural kind, or of natural kinds generally, there is either tacit reference to some inferential architecture or tacit quantification over some domain of them. At least in the case of natural kinds in the sciences, that inferential architecture can best be thought of as being provided by a *disciplinary matrix*: a family of inductive and explanatory aims and practices, together with the conceptual resources and vocabulary within which they are implemented. The naturalness of a scientific natural kind is relative to the role reference to it plays in a disciplinary matrix.

of natural kinds in explicating their epistemic reliability in a given disciplinary matrix, his accommodationist framework actually entails a more radical pluralist picture than Khalidi's account. Even if *projectibility* may be regarded as a crucial feature of scientific categories in general, different disciplinary matrices are going to posit different sets of scientific categories. This is because, given their unique epistemic agendas, different disciplinary matrices are likely to endorse different standards of *projectibility*. Hence, natural kinds are disciplinary-oriented. As Boyd puts it, '[n]atural kinds in chemistry need not be natural kinds in geography' (Boyd 2019).

All in all, Boyd's accommodationist account of natural kinds provides a blueprint for the more radical version of taxonomic pluralism I mentioned above. This is because, taking into consideration the multifarious epistemic aims of scientific classifications, it embraces a more flexible reading concerning the epistemic role of natural kinds. Indeed, this contextual reading of the *naturalness* of natural kinds also offers a more accurate and realistic picture of classificatory practices in natural science than the modest pluralist account put forward by Khalidi. But the question is: does it yield a *realist* account of natural kinds?

VIII. Problems of Boyd's Natural Kind Realism

As we have seen, for Boyd, scientific categories are part of a more encompassing 'inferential architecture.' Moreover, 'inferential architecture' is disciplinary-oriented. Under these two presumptions, the realism of natural kinds should not be construed in terms of a direct relation between natural kinds and the divisions of the world (or 'nodes in causal networks,' as suggested by Khalidi). On the contrary, according to Boyd's 'accommodationism,' the relation between our scientific categories and the world is mediated by the 'disciplinary matrix' these categories belong to. As Boyd puts it, 'questions about the reality of (alleged) natural kinds should always be understood as questions about the suitability of those kinds for induction and explanation *in particular disciplinary matrices*' (Boyd 2010: 222 original emphasis). Whether our scientific categories 'fit' the relevant causal structures of the world depends on various factors of a given disciplinary matrix, such as the scientific-epistemic aims of the disciplinary matrix, the inferential resources available, and the methodological standards adopted by the scientific community in question. As Boyd repeatedly points out, the judgment of *projectibility* of our scientific categories, or more generally, the degree of accommodation between an 'inferential architecture' and the relevant causal structures of the world, irretrievably depends on the background theories that make up the disciplinary matrix in question (Boyd 1989, 1990, 2010, 2019).

With the mediation of a disciplinary matrix, it seems that successful 'accommodation' of its inferential architecture to the relevant causal structures does not require scientific categories to correctly represent the causal structures in question. In other words, 'accommodation' may not be truth-indicative. For instance, although direct correspondence between the scientific categories of a given disciplinary matrix and the divisions of the world is likely to increase the degree of accommodation of its inferential architecture to the relevant causal structures, it is by no means necessary for successful accommodation.¹⁷ As Boyd suggests:

The key idea is that successful reference to natural kinds is a special case of epistemically fruitful alignment or *accommodation* between perceptual, instrumental, cognitive, and representational practices, on the one hand, and inductively, practically or explanatorily relevant causal features of the world.

It is not surprising that successful 'accommodation' would tolerate non-referring terms and concepts. In fact, such tolerance is necessary. As we have seen, Boyd's 'accommodationism' recognizes a more liberal notion of epistemic aims than Khalidi's account. For Boyd, such epistemic aims are not confined to tracking the causal patterns of the world, as Khalidi believes. There is no reason to assume that accomplishing aims that fall under this more liberal notion of epistemic aims always requires our scientific categories to represent the causal structures of the world, or stand for 'nodes in causal networks.' Indeed, what 'structures of the world' are we talking about here, when there is no particular structure these classifications aim to capture?¹⁸

¹⁷ Boyd uses the German 'idealist morphology' as a historical example. According to Boyd, although many details of the German 'idealist morphology' (e.g., the Hegelian idealist conceptions of beings) were 'laden with non-referring idealist terms and concepts, and so lacked truth conditions altogether,'" the theory still contributed to the development of evolutionary thought, which is essentially naturalistic and materialistic (Boyd 2019). This is because in their own disciplinary matrix, these 'non-referring idealist terms and concepts' enable the accommodation of the scientists' inferential practices to biologically important causal phenomena.

¹⁸ Let us consider the Phylo-Phenetic Species Concept (PPSC) in microbiology as an example again. As Ereshefsky and Reydon suggests, classification according to the PPSC is not intended to trace the causal mechanisms of the world. It is chosen because it allows ready and stable identification of microbiological species. Of course, this is not to say that the causal mechanisms of the world are not involved to make possible such ready and stable identification, as Boyd (2019) points out in his defense against the criticism

Indeed, once we allow epistemic agendas that do not aim at uncovering the causal structures of the world to bear on the *naturalness* of scientific categories, ‘accommodation’ or ‘fit’ can at most signify the *world-dependence* aspect of these categories. Therefore, Boyd contends that we need a ‘broader conception of accommodation and representation.’ Moreover, Boyd believes that this ‘broader conception of accommodation and representation,’ in treating ‘reference, partial denotation and truth as special cases of accommodation[,] affords realists a more promising option’ (Boyd 2019).

However, it is unclear whether this ‘broader conception of accommodation and representation’ really affords a *realist* option for taxonomic pluralism. If successful ‘accommodation’ does not require kind terms to have a reference—worse still, if successful ‘accommodation’ sometimes even depends on empty kind terms, then it seems that many superseded or obsolete scientific frameworks, such as the phlogiston theory, the caloric theory of heat, and the luminiferous aether theory of light, can be regarded as examples of successful accommodation. Despite the fact that kind terms like ‘phlogiston,’ ‘caloric,’ and ‘aether’ do not refer, they do contribute significantly to successful inferential practices in their own contexts of inquiries or disciplinary matrices. Yet, no natural kind realist would be happy to admit that kinds like *phlogiston*, *caloric*, and *aether* are *real* kinds. If, according to ‘accommodationism,’ scientific categories that contribute to the accommodation of the inferential architecture to the relevant causal structures of the world are not necessarily real kinds, then ‘accommodationism’ fails to provide a defensible distinction between real kinds and non-real kinds. However, this distinction is crucial to natural kind realism.

My doubt here is not whether the epistemic reliability of our scientific groupings is sufficient to vindicate that they ‘accommodate’ to the relevant causal structures of the world. Nor am I complaining that a sort of ‘relativism’ may creep in when the door is opened to multifarious epistemic aims and interests. These *epistemic* issues are, of course, important. The problem I am concerned with is whether the scientific categories of an inferential architecture that ‘accommodates’ the relevant causal structures of the world would reliably tell us anything about such structures, given that such structures are supposed to play a ‘heavy legislative role’ in a relation of ‘accommodation,’ as the ‘bicameralist’ thesis suggests.¹⁹ Again, as is in my objections to Khalidi’s pluralist account, my more deep-seated worry about Boyd’s ‘accommodationism’ is a *conceptual* one: does ‘accommodation’ secure a tenable distinction between realism and anti-realism about natural kinds?

IX. What is Natural Kind Realism?

In order to understand why Boyd’s ‘accommodationism’ fails to provide a defensible distinction between realism and anti-realism about natural kinds, first we need to be clear about what a natural kind realist should be *realist* about.²⁰ Consider the debate between moral realists and expressivists. The former believe that there are moral facts that govern whether moral judgments (e.g., *killing is wrong*) are true or not. The latter, being anti-realist about moral facts, contend that moral judgments only express the attitudes of moral agents. Nevertheless, even though expressivists deny that there are moral facts that determine the truth-value of moral judgments, they can still maintain that there are facts of the matter concerning the moral attitude conveyed in a given moral judgment. For example, moral expressivists can debate whether someone, in claiming that ‘killing is wrong,’ *really* holds a disapproving stance towards the act of killing (Fine 2001: 23). But this by no means implies that moral expressivists are *realists* about moral facts, such as *killing is wrong*. A similar situation can be found in the debate concerning the ontological status of mental properties such as phenomenal qualia. Although physicalists would admit that there are facts of one’s neurophysiological states in determining whether one is in a particular mental state or not, it is mistaken to conclude that they are as realist as property dualists about phenomenal qualia.

of Ereshefsky and Reydon (2015). Yet, if Ereshefsky and Reydon are correct about the motivation of the PPSC classification, then it would be mistaken to regard the PPSC categories as standing for the relevant causal structures.

¹⁹ It should also be noted that my complaint here does not assume that the reality of scientific categories can only be vindicated when they directly correspond to the natural-kinds structures of the world. In dismissing mind-independence as a criterion for the reality of natural kinds, we should not appeal to direct correspondence as a reference for their reality. Indeed, as Boyd indicates, one advantage of the accommodationist framework is that it avoids the ‘idealist (or theistic) metaphysics involving something like a pre-established harmony between human thought and other features of the world’ (Boyd 2019), which is commonly assumed in the mind-independence reading of reality.

²⁰ Interestingly, in an earlier writing on scientific realism entitled “‘Realism, Conventionality and ‘Realism about’” (before he formulated his ‘accommodationist’ account of natural kinds), Boyd has already proposed a ‘realist’ account that is very tolerant to reference failure, as he writes,

the realist, in portraying methodologically central theories as relevantly approximately true, need not treat all of their constituent terms as (even partially) referring. What she must do is to portray them as being approximately true in respects suitable to explain the reliability of the methods they underwrite (Boyd 1990: 187).

It is therefore unclear to what extent Boyd's account is truly realist about *natural kinds* when he writes the following in explaining why natural kinds and their definitions are real, despite being construed as discipline-or-practice relative:

In theories about the cognitive, perceptual and behavioral ecology of other species, like Belding's ground squirrels and vervet monkeys, no departure from realism is implicated by reference to the cognitive, perceptual or motivational states of the organisms in question. The organisms and their cognitive, perceptual or motivational states are real and causally efficacious so there's nothing anti-realist about referring to them. The same is true for any theory about the human case...

Brigandt also espoused a similar 'realist' stance in his account of biological species taxa, which is based on Boyd's Homeostatic Property Cluster (HPC) theory of natural kinds (Brigandt 2009: 86):

[T]he HPC... view agree[s] in endorsing some sort of realism about taxa, at least species taxa. Natural kinds are assemblies of objects that are grouped according to properties that actually exist in nature, so that the boundary and unity of a natural kind are not conventional.

Nevertheless, even if it is true that our 'cognitive, perceptual or motivational states are real' and things are 'grouped according to properties that actually exist in nature,' it still does not mean that the categories posited by the classification in question are real. Otherwise, we have to admit that kinds like *phlogiston*, *caloric* and *aether* are real as well, for many of the observational features that were once believed to confirm the reality of these unreal kinds, e.g., combustion, weight, temperature, as well as propagation of light, are *real* as well. Therefore, if this is what realism is all about in Boyd's 'accommodationism,' then successful 'accommodation' at most signifies that the groupings in question are world-dependent. Yet, the feature of world-dependence is by no means sufficient to differentiate real kinds from unreal kinds.

Why? This is because an anti-realist would not concede that since theoretical groupings are not real, they are all based on 'unreal' properties or properties that do not exist in nature. An anti-realist can agree, on the one hand, that some groupings are more natural than the others, and on the other hand, that these natural groupings are based on real properties, without at the same time assigning any privileged ontological status to these groupings. Having individuals grouped together according to properties they actually possess is one thing; how these properties are selected in constructing a classification is another thing. Thus, one can be a realist about properties without being a realist about *kinds*, just as one can be a realist about particulars or tropes, without at the same time being a realist about universals.²¹

The realist commitment captured by Boyd's 'accommodationism' is therefore trivial: the world has certain causal structures, and our theoretical groupings are successful because they 'accommodate' to the relevant causal structures. Yet just by saying that there exists such a relation between our scientific classifications and the relevant causal structures of the world, without explicating what this relation is, Boyd's 'accommodationism' is not robust enough to capture a realist position about *natural kinds*. As Chakravartty points out, a 'significantly more robust (and resultantly, more plausible) understanding of realism' requires more than just 'Ramsey-sentence realism' (Chakravartty 2011: 167).²²

Indeed, natural kind realism is not only concerned with whether our natural classifications have a real basis, but what that basis *is*. Being a realist about a kind *K* is more than just being a realist about the individual members of *K* or being a realist about the properties according to which these individuals are being grouped together into *K*. What is crucial is whether there is a *real* basis for selecting a particular set of properties that determines the membership in *K*. Whether we are going to agree with the details of Mill's account of natural kinds, his formulation is illuminating here. As Mill (1858) points out, apart from encompassing a wide range of common features, a natural kind should also identify properties that are the causes of these common features, i.e., properties in virtue of which members of that kind regularly possess these common features. Consider the kind *white cubic thing*. Even it groups things according to 'properties that

²¹ It may appear that I am sympathetic to substantial kind universals in addition to property universals, as proposed by Lowe (2006). Yet, this question of *kindhood*, i.e., what ontological category do natural kinds belong to, is not what I am concerned with here. I remain open to whether natural kinds are sets, complex universals, or substantial kind universals.

²² Take the Ramsey sentence of a theory *T* as: $\exists x_1, \dots, x_n T[x_1, \dots, x_n]$. The Ramsey sentence suggests that the given theory *T* is actually realized by the *n*-tuple of entities denoted by the theoretical terms it postulates. Thus we can rewrite *T* as $T[\tau_1, \dots, \tau_n]$, with the occurrence of the theoretical terms (i.e., τ_1, \dots, τ_n) posited by the theory in question. Accordingly, Ramsey-sentence realism merely states that the theoretical entities postulated by *T* are real, without specifying what they are. But it is precisely with the question of what these theoretical entities are that *natural kind realism* is concerned.

actually exist in nature,' namely *being white in color* and *being cubic in shape*, we are not going to admit that the grouping *white cubic thing* is a real kind. This is because there does not seem to exist any real linkage between the two properties in question, namely *being white in color* and *being cubic in shape*.²³

After all, realists about natural kinds are not engaging in a debate with idealists. The philosophical debate between realists and anti-realists about natural kinds would still arise even among theorists who concur on the reality of the world, or the reality of its causal structures. Indeed, in the context of this discussion, the reality of the world as well as its causal structure(s), are taken for granted; as Boyd repeatedly points out, accommodation is a relation between our inferential architecture and the 'independently existing causal structures.' The debate between realists and anti-realists about natural kinds should be concerned with a more specific question, namely whether or not *natural kinds*, understood as categories that underwrite successful scientific practices, are real. Thus to be realist about natural kinds is not just to uphold that natural kinds are world-dependent, but also to uphold that natural kinds are *real*. In this regard, Boyd's 'accommodationism' fails to provide an adequate characterization of this realist commitment.

Perhaps this failure is an inevitable outcome when we adopt a naturalist answer to the question of *naturalness*, which identifies natural kinds as groupings that underwrite successful scientific practices such as explanation, induction, and prediction. Yet, taking into consideration the manifold epistemic aims scientists try to accomplish in different investigative contexts, pluralists have to adopt a liberal notion of natural kinds. It seems that, as a consequence, pluralists also have to adopt a liberal notion of reality. As we have seen, such a liberal notion of reality is not robust enough to distinguish real kinds from unreal kinds. If this turns out to be the case, however, then pluralists should embrace anti-realism about natural kinds, instead of a deflationary notion of realism.

X. Conclusion

To conclude, let me summarize the inherent tension between the naturalist stance and the realist stance towards natural kinds adopted by pluralists. Recall that pluralists are dissatisfied with the approach taken by monists, as monists attempt to draw a metaphysical distinction between natural and non-natural kinds. On the contrary, pluralists adopt a naturalist approach that focuses on the epistemic significance of natural kinds, as informed by empirical findings. However, this naturalist approach fails to replace the mind-independence criterion of reality in the monist approach with a criterion of reality robust enough to differentiate pluralism from anti-realism about natural kinds.

Focusing on the epistemic aspects of natural kinds, pluralists (correctly, I believe) separate the question of *naturalness* from the question of *reality*. They rightly point out that naturalness here should be construed in terms of the epistemic significance of natural kinds in scientific research, which is a purely empirical matter. However, the same empirical consideration that answers the question of *naturalness* should not be used to answer the question of *reality*; for in a genuine realist account of natural kinds, the latter is supposed to ground the former. Hence, a substantial metaphysical commitment is called for if pluralists want to remain realist about natural kinds. This is the inherent tension that exists between the anti-metaphysical, naturalist stance taken by taxonomic pluralists and their natural kind realism.

So what implication does my critique of taxonomic pluralism have for the debate between natural kind essentialism and natural kind anti-essentialism? Recall that pluralism is an anti-essentialist position, since natural kind essentialism entails taxonomic monism. So if I am correct in showing that the realist commitment of pluralism is far from satisfactory, then anti-essentialists about natural kinds are left with two options. Either they should give up natural kind realism and endorse conventionalism, or they should embrace monism. Nevertheless, such monism does not appear to be plausible. For how can there be only one correct classification, which is grounded in real kinds, without these kinds being defined by essences?²⁴ The burden of proof is on anti-essentialists to demonstrate why taxonomic monism without essentialism is more defensible than essentialism itself.

²³ I want to clarify two points here. First, although it is unlikely that the grouping *white cubic thing* would turn out to be a natural kind, it is still a kind. This is because it represents a collection of things being grouped together according to its two associated properties, namely *being white in color* and *being cubic in shape*. Second, what I try to show here is not that the grouping *white cubic thing* is not a natural kind or that it is not a real kind. Instead, the point I am driving at is that even though its two associated properties (again, *being white in color* and *being cubic in shape*) are real, they are still not *sufficient* to vindicate the reality of the *kind* itself.

²⁴ As the second reviewer rightly points out, philosophers who advocate for a taxonomy that is carved-up by phylogenetic relations, without seeing such generative descent relations as (intrinsic) essences, can be monists as well. I therefore leave it open as to whether essence should be understood as microstructural constitution, as Locke asserts, or as form in Aristotle's doctrine of hylomorphism, or as historical essence, as advocated by proponents of 'new-essentialism' in the philosophy of biology with regard to essence of a given biological species.

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