# Pluralism is the Answer! What is the Question?

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This essay provides a critical assessment of species pluralism, a popular strategy to explain the discordance characterizing contemporary systematics. Specifically, my aim is to present and scrutinize species pluralism, and to discuss whether it provides a fruitful concept in biology. The article begins by distinguishing two independent theses often associated with pluralism: 'heterogeneity' and 'theory dependence.' Next, it examines how these theses have been developed in the scientific and philosophical literature. I conclude by suggesting that the overarching expression 'species pluralism' be dropped in favor of more perspicuous labels.

**Keywords**

species problem • species pluralism • species eliminativism • heterogeneity • theory-dependence • individuality thesis

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## 1 Introduction

The 'species problem' can be characterized, to a first approximation, as the task of providing a viable species concept (or concepts)—that is, a functional analysis that picks out the 'right' kind of biological entities. After decades of debate and centuries of taxonomic practice, no overarching consensus has been reached. The individuation and definition of the units of evolution and classification, species included, remains controversial. If anything, there now seems to be more disagreement than ever before.

The rationale for this ever-increasing discordance is certainly not lack of either effort or data. Obviously, a comprehensive understanding of the biological world is still wanting. However, we now know more about the ontogeny and phylogeny of organisms than we ever did. What makes the species problem puzzling, from a philosophical perspective, is its conceptual trajectory. Instead of gradually converging towards consilience, scientific progress seems to foster the production of dissonance. What is going on?

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This essay has little to say about the source of said disagreement, an important issue that transcends both my interest and professional competence. The focus is rather on a popular strategy for explaining this deluge of seemingly discordant data, thereby providing a viable solution to the species problem. The approach in question encompasses a family of views that can be grouped under the moniker 'species pluralism.' As we shall see, this expression is employed frequently but has not acquired univocal meaning.

The chief aims of this article are to present and scrutinize species pluralism, distill some of its scientific implications, and discuss whether and how it advances the study of species in our 'age of discordance.' Accordingly, the essay is divided into three main sections. To begin, §2 introduces two related theses that, despite being often conflated under the aegis of pluralism, should be clearly distinguished: heterogeneity and theory dependence. Next, §3 focuses on how these two theses have been incorporated into various influential stances regarding the nature and classification of species: second-order pluralism, eliminativism, and pragmatism. Finally, §4 concludes the discussion by suggesting that we drop the overarching expression 'species pluralism' in favor of perspicuous labels denoting more precise tenets.

## 2 Heterogeneity or Theory-Dependence?

The term 'pluralism' is frequently encountered in the literature on species, both biological and philosophical. Yet, the concept figures in various contexts. As such, it assumes different meanings and involves diverging presuppositions. Some caution is thus recommended in presenting the idea. In particular, two related but conceptually independent strands of pluralism should be unraveled (Mishler and Brandon 1987; Boyd 1999; Hey 2006).

First, species pluralism is sometimes identified with the opposite of what Hull (1997) calls 'species universalism.' The result is the claim that various kinds of species are present in nature. A plurality of species concepts may thus be required to reflect and account for this diversity. In a recent paper (Nathan and Cracraft, forthcoming), I dub this thesis *heterogeneity* since it makes the species category 'heterogeneous,' in the sense that it encompasses multiple types of species taxa, likely produced by a number of phenomena.

A clear illustration of heterogeneity in action is provided by traditional applications of the biological species concept (BSC). According to one well-known formulation, "*species are groups of interbreeding natural populations that are reproductively isolated from other such groups*" (Mayr 1996, 264). An evident feature of this definition is that it only applies to sexually reproducing organisms. What about asexual ones? Do they not constitute species? Mayr himself was never adamant on this score. Still, let us follow taxonomic consensus and assume that they do (Doolittle and Papke 2006). This being so, either we revise Mayr's definition so as to include bacteria, or these and other asexual organisms must be classified into species according to some concept other than the BSC. Whether the alternative criterion should be phylogenetic, genetic, morphological, ecological, a hybrid, or something altogether different is an important question that I set to the side. The important point, for present purposes, is that proponents of the BSC in its classic guise, who also acknowledge the existence of asexual species will, *ipso facto*, recognize the existence of at least two kinds of species, each with its own concept or definition. *Ecce* the heterogeneity of the species category.

Biologists commonly label the heterogeneity just presented as pluralism. For instance, in a section entitled "Some Consequences of Pluralism," Mishler and Donoghue (1982, 500) suggest that "a variety of species concepts are necessary to adequately capture the complexity of variation patterns in nature. To subsume this variation under the rubric of any one concept leads to confusion and tends to obscure important evolutionary questions." This flat identification of

pluralism and heterogeneity is dangerous because it obscures the distinction between what I referred to as 'heterogeneity' and a different pluralistic stance, which is independent of whether, say, prokaryotes and eukaryotes can be subsumed under the same species definition.

This second thesis involves a commitment to the claim that the assignment of species-level taxa is always relative to a theory, explanatory aim, or classificatory purpose. For this reason, let us call this strand of pluralism *theory dependence*. This is a common way of cashing out species pluralism in the philosophical literature (Boyd 1999), which has found its most systematic articulation and defense in Dupré (1981, 1999) and Kitcher (1984a, 1984b).

The core of theory-dependence is the idea that assignments of taxa crucially depend on both the organisms and processes in question and on the explanatory target at hand. It follows from this assumption that there is no uniquely correct, objective, or 'natural' way of grouping organisms into species or any other rank. Rather, a variety of classificatory schemes will best be suited to the various theoretical and practical purposes of biology.

Let me clarify the main features of heterogeneity and theory dependence, by stressing three points that are sometimes overlooked.

First, theory-dependence is conceptually distinct from heterogeneity, and it is a more radical tenet. The reason is that heterogeneity is, in principle, consistent with the existence of a single correct way of clustering populations into species. The theory-dependence presented above, in contrast, overtly rejects the idea of uniquely correct standards for grouping individuals into taxa. To be clear, this does not make the two theses incompatible. Various authors endorse both heterogeneity and theory-dependence. Yet, these two tenets do not come as a package and should thus not be conflated.

Second, neither strand of pluralism implies a relativistic 'anything goes' demeanor or a complete relinquishment of objectivity. Relativizing the classification of species (or any other biological rank) to particular inquiries is consistent with the existence of independent reasons for privileging some theoretical goals over others. This might lead one to adopt the concept posited in such frameworks over alternative definitions (Dupré 1981; Kitcher 1989).

Third, as Hull (1999, 25) notes, "One reason why philosophers find the monism-pluralism debate so interesting is its apparent connection to the dispute over realism and antirealism. Of the four possible combinations of these philosophical positions, two seem quite natural: monism combined with realism, and pluralism combined with antirealism." In my opinion, connecting these two debates is a mistake. For one, while some authors have indeed defended an anti-realist version of pluralism (Stanford 1995; Ereshefsky 1998; Devitt 2009), others have merged pluralism with realism (Kitcher 1984b; Dupré 1993, 1999; Boyd 1999; Wilkins 2003; Slater 2013). *Pace* Hull, neither combination seems more 'natural.' There is reason for this. Realism, in and of itself, is a position that bears little ontological commitment (Nathan and Cracraft, forthcoming). Virtually anything can be—and has been—dubbed as 'real,' including abstract, fictional, and framework-dependent entities. This being so, it is hardly surprising that the 'reality' of species, is compatible with monism and with pluralism, in both the heterogeneity and theory-dependent-varieties. In short, the monism vs. pluralism and the realism vs. antirealism debates are orthogonal to each other. Clearly, there is nothing wrong with combining these stances. The point is simply that these positions are conceptually independent of each other.

In sum, this section has drawn a distinction between two versions of species pluralism: heterogeneity and theory-dependence. What implications do these tenets have for philosophical theory and biological practice? The following section discusses how these ideas have been implemented in the specialized literature. Finally, §4 sketches a general constructive proposal.

## 3 Pluralistic Themes in the Species Literature

How have our two varieties of pluralism—heterogeneity and theory-dependence—been developed and applied to contemporary debates on the nature of species and the methodology of systematics? Answering this question is our next goal. To be sure, providing a comprehensive overview of the gargantuan biological and philosophical literature dedicated to species transcends the scope of this essay. For the sake of brevity, I restrict my attention to three topics. While I conjecture that analogous conclusions can be drawn from related approaches, I shall not defend this generalized thesis here.

### *3.1 Second-Order Species Pluralism*

Over the last few decades, the number of species concepts advanced in the specialized literature has soared (Zachos 2016; Wilkins 2018). Is there a way of organizing alternative definitions in a coherent fashion? An influential proposal consists in arguing that these concepts can all be equally correct from a metaphysical standpoint, reducing the relevant differences to an epistemic perspective. This approach results in the reconciliation of monism, at a bedrock ontological level, with a 'second-order' pluralism supposed to capture variety in taxonomic practice.

A notable instance of this strategy can be found in Mayden (1997), who develops Mayr's (1957) distinction between 'primary' and 'secondary' species concepts. A primary species concept is a definition that identifies the most fundamental properties of all entities belonging to the species category. According to Mayden, the best candidate is the *evolutionary species concept* that, in its most basic form, characterizes species as evolutionary units. All other species concepts are 'secondary,' that is, operational tools or definitional guidelines that can be used to discover species in practice, in accordance with the primary definition. In short, at the fundamental ontological level, species are evolutionary units. All other definitions are epistemic constructs, various alternative ways of classifying these units.

A similar proposal provides the foundation of De Queiroz's (1999, 2005) *metapopulation lineage concept*, which considers species to be segments of population-level evolutionary lineages. The core idea is that all species are separately evolving metapopulation lineages. This is the only essential property that characterizes species. All other concepts, De Queiroz (2005, 6605) argues, pick out contingent properties that "species as metapopulation lineages may or may not acquire during the course of their existence."

Mayden and de Queiroz's reconciliation of 'first-order' monism with 'second-order' pluralism of species concepts purports to salvage—and, indeed, to explain—the ongoing discordance in taxonomic practice, while maintaining consistency at the ontological level. This approach is not devoid of controversy. Are all species definitions really consistent with species being evolutionary units or meta-population lineages? What justifies treating a species concept as 'primary' or 'secondary'? What is the relation between these kinds of concepts? Does this provide a viable solution to the species problem? I set these questions aside and focus on the relation between second-order pluralism and the two strands of pluralism identified above.

First, if at the most fundamental level species are evolutionary units (as Mayden suggests) or meta-population lineages (as per de Queiroz), then their nature is not theory-dependent. Sure, their secondary attributes, their contingent properties, might depend on the specific inquiry at hand. But, the essential character of species does not change based on theory. Allow me to elaborate. As made explicit by Hull (1976), 'species' is a biological concept that must be understood within the context of evolutionary theory. However, this bare-bones form of theory-dependence hardly does justice to the insights of species pluralists, who maintain that there are several ways of conceptualizing species *within* the evolutionary framework itself.

Next, consider heterogeneity. If species are essentially evolutionary units, lineages, or both, then the species category is perfectly homogeneous, as this is the defining feature of all species. To be clear, second-order pluralism *per se* does not rule out all forms of heterogeneity. For instance, de Queiroz recognizes a plurality of ontological mechanisms for speciation, that is, multiple ways of becoming an evolving lineage. (I am grateful to an anonymous reviewer for bringing this to my attention.) Yet, this does not undermine the basic metaphysical monism that characterizes the position.

Cut the pie any way you like it, if pluralism is conceived in opposition to monism, then 'second-order pluralism' is not much of a pluralism after all.

### *3.2 Species Eliminativism*

A different take on species, also commonly associated with pluralism, falls under the moniker 'eliminativism.' This, broadly speaking, is the view that species do not constitute a privileged rank in the Linnean hierarchy or—on more radical interpretations—that species does not constitute a rank at all.

Species eliminativism comes in various forms. An influential variety has been articulated by Mishler (1999). His point of departure is the observation that, instead of converging towards consilience, the literature on species is witnessing an increasing proliferation of concepts. Rather than reeling in this discordance along the lines suggested by Mayden and de Queiroz, Mishler follows a different route. He diagnoses the current stall as the result of heroic-albeit-doomed attempts to shoehorn variation into an outdated and ultimately misguided classification system: the ranked Linnean hierarchy. More specifically, Mishler recognizes the presence of various, oft competing organizing principles in biology. However, he insists that the Linnean hierarchy be ordered according to a single, consistent, and general reference system. Following Hennig's pioneering insights, classification ought to be based on phylogeny. Formal nomenclature should solely be used to represent monophyletic groups purporting to reconstruct branching order. Now, surely, rank-free taxonomy is a popular strategy among contemporary systematists. Yet, most advocates of rank-free phylogenetic nomenclature wish to retain the species rank as a special case (Dayrat et al. 2008), because of its deep entrenchment in scientific and pre-scientific thinking. Mishler suggests that we take an additional step and eliminate the species rank with all the others. Biological classification should become a set of inter-nested clades named, if need be the case, on the basis of evidence for monophyly. In a nutshell. there is nothing special about species (Cellinese, Baum, and Mishler 2012). They are no different from other ranks and, consequently, they all stand or fall together. If other ranks are eliminated, species go as well.

A similar conclusion is advocated by Ereshefsky's 'eliminative pluralism':

> The forces of evolution produce at least three different types of basal lineages (interbreeding, ecological, and monophyletic) that cross-classify the organic world. Each of these lineages is equally important in the evolution of life on this planet. Moreover, according to current biological thinking, there is no fourth parameter to which these types of lineages can be reduced. Consequently, the tree of life on this planet is segmented into a plurality of incompatible but equally legitimate taxonomies. (Ereshefsky 1992, 679)

The 'eliminative' component of this form of heterogeneity is further clarified in a later publication, which concludes by suggesting that:

> The existence of the species category has come under attack on a number of fronts, and the Linnean rules for naming taxa have become more of a hindrance than a help (…) [These considerations] warrant a serious review of the continued use of the species category and its associated rule of nomenclature. Biological theory has changed drastically over the last two hundred years. Perhaps it is time we changed the way we represent the organic world. (Ereshefsky 1999, 302)

Mishler and Ereshefsky's provocative proposals have spurred interesting debates (Barker 2017). My present concern, once again, is their relation to the strands of pluralism outlined above. Theory-dependence is clearly not part of the equation. Indeed, both authors are adamant in rejecting, for different reasons, the stance presented as 'species pragmatism' in §3.3 below. This leaves heterogeneity, which does indeed seem to play an important role in Ereshefsky's argument: "[A]s things now stand in biology, we have no reason to believe that a monistic definition is on the horizon. In fact, we have every reason to believe that the species category will remain heterogeneous" (Ereshefsky 1999, 294). The question is whether this commitment to heterogeneity makes 'eliminative pluralism' a kind of species pluralism at all. There are reasons to be skeptical. If we are going to be eliminativists about the species category then, *ipso facto*, there seems to be no need to be pluralists about species. Indeed, as Ereshefsky (1992, 688) himself puts it, in his concluding remarks, "Some may view eliminative pluralism as just a complicated form of monism. If that is the case, then the arguments of this paper have been successful." Eliminative pluralism is no species pluralism.

### *3.3 Species Pragmatism*

Finally, we get to a position that builds upon the theory-dependence strand of pluralism. This encompasses a family of views, which I dub 'species pragmatism.' Contrary to the eliminativism presented above, pragmatism retains the centrality of species in biology. Yet, according to pragmatists, all classifications of organisms into species are relativized to a particular inquiry, theory, aim, or discourse. This claim requires elucidation. What does it mean to assert the 'theory-dependence' of species? As noted, virtually all scientific entities are theory-dependent, in some sense or another. Pragmatism takes this platitude to the extreme. There are two main readings of the claim, an epistemic and an ontological one. Let's consider them in turn.

The epistemic route has been explored by Kitcher (1984b), who claims that "The species category is heterogeneous because there are two main approaches to the demarcation of species taxa and within each of these approaches there are several legitimate variations" (309). The first approach encompasses 'structural' definitions, which require that conspecific organisms share significant functional similarities. The second approach involves historical or phylogenetic definitions, which characterize species as genealogical entities. However, heterogeneity is only part of Kitcher's proposal and not the controversial one. This would be his 'pluralistic realism' according to which "different views of species may be produced by different biological priorities" (324). It is in this sense that species are theory-dependent: the classification of organisms into species follows from the inquiry at hand.

The reason I dub Kitcher's pragmatism 'epistemic' is that his main concerns are not ontological, but methodological. To wit, his target, in a later publication, becomes Ghiselin and Hull's individuality thesis, understood as a metaphysical claim. In contrast, he maintains that "all of our discourse about evolution can be reconstructed equally well within set theory or within mereology" (Kitcher 1989, 185). This proposal is provocative and controversial (Haber 2016a). Is individuality an epistemic thesis about the representation of species? Can we reconstruct all evolutionary concepts in set-theoretic terms without significant loss of meaning? What evidence

do we have that such reformulations of evolution are even possible? Allow me to set these interesting issues aside. This is because Kitcher's epistemic pragmatism, thus construed, is not a solution to the species problem, as traditionally understood. His species pluralism does not tell us what species are. Rather, it reconstructs their contribution to biological knowledge.

A similar, more ontologically-laden perspective has been advocated by John Dupré, initially presented under the moniker 'promiscuous realism' (Dupré 1981), and later repackaged as 'taxonomic pluralism' (Dupré 1999). Simply put, this is the thesis that there are several alternative ways of grouping organisms into species (or other categories) based on various concerns. None of these relations is privileged, from an ontological perspective. So far, the position is analogous to Kitcher's. Yet, Dupré is more explicit and committed, metaphysically speaking. The fundamental question is not how species can be represented in biology but, rather, what they are. So, what kinds of entities must species be, in order to vindicate Dupré's ontological version of theory-dependence? Sets? Kinds? More recently, he has been exploring the prospects of developing an ontology of processes and the possibility of applying this approach to species. Be that as it may, as far as I can see, Dupré comes the closest to developing a 'pluralistic' ontological view of species as theory-dependent. What exactly this ontology will look like, and whether the proposal will prove philosophically and scientifically tenable, are open questions whose verdict is still currently unsettled.

In sum, pragmatism, in both its epistemic and ontological strands, is pluralistic vis-à-vis its connection to the theory-dependence of species entities and to the boundaries of the species category. Advocates of pragmatism, such as Kitcher and Dupré, also endorse the heterogeneity of the species category. However, I stress that the two theses do not come as a package. Authors like Mayden, de Queiroz, and Ereshefsky espouse heterogeneity while eschewing theory-dependence. Conversely, pragmatists can endorse theory-dependence, regardless of their stance towards heterogeneity. At the end of the day, both strands of pluralism are interesting theses and have prominent supporters. Nevertheless, these two tenets should not be conflated.

## 4 What *Is* the Question, Then?

Time to take stock. The first part of the essay showed that pluralism is a multifaceted concept. It encompasses (at least) two independent ideas. The first one is what I called 'heterogeneity.' This is the claim that the species category is an ontologically mixed bag of entities. More precisely, the species category includes multiple types of species taxa, presumably because different species may be produced by a variety of natural phenomena. The second strand of pluralism involves a view that can be dubbed 'theory dependence.' Here, the guiding thought is that assignments of species-level taxa crucially depend on both the organisms and the evolutionary processes in question, and on the explanatory target at hand. Theory-dependence entails that there is no uniquely correct, objective, or natural way of grouping organisms into species, or into any other rank of the Linnaean hierarchy. The second portion of the article presented and discussed three influential stances—or, better, families of stances—concerning the nature of species. I referred to them as 'second-order pluralism,' 'eliminativism,' and 'pragmatism,' respectively. Several authors associated with all of these positions have identified their views as 'pluralist.' However, these approaches differ widely across our two dimensions. The meaning of pluralism changes considerably across the board. What implications should we draw from all of this? Let me wrap up the discussion by offering a terminological suggestion.

Should we continue to talk about 'species pluralism'? Or are we better off dropping the expression *tout court*? The issue is tricky. On the one hand, every author has a sacred right to pick whatever label best describes her or his views. No one—myself included—should self-appoint

the semantic-police badge. On the other hand, choice of words does matter, making the nature and implications of positions crisper and clearer. With this in mind, let us consider whether the pros of retaining 'pluralism' outweigh the cons.

As mentioned at the outset, the moniker 'species pluralism' typically refers to a family of views. Setting substantial differences asides, all these views do share a common presupposition, namely, an aversion to species monism, the claim that the species category is a homogeneous set, which can be captured by a univocal definition set in stone, once and for all. This could help explain why there is so much discordance regarding the three aspects of the species problem: nature, definition and demarcation of species (Nathan and Cracraft, forthcoming). In short, 'species pluralism' is a useful umbrella term that captures a cluster of related approaches, drawing an explicit contrast with its nemesis: species monism.

At the same time, our discussion does suggest that the expression 'species pluralism' is dangerously ambiguous, encompassing at least two independent claims. Employing the same term for denoting conceptually distinct positions runs the risk of conflation and confusion. The authors discussed above have very different views about species. Presenting all of them as variants of pluralism makes them seem closer than they are. This can be avoided by introducing distinct concepts, which capture and reflect relevant differences.

These considerations are hardly decisive. Old habits die hard and some readers might resist replacing entrenched concepts with new ones. The potential for confusion flagged above can be avoided by ensuring that, when talking about 'pluralism,' one clarifies whether the main issue at stake is heterogeneity, theory-dependence, or something else. Still, it seems to me that the benefits of dropping talk of 'pluralism' *tout court* and introducing more precise terms denoting independent theses—heterogeneity vs. theory-dependence, $\text{pluralism}_1$ vs. $\text{pluralism}_2$, or something else—offsets the costs.

In conclusion, asking whether or not we should be species pluralists is elliptical. There are various ways of being a pluralist. There is a pluralism of pluralisms, so to speak. Unless one clarifies the relevant senses and respects in which 'pluralism' is advocated, the problem is not well-defined. What issues should we raise, then? What *is* the question? The short answer is that there is a variety of questions to ask. Some of these questions have been examined here. Is there a single kind of species in nature or multiple kinds? Are species discovered or are they posited in a theoretical context? Can we draw a distinction between 'primary' and 'secondary' species concepts and, if so, what is the relation between them? Does the species rank have a privileged status in phylogenetic nomenclature? How do species contribute to biological knowledge, broadly construed? Other, equally important and well-defined issues, are scattered across the specialized literature, awaiting resolution. 'Should we be pluralists about species?' is just not one of them.

This leads me to a final, speculative remark. Attentive readers will surely note that the above questions are primarily epistemic, methodological, and conceptual. What about ontology? To solve the species problem, should we not ask whether species are 'real,' how they 'exist,' and what kind of entities they are? I suggest a negative answer. As currently framed, these issues are dangerously vague. Unless various epistemic, methodological, and conceptual preliminaries are clarified, we are not in a position to adequately address the metaphysical status of species, which is replete with controversial assumptions (Ghiselin 1997; Crane 2004; Haber 2016b). In light of these concerns, why not replace ontological stances—monistic and pluralistic alike—with some form of 'metaphysical agnosticism,' at least until the current age of discordance has gone by and consilience is back in the game?

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