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A SELECTIONIST APPROACH TO THE PROBLEM OF UNIVERSALS

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Abstract

As it is discussed by philosophers, the problem of universals has two aspects: an ontological aspect and an epistemological aspect. Views on the ontological aspect divide between "realism" which holds that universals are abstract objects, distinct from their instances, with which the organism's concepts must line up if it is to survive and reproduce, and "constructivism" which holds that the organism's concepts are the only universals there are. Views on the epistemological issue divide between "nativism" which holds that concepts are innate, and "empiricism" which holds that they are learned. Most realists are nativists. Most constructivists are empiricists. Selectionist considerations suggest a middle position between these extremes:

- (1) There are no universals in the absence of a classifying organism (constructivism).
- (2) There is a significant innate contribution to the organism's system of concepts (nativism).
- (3) The fine tuning which brings the organism's concepts into line with what Skinner (1938) calls "the natural lines of fracture along which environment and behavior actually break" is a matter of contingency-shaped discrimination learning (empiricism).
- (4) There are objective constraints which ensure that the concepts so formed line up with "real" similarities and differences between objects, events and states of affairs in the organism's interactions with the environment (realism).

Amongst those who take their cue, as I do, from the later philosophy of Wittgenstein and the Oxford 'ordinary language' school, it is accepted that all the traditional problems of philosophy are mixture of conceptual confusion and unresolved empirical issues. On this view the job of the philosopher is to disentangle the two, dispel the conceptual confusion and hand over the empirical issues for resolution

by the appropriate scientific discipline. In the version of that perspective to which I have given the name 'linguistic behaviorism' (Place 1996), the technique known as 'conceptual analysis' which is used by those who do philosophy in this way in order to resolve conceptual confusion is itself presented as an empirical investigation. It is an empirical investigation partly of the linguistic conventions governing the construction of intelligible sentences in natural language, and partly of the behavioral principles governing the relation between such sentences and the environmental reality they depict. Universals present a special problem for such a view. This is partly because the problem remains unresolved and shrouded in conceptual confusion despite having been debated by philosophers for more than two thousand three hundred years since the days of Plato and Aristotle. It is also partly because it is a problem that goes to the very root, not just of the relation between language and reality, between what speakers say and what it is they are talking about, but of the relation between behavior of all kinds and its environmental antecedents and consequences.

The problem is this. Every object, event and state of affairs an organism encounters as it interacts with its environment, including its own behavior, is a unique particular. Yet in order to adapt its behavior and in the case of a linguistically competent human its verbal behavior to those unique particulars, the organism must generalize. It must ignore the unique particularity of the situation confronting it and respond to some feature or set of features which it shares with other unique particulars. Such features constitute a respect in which all the particulars which share them resemble one another and allow them to qualify as instances of the same universal or kind of thing. But in order to survive and reproduce itself an organism needs not only to generalize its responses on the basis of resemblances between one object event or state of affairs and another, it must select from among the various respects in which things resemble one another those which, in Skinner's words

"follow the natural lines of fracture along which behavior and the environment actually break"

(Skinner 1938, p.33)

As some of you may recall, this quotation comes from a passage in which Skinner is talking about the way the concepts of 'stimulus' and 'response' are to be understood when used in formulating the

fundamental laws of a science of the behavior of living organisms. The complete paragraph from which it is taken reads as follows:

"The preceding system is based upon the assumption that both behavior and environment may be broken into parts which retain their identity throughout an experiment and undergo orderly changes. If this assumption were not in some sense justified, a science of behavior would be impossible. But the analysis of behavior is not an act of arbitrary sub-dividing. We cannot define the concepts of stimulus and response quite as simply as 'parts of behavior and environment' without taking account of the natural lines of fracture along which behavior and environment actually break." (Skinner 1938 p.33).

What I take Skinner to be saying in this passage is that we can't simply decide *a priori* how the basic concepts of our science are to be used without first seeing how they match up with the actual phenomena we are using them to talk about. But the same principle applies to the stimulus classes across which any living organism generalizes its responses. They too need to respect "the natural lines of fracture," if the organism is to survive and reproduce itself.

But this where the problems start. Traditionally there are two: the *ontological problem* and the *epistemological problem*. The ontological problem concerns the nature of the reality that underlies metaphors such as Skinner's "natural lines of fracture" and the one with which philosophers are more familiar in which some conceptual schemes are said to "carve nature at its joints," while others, presumably, hack it up in a more arbitrary fashion. Do we have to suppose with the so-called 'realists' or 'essentialists' that identifying the kind of thing something is and getting it right is a matter of lining up our classificatory behavior, our concepts, with universals or kinds of thing which exist in some sense in addition to and over and above their instances? Alternatively, are these universals, as is believed by those who belong to the opposing camp, the 'constructivists' as we may call them, nothing more than products of the classificatory behavior of living organisms.

Constructivists in this sense are of two kinds, *nominalists* and *conceptualists*. Nominalists follow Aristotle and Locke in believing that the ability abstract universals from encounters with particulars which are thereby classified as instances of the kind in question is something only human beings possess,

something which comes with and accounts for the exclusively human ability to use language. Conceptualists, on the other hand, see the ability to classify particulars as instances of a kind, in Skinner's terms, to form 'stimulus classes', as something every complex free-moving living organism needs to do, if it is to survive and reproduce itself.

It follows from this that, according to the essentialist, universals and the organism's concepts are two different things. The organism's concepts are its attempt to figure out where the boundaries lie between one universal and another. According to the constructivist, on the other hand, the boundaries between universals are fixed by the organism. Universals are nothing more than the shared concepts of a particular social group. Universals and concepts are the same thing.

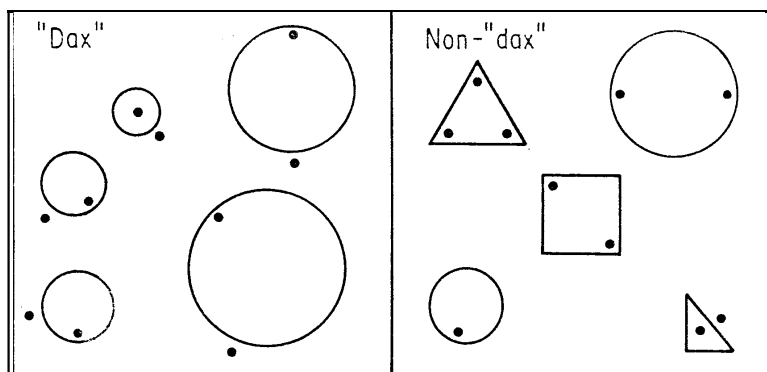
The form taken by the epistemological problem of universals is shaped by the answer that is given to the ontological problem. If you think, as the realists/essentialists do, that universals exist as abstract objects over and above the groupings formed by the classificatory behavior of living organisms, the epistemological problem is the problem of explaining how the stimulus classes which control the organisms responses are induced to line up with the universals that exist independently of them and how we know that that lining up has been achieved when it has been. If you think, as the constructivist does, that universals are created by the organism's classificatory responses, the epistemological problem takes a form which is indelibly associated with great German philosopher Immanuel Kant (1781/1787/1929), the argument that, since we have no way of responding to the environment without classifying the particulars of which it consists into different kinds of thing, and if that is all there is to it, we have no means of knowing whether or not the classificatory scheme we impose on it does or does not follow Skinner's "natural lines of fracture." Indeed, it is not at all clear what sense can be made on this view of the suggestion that some of our concepts "follow the natural lines of fracture" while others do not.

Although there is little to choose between the skeptical doubts which arise whichever way the epistemological problem is formulated, the advocates of the different ontological positions have traditionally favored opposite solutions to it. The essentialists, particularly those who take their cue from Plato, have typically argued that the only way to account for our ability to recognize universals despite the particularity of everything we actually encounter is to suppose that our ability to do so is *innate*.

Needless to say, one of the foremost advocates of this view in recent years has been every behaviorist's *bête noir*, the linguist Noam Chomsky (1965). The problem for this view is to explain why we are sometimes compelled to revise the boundaries between our concepts in the light of scientific research, and why some of them, at least, vary

from one human social group to another.

Similarly, the constructivists have traditionally maintained that the organism's conceptual scheme is a product of a learning process known as *abstraction*. In this process, after



Samples of "dax" S^D's and "dax" S^A's
(From Kimble and Garzey, 1963, after Smoke, 1932).

repeated exposure to particulars which resemble one another in a certain respect, the organism abstracts the common feature that unites them and thus forms the universal or concept of which they are thereafter taken to be instances. The problem for this view is to explain the remarkable uniformity not only between the concepts embodied within a particular natural language without which the speakers and interpreters of that language would not understand another, not only between the concepts embodied in different natural languages without which it would not be possible, as it evidently is, to translate from language to another, but also between the stimulus classes which control the behavior of pre-linguistic organisms, not only of the same species, but, allowing for differences in the sensory apparatus available, between members of different species.

One of the arguments for and against these opposing views is illustrated on Figure 1, which is taken from the chapter on 'Concept Acquisition' in Jock Millenson's (1967) *Principles of Behavior Analysis*. It illustrates the formation of a concept, the concept designated by the nonsense syllable "dax", through the process of abstraction as it is described in the constructivist literature. Any reasonable intelligent human subject can tell almost at a glance by looking at the examples of "dax"s on the left of the diagram, even without looking at the examples of otherwise similar non-"dax"s on the right, that the

set of features that all "dax"s have in common are a circular shape with one dot inside the circle and another outside but adjacent to it. But, as has been argued by essentialists since the time of Plato (1961), the human subject's ability to recognize in such a case what it is that all "dax"s have in common is made possible only by the fact that they already possess the concepts 'circle', 'dot', 'inside', 'adjacent' and 'outside'. That they already possess these concepts is clear both from their use of the words in giving a definition of a "dax" and from their ability both to use the words in question when presented with a relevant instance and to select the appropriate object when presented with the word.

But where, the essentialist asks, do these concepts come from? Are they too learned by noticing the features that circles, dots and cases of things that are inside, outside or adjacent to something else have in common and thus arriving at a verbal definition of things of that kind? Surely not. There are, no doubt, mathematical definitions of 'circle', 'dot', 'inside', 'adjacent' and 'outside' that have been or might be constructed. But there is no reason to suppose that such definitions play a role in anyone's acquisition of *those* concepts in the way that the verbal definition allows us to acquire the concept of a "dax". Even if they did, the process of acquiring word-meanings by giving a verbal definition could not conceivably account for the acquisition of *all* our concepts, for the simple reason that in order to learning the meaning of a word through a verbal definition you must already understand the meanings of the words used in the definition. Thus in any language there have to be at least some and arguably a great many basic concepts whose meanings are acquired in some other way, and that, according to the essentialist, can only mean that these basic concepts are innate.

But if our basic concepts are innate, how, the constructivist retorts, do we explain the fact that in light of scientific discovery we frequently find ourselves forced to revise concepts which, on any account, are basic to the way we classify the particulars we encounter in our environment, re-interpreting water as H₂O to take but one example. And so the argument goes on.

The Selectionist Solution

I want to suggest not only that we now have a solution to this problem, but that it lies much closer to hand than anyone, certainly any philosopher, would have supposed. It can be found in an article by Dave

Palmer and John Donahoe entitled 'Essentialism and selectionism in cognitive science and behavior analysis' which appeared in a collection of 'Reflections on B.F. Skinner and Psychology' published in the *American Psychologist* in 1992. In that article Palmer and Donahoe are concerned, as Skinner was in the passage quoted earlier from *The Behavior of Organisms*, with the units of analysis to be used in the prosecution of our particular scientific discipline, rather than with the wider problem of universals in general as I have tried to characterize it here. What they are arguing is that in order to do good science we need to reject essentialism which they define as the practice of adopting basic concepts or units of analysis based on *a priori* definitions, and instead allow our basic-concepts/units-of-analysis to emerge from a process of variation and natural selection in the course of a systematic program of experimental and observational research.

The idea that Darwin's (1859) principle has application outside the process of phylogenetic evolution to which it was originally applied goes back to Thorndike's (1898) analysis of trial-and-error learning in the cat and is the basis of Skinner's (1981) notion of "selection by consequences." As Palmer and Donahoe point out, the suggestion that the principle can and should be applied to the evolution of concepts and theories in science seems to have been originally suggested by the late Karl Popper (1957; 1972), though there are traces of the idea in the pragmatism of C.S. Pierce. More recently it has been applied by Gerald Edelman (1987) to the process of ontogenetic development within the nervous system which, so he believes, underlies the process of concept acquisition or "categorization," as he calls it. The following quotation is representative of his view:

"The theory of neuronal group selection was formulated to explain how perceptual categorization could occur without assuming that the world is pre-arranged in an informational fashion." (Edelman 1987, p. 4)

One could hardly wish for a more explicit statement of the constructivist view that universals are entirely a product of categorization/classificatory behavior on the part of the organism. At the same time, the appeal to Darwin's principle of variation and natural selection allows Edelman to escape from Kant's dilemma by supposing that the process of selection, operating both on the genetically determined structure of the brain and on the ontogenetic development of its synaptic connections through the process of

learning, will ensure that the categories/concepts/universals so formed "follow-the-natural-lines-of-fracture"/"carve-nature-at-its-joints" whichever metaphor you prefer. Moreover, since this account is intended to apply to brains in general and [not] just to the human brain, it aligns Edelman with conceptualism rather than nominalism. It is true that there is much [in] Edelman's writing to which a behavior analyst will find difficult to stomach, such as his refusal to recognize that Thorndike and Skinner have been there before him and his use of the nominalized predicates from the language of faculty and cognitive psychology such as 'perception', 'categorization' and 'memory'. Nevertheless, as an advocate of the selectionist solution to problem of universals, he is difficult to fault. Generalized in this way, the selectionist principle provides us, I believe, with a final solution to problem of universals, as it has been debated by philosophers since the time of Plato, both in its ontological and epistemological aspects.

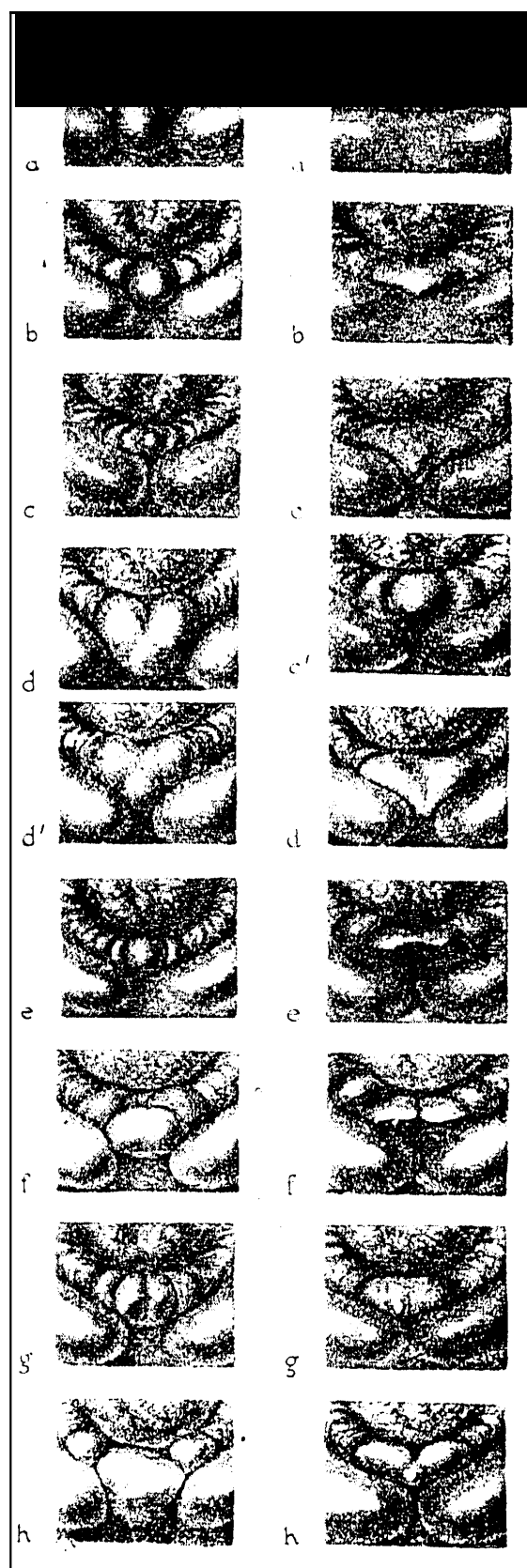
It resolves the ontological aspect of the problem by proposing that concepts which follow Skinner's "natural lines of fracture" are ones which group things together according to their causal properties. What ensures that the stimulus classes which control the organism's behavior group things together in this way, and thus accounts for the remarkable uniformity in the way things are classified both by different individuals of the same species and to a lesser extent by members of different species, is the role of the consequences of behaving in one way rather than another in shaping both stimulus classes, response classes and the link between the two.

It resolves the epistemological aspect of the problem in part by proposing a theory of concept acquisition in which the broad outline of the individual's conceptual scheme are fixed, but not immovably so as the metaphor of 'hardwiring' would suggest, by its genetic constitution as determined by what Skinner (1975) has called the "contingencies of survival", but where the details are fine-tuned by the process of operant discrimination learning, as described by Skinner (1938) in Chapter 5 of *The Behavior of Organisms*. But it also resolves the dilemma posed for the constructivist/abstractionist theory of concept acquisition, as illustrated in our discussion of the "dax" example (Figure 1. above). For the process of operant discrimination, as described by Skinner and as demonstrated repeatedly in the laboratory, does not require, even in the case of a linguistically competent human, that the subject be able to provide a verbal specification of the cues to which he or she is responding when reliably discriminating the S^D cases

from the S^A . This is well illustrated by Figure 2. which illustrates the classic case of the chicken-sexer described by Canfield (1941). The chicken-sexer learns to discriminate between male and female day-old chicks guided only by a brief glance at their external genitalia. Such learning is only made possible by feedback received from another already competent chicken-sexer who tells the apprentice, not what features to look out for - for even a skilled chicken sexer cannot do that - but simply when he or she is right and when wrong. At no stage is the chicken-sexer able to specify what cues he or she is going on in making this judgment. As you can see from Figure 2., there is no common feature that distinguishes the external genitalia of the male on the left from those of the female on the right.

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External genitalia of male (left) and female (right) day-old chicks (Canfield, 1941).

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