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EXPLANATORY REDUCTION: RESPONSE TO GUIDO IMAGUIRE

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Abstract: Guido Imaguire proposes an epistemological (and ontological) formulation of Ockham's razor in terms of the notion of explanatory reduction. Although in my response I express reservations about some aspects of the specific formulations, I agree with the general epistemological idea.

Key-words: Ockham's razor. Parsimony. Reduction. Explanation.

REDUÇÃO EXPLICATIVA: RÉPLICA À GUIDO IMAGUIRE

Resumo: Guido Imaguire propõe uma formulação epistemológica (e ontológica) da navalha de Occam em termos da noção de redução explicativa. Apesar de em minha réplica expressar reservas com respeito à alguns aspectos das formulações, concordo com a idéia geral epistemológica.

Palavras chave: Navalha de Occam. Parcimônia. Redução. Explicação.

Guido discusses several interpretations of Ockham's razor, and proposes an epistemological (and ontological) formulation in terms of the notion of explanatory reduction. Although I have reservations about some specific aspects of his formulation, I am sympathetic to the general epistemological idea.

1. QUALITATIVE PARSIMONY AND NECESSARY REDUCTION

Guido begins his discussion recalling Lewis' (1973) distinction between qualitative and quantitative parsimony used in the justification of realism about possible worlds. Although he does not want to formulate Ockham's razor merely in terms of this distinction, he shows a penchant for qualitative parsimony. He proposes to interpret the traditional slogan "entities must not be multiplied without necessity" in the sense of "kinds of entities must not be multiplied without necessity", and suggests that his formulation of Ockham's razor will have this consequence.

Of course, whether quantitative or qualitative parsimony are reasonable epistemological or ontological constraints will depend on cases, and on the interpretation of the qualification "without necessity". I do not agree with the compulsion for categorial minimalism—"ontologists must develop a complete theory of all reality with the *smallest possible basis*"—defended by Guido on p. 148. In Chapter 23 (p. 377) I argued it is a mistake to zero in on something or other as fundamental, and attempt to reduce other categories to that. In the case of mathematics, for instance, even if we acknowledge abstract mathematical properties, it does not follow we must exclude mental concepts, ideas, formal expressions, etc. from having an important explanatory role.

At the beginning of his next section Guido remarks (p. 144):

Ockham's principle becomes interesting when we read it as the principle of necessary reduction: whenever entities of kind A *can* be reduced to entities of kind B, we *must* reduce A to B. And why *must* we do it? According to the "reducibility as unreality" interpretation, the answer is this: because in this case A is not real, but merely a fiction.

The answer refers to Russell's notion of logical construct, and to his doctrine that logical constructs are not real precisely because they can be reduced to other entities.

Guido rejects this doctrine of Russell's on the grounds that whereas reality is an ontological notion, reducibility is an epistemological notion, and argues that "from the fact that temperature or heat can be fully reduced to movement of molecules does not follow that temperature or heat is unreal".

For Guido, reducibility is not tantamount to unreality, but to explanatory sufficiency, and this is the motivation for his epistemological formulation of Ockham's razor, which combines the principle of necessary reduction with a characterization of reduction as "full explanation". As he puts it on p. 145: "Reduction and full explanation are equivalent."

2. REDUCTION AS EXPLANATION

Some of Guido's formulations of the notions of *reduction* and *full explanation* are the following:

- (1) An entity (of kind) A can be reduced to another entity (of kind) B if and only if A can be fully explained by means of B.
- (2) An entity (of kind) A can be reduced to an entity (of kind) B if and only if entity A can be fully explained by means of a *theory* about B.
- (3) An entity A is said to be fully explained when the very nature of A is made explicit.

Although the notions "full explanation" and "the very nature of" are somewhat problematic, I agree with the basic intuition behind these formulations. In fact, I think most appeals to *parsimony* by scientists have precisely this character, even if they are not necessarily reductions of a kind of entity to another kind of entity.

It is quite clear, for instance, that the theory of evolution is an explanatory reduction without providing a full explanation of all aspects of the origin and development of the various forms of life on Earth. Now what is being reduced to what here? It is obviously not the case that kinds of animals and plants are being reduced to other kinds; what is being explained is the development of kinds from other kinds—i.e., the tree of life. And this development is explained in terms of various mechanisms of mutation, adaptation, selection, speciation, etc., which depend on biological and ecological factors. We may say, with Guido, that what is being explained is the very nature of life on Earth, as deriving from natural processes (physical, chemical, biological, ecological, etc.). I agree, though we are still far from having a *full* explanation, not only of the various stages and mechanisms of development, but of the actual origin of life itself—the latter being a particularly controversial issue among scientists.¹

I do not agree, however, that the frequent appeals to Ockham's razor by philosophers has this character—and certainly not the appeals to Ockham's razor I discussed in Chapter 23.

The modern champion of the use of Ockham's razor in philosophical reductions is Quine, and his proxy-function reductions have very little to do with any kind of explanatory adequacy. Thus, Quine claims mental states can be reduced to bodily states by a correlation of the two. He says (1981, pp. 18-19):

I hardly need say that the dualism [of mind and body] is unattractive. If mind and body are to interact, we are at a loss for a plausible mechanism for the purpose. Also we are faced with the melancholy office of talking physicists out of their cherished conservation laws. On the other hand, an ascetic dualistic parallelism is monumentally redundant, a monument to everything multiplicatious that William of Ockham so rightly deplored. But now it is easily seen that dualism with or without interaction is

¹ See Fry 2000 for a very interesting overview.

reducible to physical monism, unless disembodied spirits are assumed. For the dualist who rejects disembodied spirits is bound to agree that for every state of mind there is an exactly concurrent and readily specifiable state of the accompanying body. Readily specifiable certainly; the bodily state is specifiable simply as the state of accompanying a mind that is in that mental state. But then we can settle for the bodily states outright, bypassing the mental states in terms of which I specified them. We can just reinterpret the mentalistic terms as denoting these correlated bodily states, and who is to know the difference?

I have quoted this passage at length not only because it is characteristic of the reductions Quine proposes, but also because it shows his utter disregard for any explanatory considerations; even if we were to agree with his reservations about dualism, his reduction has no explanatory value.

One could claim, of course, as does Quine, that the explanatory value resides in the reduction itself. This is not true, however, because on Quine's own terms, the reduction depends on a proxy-function that correlates *every* mental state with a bodily state, and Quine cannot make good on the claim that *he can specify* such a function—he does not even try, in fact. Moreover, he has no way of specifying kinds of mental states—pains, thoughts, beliefs, etc.—in terms of the bodily states, and cannot explain the difference between a thought and a pain.

Judging from Guido's remarks throughout his paper, I assume he would agree this kind of reduction is not what he means by “fully explaining the mental”, or by “making the nature of the mental explicit”.

I turn now to the discussion of the logicist's reduction of numbers to extensions with which Guido concludes his paper.

3. LOGICISM

Guido takes Frege's reduction of arithmetic to logic as "explaining the very nature of numbers, i.e. explaining *what numbers really are*"; a view with which I very nearly agree. He then argues that Russell's no-class theory—which reduces contexts involving class terms, and quantification over classes, to contexts involving propositional functions—is a very important reduction, in that it can be used to solve Benacerraf's puzzle concerning Zermelo's and von Neumann's reductions of numbers to sets. He says (p. 152):

Russell would simply respond to Benacerraf: of course, numbers cannot be (and are not) classes (or sets), because class theory can be reduced to the theory of propositional functions. Paraphrasing Ockham: whenever you *can* make a reduction, you *should* make it, i.e. you should not stop in the middle of the way. To stop the reduction of numbers at the level of classes is, thus, an error. Use Ockham's razor and you will run less risk of error.

I see some problems here. Clearly, the value of Frege's explanation of the nature of numbers depends essentially on three factors: (1) his account of numerical attributions as attributions to concepts, rather than attributions to objects; (2) his definition of each particular number n as the extension of the concept that applies to all concepts equinumerical with a logical concept applying to n things; and (3) his definition of the successor relation and his proofs of its essential structural properties.

The reductions proposed by Zermelo and by von Neumann had an altogether different character, and I do not think anybody ever claimed that either of these reductions provides an explanation of the very nature of numbers. They are, rather, parasitic on Frege's work, and on the structural characterization given by Dedekind.

From an explanatory point of view, Russell's reduction is even more problematic, for there are notorious difficulties with his conception of propositional functions and the ramified hierarchy of types, including the status of propositional functions as entities, the justification of the axiom of reducibility, and the justification of the axiom of infinity for individuals at the bottom of the hierarchy. Moreover, numbers appear all over the hierarchy without a satisfactory explanation for this multiplication, and I think anyone unfamiliar with the earlier work by Frege, Dedekind, and Peano, would be hard put to understand the nature of numbers from Russell's definitions.

At the end, however, Guido seems to leave Russell behind and adopt a structuralist view of numbers (p. 152):

Numbers are neither identical with von Neumann's sets nor with Zermelo's sets, but with an isomorphic structure instantiated in many different systems (not only of sets or classes).

Without further clarification of what it is for numbers to be "identical with an isomorphic structure", this may bring us back to Quine, who holds there is no such thing as the very nature of numbers ('number' being a defective noun for him), and that "any progression—i.e., any infinite series each of whose members has only finitely many predecessors—will do nicely." (Quine 1960, p. 258)

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