"On the Origin of «That Thing You Call “Species”»*"

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Abstract:

In The Disorder of Things Dupré argues for a pluralist answer to the debated question of the ontological status of species. One of the premises of his reasoning involves endorsement of radical holism on the issue of the meaning of theoretical terms, i.e., the idea that such meaning depends on all the theoretical contexts in which such a term appears. This thesis does not acknowledge the possibility of a term occurring within a theory and not depending semantically on it. It might be possible to argue for a more moderate holism in which the meaning of theoretical terms does not depend on all the theories in which they occur. To illustrate this point, this paper intends to analyze the relationship between the theoretical term “species” and the theory of natural selection as Darwin conceived it. For this purpose, use is made of the distinction provided by structuralism between terms introduced in a theory and theoretical terms previously available. The thesis of this paper is that “species” is not a term that depends

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semantically on the theory of natural selection, but rather one previously available. In structuralist language: “species” is *Natural Selection-non theoretical*.
This paper analyzes the relationship between the theoretical term “species” and the theory of natural selection as Darwin conceived it. For this purpose, use is made of the distinction provided by structuralism between terms introduced in a theory and theoretical terms previously available. The thesis of this paper is that “species” is not a term that depends semantically on the theory of natural selection (in a sense that will be clarified later), but one previously available instead. In structuralist language: “species” is Natural Selection-non theoretical. This analysis intends also to illustrate the benefits of a moderate version of holism regarding the meaning of theoretical terms as an alternative to radical holism.

In The Disorder of Things Dupré advocates, among other things, a pluralist answer to the question concerning the ontological status of species. One of the arguments he offers is the following (Dupré 1993, pp. 38-39):

   a) “Species” is a theoretical term.

   b) Theoretical terms are to be understood by means of the theoretical context in which they occur.

   c) Species are treated as individual objects in the central parts of evolutionary biology, and as classes in ecology.

Therefore,

   d) we are driven towards a pluralist view on the ontological status of species. In some contexts they are treated as classes, in others as individuals.

This paper does not intend either to analyze this argument at full length, or to criticize pluralism. I will only focus on the assumptions underlying premise b, which asserts that theoretical terms cannot be understood without paying attention to the theoretical
contexts in which they occur. I assume I am not doing violence to Dupré’s thought by claiming that this premise presupposes the thesis that theoretical terms acquire at least part of their meaning from the relationships they hold with the rest of the terms in the theories in which they appear. I do not intend to criticize holism regarding the meaning of theoretical terms either; however, I find it more fruitful to restrict this generalized version of holism to a more localized version. The claim in premise b does not consider the possibility that theoretical terms might not acquire their meaning from all the theories in which they appear. Specially, it does not take into account the fact that there are two ways in which one and the same theoretical term may appear in a theory: it may be a term introduced by that theory and whose application presupposes the theory, or it may be a theoretical term previously available and that can be applied without any reference to the theory. In Philosophy of Natural Science, Hempel calls the former “theoretical terms proper”, and the latter “pretheoretical or antecedently available terms” (Hempel 1966 pp.74-75). This distinction is relative to a theory. A term that is properly theoretical in a theory may be pretheoretic in another and vice versa. If this distinction is correct, then it is not true that the meaning of theoretical terms depends on all the theories in which they might appear. It would depend only on the theories for which they are properly theoretical.

Structuralism offers a distinction between theoretic for a given theory T and non-theoretic for a given theory T, which is the one I am going to use, albeit in an informal way, because I think it elucidates Hempel’s intuition.

**T-theoreticity**

Structuralism rejects the traditional theoretical/observational distinction. This distinction encloses two different ones: theoretical/non-theoretical, and
observational/non-observational. Of these, structuralism only preserves the first, though, as we have seen, relativized to a given theory\(^1\). As Moulines explains in *Pluralidad y recursión* (1991), opposing both operationalism –which equates the meaning of a theoretical term with the physical processes that can be associated with it– and radical semantical holism –which claims that the meaning of a theoretical term is determined by every theory in which such term appears (the kind of holism Dupré seems to uphold)—, a moderate holism holds. According to it, there are terms –the \(T\)-theoretical ones– that depend semantically on a given theory \(T\), and others –the \(T\)-non-theoretical– than do not depend semantically on \(T\), but on another theory and may be used to contrast \(T\) (Moulines 1991 ch. II.3). Saying that a term is semantically dependent on a given theory \(T\) means that in order to determine the concept expressed by such term it is always necessary to assume the validity of \(T\)'s laws, in which case the term is \(T\)-theoretical. A \(T\)-non-theoretical term is such that it is not always necessary to assume \(T\)'s laws for the determination of the concept expressed by it. The determination of a concept, in the case of qualitative ones, consists in determining whether it applies to a particular given object, and in the case of quantitative ones, it consists in determining the value of the magnitude for the object (Díez and Moulines 1997, pp. 354-6).

**Restating the question**

It was already hard to think that the problem of the meaning of “species” might have a general solution for all branches of biology, given it presupposes a unity of the discipline that is difficult to sustain. In this framework, it does not make any sense either presenting the issue as relative to evolutionary biology in general. To elucidate the

\(^1\) The reasons for the rejection of the theoretical/observational distinction as inadequate for the task of reconstructing scientific theories and their empirical basis can be found in Balzer,
meaning of the term “species” it is necessary to look at the role played by the term in each theory. It might occur that as a result of the reconstruction of all the theories that constitute evolutionary biology we reach a single concept of species, but this is a result of metatheoretic investigation. The unity of evolutionary biology must not be presupposed.

Therefore, the problem of the meaning of “species” must be presented in relation to particular theories. Though this way of dealing with the problem requires having systematized such theories in some fashion, I will now try to apply this analytical framework to Darwin’s theory of natural selection in an informal manner intending to show how a term might appear in a theory without being theoretical for that theory.

“That thing you call ‘species’”

The most extended opinion is that Darwin was a nominalist concerning the concept of species\(^2\). Mayr, for instance, holds that:

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\text{[...]} \text{his characterization of the species is now [he refers to the time of the } \text{Origin]} \text{ a mixture of typological and nominalist definitions. (Mayr 1991/1992, p. 43 of the spanish version)}
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These opinions find strong support in Darwin’s own words. In the Origin he makes several statements like the following:

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Moulines and Sneed 1987, p. 48.
\(^2\) I am speaking of Darwin’s opinions in the Origin. Darwin changed several times his opinions about the concept of species until he reached his conceptions of the Origin.
In short, we shall have to treat species in the same manner as those naturalist treat genera, who admit that genera are merely artificial combinations made for convenience (Darwin 1859, p. 485).

Statements like this one seem to support the idea that in the context of natural selection “species” does not appear at all, but I find this presumption too hasty. What Darwin is really opposing to is the search for essences founding the differences between species and the search for an essence of the term “species” itself, and consequently, the possibility of defining the species and the term “species”. This rejection is really a rejection of fixist and creationist ideas. But the fact that a term cannot be defined does not mean it cannot be theoretical for a given theory. On the contrary, their openness, that is, their lack of definition, is for some one important feature of the most fruitful theoretical terms (Hempel 1952, pp.28-29). Nevertheless, given that Darwin did not consider the fact that the term “species” lacked a definition to be an objection to his theory of natural selection, and that conventionalist elements played some role in the determination of its extension, it seems reasonable to assume that he did not think the term “species” played an important role in his theory. Especially considering he not only did not regard them as objections, but rather as positive consequences of his theory:

Systematists will be able to pursue their labours as at present; but they will not be incessantly haunted by the shadowy doubt whether this or that form be in essence a species. This I feel sure, and I speak after experience, will be no slight relief (Darwin 1859, p. 484).

The claim that the term “species” does not play a very important role might seem quite difficult to sustain. The term “species” appears hundreds of times in the Origin, it
even appears in its title. However, whatever conception of theory is presupposed, it seems fairly obvious that we have to distinguish between the theory of natural selection and the book in which this theory appears along with others (according to Mayr there are at least five theories that are held in the *Origin* (Mayr 1991/1992 p.48-50 of the spanish version)). Besides, it would not be the first time the title of a book is misleading about its contents.

On the other hand, it is interesting to bring forward the proposal Beatty takes from Sulloway (Sulloway 1979) concerning why Darwin uses the concept of *species* and how he does so (Beatty 1985). Darwin’s decision to use the concept of *species* would have been guided by tactical considerations. Among these would be the decision to employ the same concept that naturalists of his time employed in order to communicate with them in their own language. According to Beatty, Darwin used the term “species” in the same way his contemporaries did, but without accepting the definition they ascribed to it, which was incompatible with his evolutionary views. Darwin, then, would have used “species” to refer to the same things in the world his contemporary naturalists referred to, but believed these things did not satisfy the given definition of “species”. Accepting its reference while rejecting its definition allowed him to communicate with naturalists and also provided him some space for disagreement. Not only did Darwin not accept the commonly accepted definitions of “species”, but also held that the term was indefinable, as we saw earlier. Species could not be clearly distinguished from varieties, fact that is intelligible in the light of diversifying evolution, in which varieties are incipient species. The following quote from Darwin can be brought in support of Beatty’s interpretation:

> At the end of this chapter, it will be seen that according to the views, which we have to discuss in this volume, it is no wonder that there should be difficulty in defining the difference between a species & a variety;—there being no essential, only an
arbitrary difference. In the following pages I mean by species, those collections of individuals, which have commonly been so designated by naturalists (in Stauffer 1975, p. 98).

If this interpretation is correct it would help explain why the term “species” appears so many times in the *Origin* without having to admit that the concept of species plays a fundamental role in the theory of natural selection.

But let us be more systematic. Let us leave Darwin’s opinions aside and ask ourselves: is “species” a NS-theoretical (*Natural Selection*-theoretical) term? We should remember that a term is *T*-theoretical if we must always suppose the applicability of *T*’s fundamental laws in order to determine the term’s extension. So, are the fundamental laws of natural selection always supposed whenever the extension of “species” is determined? Given the multiplicity of concepts expressed by “species”, I will focus on some of the most salient ones to answer this question. I repeat: for an exhaustive treatment of this issue we need to have the theory of natural selection reconstructed, but I think that treating it before this reconstruction might still be productive. We will consider then the typical informal presentation of natural selection.

Let us start with the *morphological concept of species*. According to this concept, a species is a collection of individuals who possess similar morphological features. We can include within this concept the typological concept of *species*, in which the morphological properties shared by all the individuals must be essential to the species in question. It is clear that the determination of whether an individual belongs to a species is in this case independent of natural selection. Being included or not in a species depends on the presence or absence of certain features in a certain degree, and I cannot think how confirming that an individual possesses those features might depend on natural selection. This does not mean that we cannot choose a concept of *morphospecies*
compatible with natural selection rejecting, for instance, any atavistic essentialist feature of that concept—the fenetist concept of species, for example. But a concept’s being compatible with a theory is not enough to make it theoretical in that theory. To make it so it should be impossible to determine the extension of the concept without resorting to the theory’s laws.

As for the biological concept of species, whether we refer to a concept in which a collection of individuals is a species if each of the individuals can have a fertile descendant with any of the others, or whether we refer to a more modern one that applies to populations and not to individuals, in which a species is constituted by populations connected by genic flux and reproductively isolated from other populations, it is quite clear that such concept is not NS-theoretical either. In both cases we find criteria whose application is clearly independent of natural selection. Although this concept has major importance for evolutionists, it is not necessary to suppose natural selection to determine whether two individuals can have fertile offspring, or whether two populations are connected by genic flux.

Finally, let us consider the evolutionary concept of species. This concept is more interesting because it was apparently the most attractive one for Darwin. It is held in various places that the classificatory system should really reflect the genealogical relationships amongst different individuals:

In my opinion (which I allow everyone to boo as I would have done to them 6 years ago for holding opinions like this one) classification consists in grouping beings according to their real relationships, that is, their kinship or their descent form common trunks… (Burkhardt 1996/1999 p. 103 of the spanish version).
According to this view, species are segments of the filogenetic tree with certain characteristics. Jean Gayon argues that in the Origin Darwin favored a concept of species of this sort (Gayon 1996). Near the end of the Origin Darwin describes what the task of systematists would be like once his evolutionary views were accepted:

Systematists will have only to decide (not that this will be easy) whether any form be sufficiently constant and distinct from other forms, to be capable of definition; and if definable, whether the differences be sufficiently important to deserve a specific name (Darwin 1859, p. 484).

And then he claims that the present degree of difference should be measured more carefully, for:

It is quite possible that forms now generally acknowledged to be merely varieties may hereafter be thought worthy of specific names… (Darwin 1859, p. 485).

This quote is interpreted by Mayr as showing that Darwin held a concept of species that was halfway between nominalistic and typological (Mayr 1991/1992, p. 43 of the spanish version). I agree with Gayon that the criteria provided here by Darwin are such that they allow the systematic to infer genealogical links. The assumed concept of species would then be the evolutionary one, rather than the typological one. But Gayon’s interpretation goes beyond this claim. The criteria mentioned in the quote from Darwin would not count as empirical rules for the recognition of species, but as theoretical claims that would furnish “species” with meaning in relation to the principles of natural selection. Morphological differences should be then considered in the light of natural
selection. There would not be, according to Gayon, any definition of ‘species’ independent of the theory of natural selection. It would seem then that this concept were indeed NS-theoretical. But I think Gayon exaggerates when he infers a semantical dependence from that quote from Darwin. Darwin is telling there how the different branches of natural history will be affected once his views are accepted. I agree that Darwin held that what the systematics understood by “species” could no longer be the same. But there is a great distance from that to the assertion of a meaning dependence. The systematics might search for a concept of species compatible with Darwin’s theory and yet with an independent meaning. Besides, in any case, I think that the fact that varieties are incipient species, something that is supposed by this whole discussion, does not depend on natural selection. I believe Mayr is right to distinguish the different theories supported by Darwin in the Origin. The ones supposed in this case are the theory of the common origin –that all organisms descend from a common ancestor–, without which it would not be possible to construct a single filogenetic tree, and the theory of diversifying speciation –that species diversify into daughter species, those that are at first varieties of a species can end up being daughter species. None of these two theories follows necessarily from natural selection.

Notwithstanding what Gayon affirms, let us examine the question of whether the evolutionary concept of species is natural selection-theoretical. According to this concept, I repeat, species are segments with certain features in a genealogical tree, that is, a species would be the segment contained between a speciation event –the birth of a species– and an extinction or speciation of the species event. Once the filogenetic tree is complete, there is no appeal to the laws of natural selection to determine the extension of “species”. We only have to distinguish in the filogenetic tree those branches that posses distinctive features. We could ask then whether it is necessary to resort to the theory in the construction of the filogenetic tree itself. Again, we must give a negative answer. Although the acceptance of natural selection might influence the manner in which the
filogenetic tree is framed, it is constructed out of morphological similarities among individuals (as Darwin recommends in the fragments quoted above), fossil record, and finally –though not in Darwin’s time, of course– data provided by molecular biology. Therefore, the evolutionary concept of species is not NS-theoretical either.

“Species” as a NS-non theoretical term

As we have seen, there are reasons to believe that “species” is not NS-theoretical. We should inquire now if the term “species” appears in the theory as a NS-non-theoretical term. I do not intend to give this issue full treatment here, but only to suggest two possible ways in which this might occur.

The first one takes place in a strict Darwinian frame. In chapter VI of the Origin Darwin presents and tries to answer different objections to the theory of natural selection. The first of these is the following:

...why, if species have descended from other species by insensibly fine gradations, do we not everywhere see innumerable transitional forms? Why is not all nature in confusion instead of the species being, as we see them, well defined? (Darwin 1859, p. 171).

Though natural selection was not for Darwin the only mechanism of evolution, it certainly was the main one. This means that natural selection was mainly responsible for explaining the forms in which living organisms presented themselves. But it turns out that in nature living organisms present themselves in discrete groups. Natural selection should explain that. In the empirical basis used for contrasting natural selection we find
discrete groups of organisms, that is, we find species. This is one way in which “species” might appear in natural selection as a NS-non-theoretical term.

The second way is more or less foreign to Darwin’s thought. For him, the unit of selection was mainly the individual (although in some places in the *Origin* he suggests that groups of individuals might also play that role). However, there is no impediment for natural selection to work on other levels. There are three requisites for a given entity to evolve by means of natural selection: a) it must vary in its fenotypical features, b) these features must be inheritable, and c) these fenotypical variations must correspond to differences in survival and reproduction (Sober & Wilson 1998, p. 83). If species satisfy these requisites nothings prevents them from evolving by natural selection. So, another possibility for “species” to fit into the context of natural selection as a NS-non-theoretical term is as the unit for selection.

**Conclusions**

If my argument is correct, then there is sound reason to believe that the meaning of the term “species” does not depend on natural selection. People often speak of the problem of species without being explicit as to what that problem is. Just as I find it useful to relativize the question of theoreticity to a given theory, I find it useful to do the same with problems. A problem is only such in the light of some theory. If by “the problem of species” we mean the inability to find a criterion that distinguishes it from inferior and superior taxa, we have already seen this is not a problem for natural selection (at least it was not for Darwin). What did and does constitute a problem is the absence of transitional varieties, that is, the fact that organisms come in species, and remains to be a problem also the question of whether species can be the unit for selection.
In case I have not provided sufficient argument for the central thesis of this work, I hope at least to have shown the relevance of the distinction between theoretical and non-theoretical terms in relation to a given theory for the question of the meaning of the term “species”.
References


