Natural Kinds and Ecological Niches – Response to Johnson's Paper

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David Johnson is quite right to resist the view that if species were kinds, they would be subjective.[1] There is an alternative view about kinds. It goes together with a certain theory about the way expressions that designate kinds work. On this theory kind terms can designate a kind without expressing a meaning that is true of the kind. The capacity of a person to refer to the kind by the use of the term may be explained by a causal-historical connection of the kind with the use of the term. It follows that there *are* natural kinds, i.e., mind-independent categories.

In support of this view, which he calls the "modern ostensive view" of kinds, Johnson makes the intriguing suggestion that natural kinds are, or are like, ecological niches. He applies the model literally in the case of purported evolutionary kinds, pointing out some of its consequences for the controversy about whether species are classes or individuals.[2] He proposes to identify species with ecological niches. There are then, two issues to be dealt with in this paper: whether species are ecological niches, and whether there is reason to construe kinds generally on the model of ecological niches.

Johnson introduces ecological niches to answer the person who simply denies that kinds or categories can be causes. The objection as Johnson puts it is that "... the presumed fact that a ... kind is an abstract and repeatable nature, category, or property seems to make it impossible for it to be the initiating cause for a chain of events ..." and "...abstractions (while perhaps sometimes inspiring people and other animals to cause things to happen in certain ways) are never causes in and of themselves" (1990, p. 66). Hence ecological niches. Ecological niches are characterized as "abstract repeatables", which at the same time are "describable without being definable" and have "causal influence" or "causal force".

The problem Johnson raises is important. His proposal is rich in suggestive insights and deserves careful examination and development. In what follows I want to raise several questions about how exactly the appeal to ecological niches can help solve the problem how abstract repeatables can be causes.

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There is a difficulty with Johnson's characterization of the "modern ostensive view". He suggests that the claim that natural kinds exist "independently of our personal circumstances or desires" "... implies that kinds lack definitions in the sense of listable sets of intrinsic qualities..., so one never can be sure he has characterised any of them either exhaustively or ... accurately" (1990, p. 65). This is too strong. It asserts necessary ignorance rather than possible ignorance. It may happen to be true (due, e.g., to our epistemic limitations) that no natural kind can be characterized exhaustively and accurately, but this does not follow from the claim that kinds exist independently of our personal circumstances or desires.[3] Nor does it follow that no natural kind has a set of properties associated with it which distinguish it from every other kind. What is true, and what will distinguish the "modern ostensive view" from the nominalistic alternative is that kinds lack definitions in the sense that they are not words. The kind of thing a star is, for example, is not given by giving the meaning of the word "star". So if someone has defined the word "star" for you it does not follow that you now have complete knowledge of what stars are, even if you have complete knowledge of what the term "star" means. But still, complete knowledge of stars might be possible, so you might be able to define the kind in the sense of characterizing it completely.[4] The modern ostensive view of kind terms need not hold it to be impossible in principle to have complete knowledge of a kind, but only that complete knowledge is not required in order to refer to a kind. And this is where the causal theory of kind terms comes in. It shows how reference is possible even without having complete knowledge of the kind at hand.

So then, how can thinking of kinds on the model of ecological niches show us that kinds can be causes? A prior question is: why would anyone deny that abstract repeatables can be causes in the first place? One suggestion hinted at in Johnson's discussion of Ghiselin's views is that they cannot be causes because they do not change. The objects that belong to the kind can change of course: a brother can become an uncle, a positively charged ion can become a negatively charged ion. But kinds themselves cannot change with respect to what makes them be the kind that they are. To deny this would be to hold that counterfactuals such as "if it wasn't made of oxygen and hydrogen it wouldn't be water" are false.[5] Johnson introduces ecological niches as objects for which "... one ... is entitled to suppose that they have some sort of objective existence in nature – and therefore are describable but not definable..." (1990, p. 68). I am not sure whether the claim that niches are describable but not definable is intended merely as another way of saying that niches are objective, or as the claim that there is no particular way a niche has to be in order to be the niche that it is. If the latter is meant, then perhaps we have entities which can change, but then it is hard to see how ecological niches have the ontological status of kind.

Part of the problem in seeing how turning to ecological niches helps is that it is not clear what is required of abstract repeatables that they may be causes. When it is asked how kinds can be causes, is this a question about whether abstract repeatables can cause anything without even being exemplified or entokened? Or is it a question about what underlies the attribution of causal responsibility to the abstract repeatables which a given individual (object, event) may exemplify or entoken? Johnson seems to think that the demand is that the kind do the causing all by itself, without any help from the concrete particulars which may instantiate it. But there is no clear reason why this demand should be met, in order to attribute causal responsibility to kinds. The person who hired the hitman is responsible for the murder, even if he did not pull the trigger. If I want to know why a certain thing has happened, there are some causal explanations that will advert to the kind(s) involved in the production of the event. For example, if I want to know why Joe is paying $0.60 rather than $0.40 for a cup of coffee the answer has to do with the size (and so to the kind)[6] of cup that holds the coffee (or else, e.g., it has to do with the fact that the event is of the type large coffee purchase, etc.). It is true that the cause of there being any transaction at all is some one event – some "concrete individual" – involving Joe and a cup and the clerk. But the nonrepeatable concreteness of the event of Joe's bringing a definite cup up to the register only explains why any transaction occurs at all right then; it does not explain why Joe is handing over $0.60 rather than $0.40. This is one way that abstract repeatables might involve themselves in the causal order without themselves undergoing change.

I have no doubt that ecological niches do have "causal force". But the sort of causal role they have needs to be described, to make it convincing that we need to appeal to ecological niches to understand in general how abstract repeatables have causal force. Johnson points out that knowing the niche some organisms occupy enables us to predict what properties organisms occupying the niche will have. This in itself of course does not tell us that the niche is causally responsible for the properties the organism is predicted to have. Not everything from which one accurately predicts is a cause of what one predicts. I can predict a storm from the reading on the barometer, but the reading on the barometer is not a cause of the storm. Nevertheless this points in the direction of an answer to the question how the appeal to ecological niches helps to understand the causal powers of abstract objects. Undoubtedly we *are* able to predict some of "the distinctive characteristics of some group of creatures" precisely because niches do cause (partly cause) species to have the properties they do. And perhaps Johnson would say that their precise causal role is described by ecology and evolutionary biology. So in order to understand how the model is appropriate for understanding kinds in general we must turn to evolutionary biology. Evolutionary biology rather than Newtonian mechanics is to be the new paradigm.

But allowing that an understanding of the causal powers of ecological niches will come from the appropriate science does not tell us whether all kinds should be construed as being like ecological niches (it does not tell us that evolutionary biology should be the new paradigm). Nor does it tell us that biological species in particular are identical with ecological niches, which is what Johnson wants to claim. He does qualify this somewhat. He says "... in the context of trying to answer certain questions about evolutionary development, sometimes it is useful to identify a species with an ecological niche itself, rather than the group of genetically related organisms that happens to fill this niche at a given time"

(1990, pp. 67–68). But why is it useful to identify a species with an ecological niche?[7] An ecological niche is the place a species has in an ecosystem. A species is no more identical with its ecological niche than I am identical with the house that I live in or the work that I do. This would remain so even if for every species there is one niche and for every niche there is one species. If they are thus equinumerous it might be thought that we are at least on the way to being in a position to identify them (i.e., treat them as one). But it is not obvious that no two species fill the same niche and no two niches are filled by the same species. Competitive exclusion[8] might make the first half of this true, but what makes the second half true? Some species are polymorphous; if a species is sexually dimorphous the females and the males might fill different ecological niches in the same ecosystem. But the main point is that even if it can be argued *a posteriori* that species and very fully specified niches stand in one-one correspondence, it does not follow that a species is identical with its ecological niche. Being equinumerous with some other thing is simply not the same as being self-identical. But if they are not in fact identical, I do not know why it would be useful to identify them.

Nevertheless it might be argued, I suppose, that finding species (identified on the basis of some biological criterion) and ecological niches stand in one-one correspondence, together with an application of Ockham's razor, provides a reason to identify them. A compare and contrast exercise is useful here for illustrating the resulting view about the ontological status of species. In the philosophy of mind there is a view about the nature of mental states (beliefs, desires, fears, hopes, pains) known as functionalism. On such a view mental states are identical with functional states. A functional state may have various physical realizations; what it is essentially is a state with a certain causal role. The causal role of a mental state is what causes it and what it causes. The causal roles of mental states have to be identified with care. For example, the theorist will want it to come out that the belief that it is about to rain will tend to cause certain actions under certain conditions, but there will be things the belief might cause on occasion that will *not* be counted as its proper causal role. A possible dissimilarity between functionalism in the philosophy of mind and ecologism is that we have no independent way of identifying (in the epistemological sense of identify) mental states than by their causal roles.[9] But in biology we do have plausible ways of identifying species independently of identifying ecological niches.

Identifying kinds with the causal roles that objects belonging to the kind have seems to be the way that Johnson wants to go. He offers a very suggestive description of how ecological niches provide a paradigm for understanding kinds in general:

> Conceivably … the best explanation for the fact that a substance like oxygen or gold has the particular dispositions it does might turn out to be that the cosmos in which we live contains a 'place' for entities with just these dispositions: and therefore more or less random objects acquire these same tendencies whenever they come to occupy this place. In other terms … the basic form of existence belonging to inorganic sorts like 'oxygen' and 'gold' might be that they are (or are like) causally effective niches in nature (1990, p. 71).

The place that, e.g., oxygen has – its niche – is its causal role on this view, for its causal role is given in part by giving its tendencies and dispositions. But furthermore the "basic form of existence" that oxygen has is its causal role.

But now here is the problem. On one hand ecological niches are to causally explain properties of species. (And, generally, places in the cosmos are to explain the tendencies of objects that occupy the place.) On the other hand, species are to be identical with ecological niches. (And "inorganic sorts" like oxygen are causally effective niches in nature.) But if ecological niches causally explain properties of species they *cannot* be identical with them. What Johnson actually says is that ecological niches "… predictively determine (some of) the properties of the things which occupy them…" (1990, p. 69). Presumably an appeal to the niche an organism occupies does not explain why a *particular* organism has the properties it does. That is explained by the fact that its parents had the genes that they did. What the niche (partially) explains is why the (genetically related) group of organisms occupying the niche, i.e., the species, has the properties it does. But then, it looks like we have to distinguish between the species and the niche that it fills. This follows from a classic principle about property identity. If A causes B, A cannot be identical with B. A cause must be distinct from its effect. This kind of principle must hold, I believe, even in explanations that have the structure of explanations in evolutionary biology.

Perhaps Johnson would object that this is a principle that goes with a "mechanistic" conception of causality. Perhaps it does; I do not know. In any case, even if we get an understanding by looking to ecological niches, for how abstract repeatables can be causes, it is not clear that every kind should be construed in this way. Why adopt a single paradigm for understanding natural kinds?

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NOTES

[1] (Johnson 1990). Johnson attributes such a view to Ghiselin. What he actually says is: "[Ghiselin] says a proof of the unsatisfactory status of the idea of construing biological species as spatio-temporarily unrestricted classes … is that it makes species subjective. More specifically … species would be nothing more than categories resulting from, and

dependent on, thought processes in which certain people have engaged at particular times" (p. 68). He cites Ghiselin (1987, p. 130). He does not take up Ghiselin's other arguments for the claim that species are individuals rather than classes determined by some property that all and only the members of the class have in common.

[2] See Ghiselin (1987), and related papers in that issue of *Biology and Philosophy* for a history of this controversy.

[3] There are abstract objects which some people have wanted to provide with definitions, while at the same time maintaining they are mind-independent. The numbers, for instance.

[4] This would not mean that you were redefining the word "star"; in this future state of knowledge, "star" could express what it had always expressed.

[5] This assumes, of course, that water is a natural kind and that what the term "water" designates is held constant.

[6] Sizes of cups are not natural kinds. But they are kinds relative to the explanation, patterned after deductive nomological explanations, that might be offered for Joe's handing over $0.60 rather than $0.40.

[7] If the point in identifying species with ecological niches is to counter Ghiselin's implied view (Johnson quotes Ghiselin: "If species were not individuals, they could not evolve, indeed they could not do anything whatever", Johnson 1990, p. 69) that abstract repeatables cannot be causes, it suffices to show that this is not true of niches: they can be causes even though they are abstract repeatables; so it is not a general truth that abstract repeatables cannot be causes. This would show that Ghiselin is arguing from a false premise to his conclusion that species, being causes, must be individuals. It would show this if individual niches were "abstract repeatables". I have reservations about this, but possibly what the view is is that when niches are occupied they are exemplified.

[8] This is a principle which says "complete competitors cannot coexist" or at least that "two similar species scarcely ever occupy similar niches, but displace each other in such a manner that each takes possession of certain peculiar kinds of food and modes of life in which it has an advantage over its competitors" (as given in Hutchinson (1978)). The first gloss comes from Hardin (1960). The second comes from Gause (1934).

[9] This leaves the possible reliability of introspective awareness of one's own mental states out of consideration. I do not believe that introspection is a reliable method of identifying the contents of one's mental states.

REFERENCES

Gause, G.F.: 1934, *The Struggle for Existence*, Williams and Wilkins, Baltimore.

Ghiselin, M.T.: 1987, 'Species Concepts, Individuality, and Objectivity', *Biology and Philosophy* **2**, 127–143.

Hardin, G.: 1960, 'The Competitive Exclusion Principle', *Science* **131**, 1292–1297.

Hutchinson, G.E.: 1978, *An Introduction to Population Ecology*, Yale, New Haven and London.

Johnson, D.M.: 1990, 'Can Abstractions Be Causes?', *Biology and Philosophy* **5**, 63–77.