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Discussion note: Did Darwin really answer Paley's question?

Abstract: It is commonly thought that natural selection explains the rise of adaptive complexity. Razeto-Barry and Frick (2011) have recently argued in favour of this view, dubbing it the Creative View. I argue that the Creative View is mistaken if it claims that natural selection serves to answer Paley's question. This is shown by a case that brings out the contrastive structure inherent in this demand for explanation. There is, however, a rather trivial sense in which specific environmental conditions are crucial for the rise of specific adaptations, but this is hardly what opponents of the Creative View are denying.

Keywords: Contrastive explanation; Creative View; Darwin; Natural selection; Paley's question

Introduction

In a recent paper in this journal, Razeto-Barry and Frick (2011) look into debates that concern the explanatory credentials of natural selection. They list five explananda that are, or may be, debated: maintenance of traits, propagation of traits, origin of traits, trait identity and individual existence (2011, 345). Here I will concentrate on only one of these, the question about the origins, or "creation", of traits. Razeto-Barry and Frick defend a view that they dub the Creative View. They present this view as follows (344):

This vision asserts that natural selection is a creative force because it can generate new traits by the cumulative selection that makes probable a combination of mutations which are necessary for trait development and that would not probably be combined together without natural selection. We shall call this position the 'Creative View'.

Razeto-Barry and Frick are able to find support from many leading biologists on the issue. The authors report that a recurring element in the writings of founders of the modern synthesis is the idea that the creative aspect constitutes "...a major part of the essence of the Darwinian revolution" (2011, 345). They cite Huxley (1936) who in his turn reports R. A. Fisher describing selection as "...a mechanism for generating an exceedingly high degree of improbability" (from Razeto and Frick 2011, 345).

Sometimes the Creative View is expressed by saying that the theory of natural selection can serve to provide an answer to *Paley's question* (Maynard Smith, 1969, Dawkins, 1983, Neander 1995a). Razeto-Barry and Frick do not make any explicit reference to Paley's

question, but there is no doubt that they have in mind the very same explanatory task: accounting for the highly improbable. They write (349):

The major point of the Creative View is that natural selection makes more probable the occurrence of types of sequences of phenotypic steps that seem impossible (in other words, extremely improbable) to occur by the random accumulation of changes. This “creative force” of natural selection has been associated with the ability of natural selection to explain or cause the ‘origin’, ‘formation’, ‘generation’ or ‘building’ of traits.

What is deemed impossible given mere random accumulation is clearly complex adaptive traits of whatever kind, so the role of selection is here taken to be accounting for adaptive complexity as such.

On the assumption that the Creative View amounts to claiming that natural selection provides an answer to Paley’s question, I will argue that it is mistaken. If one understands the view as not involving such a commitment it is most likely trivial and nowhere contested.

Razeto-Barry and Frick’s commitment to the Creative View concerns the possibility of the explanatory relevance of natural selection. They stress that whether natural selection actually explains complexity depends on various empirical issues that should not be prejudged (349-50). Focus here is on the in-principle issue, so the empirical issues will not be addressed.

Selection and the contrast inherent in Paley's question

In order to correctly assess the Creative View we need to take a reasonable contrastive perspective into consideration when spelling out the explanatory context. As for William Paley, in formulating his famous argument from design he clearly wanted to explain why there was adaptive complexity rather than not - the appeal to God served that very purpose. The question that finding a watch on a heath was supposed to provoke was why there is something as complex as a watch rather than all and only considerably less complex things like stones (Paley 2008/1801, 7). It was clearly not a question of why there is a watch rather than, say, a cembalo. That is, the contrast is not why there is one complex thing rather than some other complex thing. However, the theory of natural selection in fact addresses only the latter contrast, and thus doesn't answer Paley's question. This doesn't render the evolutionary perspective explanatorily inert, but once we acknowledge the appropriate contrast the “creativity” involved is uncontroversial.

If we trace lineages backwards in time we will eventually, perhaps 3,5 billion years ago or so, arrive at forms that are considerably less complex.¹ This is at least a presupposition behind the view that Darwin answered Paley's question about exceedingly improbable outcomes (to borrow Fisher's phrase). Clearly, if there were improbable complexity from the very beginning then Darwin's account is not the explanation. According to the Creative View, appeals to selection are taken to provide an answer to the following contrastive question: Why are there complex structures like us rather than all and only much less complex ones? The answer that is proposed is that selection has propelled the process from the less complex stage to the more complex stage. In speaking of the impact of the "process", "mechanism", or "force" of selection authors must clearly intend to refer to features that different instantiations of the principle of selection have in common. Thus, 'natural selection' is taken to denote a kind of causal influence that may be present on planets with quite different ranges of possible variation. Given this, however, we can point to a significant problem with sayings such as "natural selection drives evolution" or "natural selection creates complex adaptations", one that emanates from a very reasonable contrastive perspective on the explanatory project. When we look at this proposed explanation of adaptive complexity from a contrastive point of view the process of natural selection, as commonly presented, does not come out as a relevant difference-maker.

So, for instance, the principle of natural selection could be instantiated on a planet, let's call it *Dull Earth*, where only two different proto-life varieties are possible under the relatively stable conditions that obtain. These varieties could be in a continuous process of replacing each other non-randomly (i.e. as we would predict given fitnesses), locally or globally, as environments change. That is, there is natural selection. Now, we presumably want to know why our planet contains much more complex life forms than Dull Earth. How could proto-life ancestors end up having descendants like us? It is clear that an appeal to natural selection doesn't tell us. The contrast between Earth and Dull Earth resides in the fact that more complex varieties have kept appearing on Earth but not on Dull Earth. Appeal to selection, which is something that the planets have in common, does nothing to explain that difference. Consider again Fisher's claim that selection is "...a mechanism for generating an exceedingly high degree of improbability". Selection will not generate exceedingly improbable outcomes

¹ We will at least have to predate the bacterial flagellum (the "propeller"), which has been invoked by creationists as an instance of "irreducible complexity" (e.g. Behe, 1996).

on Dull Earth whatever the time-scale, so Fisher's description cannot be claimed to capture something that is inherent in "the mechanism" of natural selection as such.

The point concerning contrastive explanation that is presented here is clearly what Denis Walsh (2000) has in mind when, invoking a different contrast than I do, he asks why selection in the biological realm – but not in other contexts where there is selection – yields adaptations. He writes: "Selection as a general phenomenon is widespread but in very few areas does it lead to increases in adaptive complexity." (2000. 142). Walsh furthermore points out that it is of no avail to invoke cumulative selection, rather than non-cumulative selection, as the relevant mechanism (2000. 143). This only raises the question why this cumulative cause occurs on Earth but not on Dull Earth. In answering this question we would be back to what is in fact the relevant difference-maker: the varieties that actually arise. The occurrence of cumulative, rather than non-cumulative, selection is simply the consequence of the continuing appearance of novelty in a world with some degree of environmental stability. Then, cumulative selection cannot be appealed to as what accounts for the difference between Earth and Dull Earth since in invoking it in the case of Earth we are merely presupposing the crucial difference in "mutational generosity" that makes all the difference. It will not help to insist that selection is a two-step process, with variation being generated at the first step and sieving among the alternatives being performed at the second. The theory of selection doesn't tell us why the first step of this two-step process is much friendlier to accumulation of structure on Earth than it is on Dull Earth. As far as natural selection is concerned, Earth could have been Dull Earth.

The upshot is that appeals to selection do not help answer Paley's question. For all we know about the principle of natural selection our planet could have peaked in adaptive complexity at some proto-life stage billions of years ago. What has "driven" evolution isn't selection but the continuing appearance of novelty, including adaptive novelty once in a while. Appeals to selection have us focus instead on the statistically inevitable consequence of such appearances. So, the general characteristics of the "force", "mechanism", or "process" of selection do not tell us why there are eyes and brains rather than merely proto-life.

The Creative View conforms to a highly questionable understanding of the import of the principle of natural selection. A very reasonable view, which does not lend itself to the Creative View, is as follows: There was considerable evidence for the occurrence of substantial evolution at Darwin's time, and Darwin (1998/1859) was ardent in bringing all relevant data together to state his case. A serious problem was that it was commonly held that evolution required "improvement-mechanisms" that operated at the level of modifications. If

such mechanisms are deemed necessary for evolution, and if they cannot be found, then one would be inclined to try to explain away the evidence for evolution, not least in Darwin's time since such inclinations were already natural in the creationist intellectual milieu that prevailed. The appeal to the principle of natural selection counters the very demand for improvement-mechanisms. If there are processes that blindly keep generating novelty (including adaptive novelty once in a while) in a world with a fair degree of heredity, some environmental stability, a potential for vast accumulation of structure, and plenty of time available, then the principle of natural selection tells us that that is all that is required for things to be as we find them. That is, there is no need to posit mechanisms for producing adaptive modifications. This is then offering natural selection as a reason not to require such mechanisms, not offering it as a cause in the context of answering Paley's contrastive question: Why adaptive complexity rather than not?

The seeming creativity of environmental conditions

Now, some kind of creation question remains even if it is agreed with what is said above. Setting creationism to the side, we all agree that persistent or recurring environmental conditions are relevant in accounting for the existence of particular biological traits. So, for instance, it will be universally granted among evolutionists that the interactions between predators and prey are relevant for evolutionary outcomes. Focusing on a very "predator-appropriate" trait in a prey species the question may arise about the role of predators in accounting for this. Is the role of predator activities of the past merely destructive - one of eliminating the less fit - or has it in some reasonable sense helped to create the adaptation in the prey species?

The answer to the question we are now dealing with is likely to depend on our views on causation in general. Given a transmission account of causation (e.g. Reichenbach 1957/1928, Salmon 1984, Dowe 2000) the activities of predators will not be causal conditions in the generation of adaptations. The activities themselves are transmission-causal but there is, for instance, no transmission of energy from the death of some individuals to cause the occurrence of useful mutations in others.

Razeto-Barry and Frick approach the question from a probabilistic view of causation (346). On this view, predators are causally relevant for the outcome if the outcome would have been less probable without the predators, whether or not cause and effect are related in the transmission-causal sense. Now, I cannot imagine that there is controversy concerning the counterfactual probabilistic dependence as such, although some will deny that the relation is

causal. There is indeed good reason to assume that a complex predator-appropriate adaptation in some prey species depends counterfactually on past interactions between predators and prey, at least if the dependence is understood probabilistically such that the adaptation would be utterly improbable otherwise. It is clear that the probability of the appearance of some useful trait T through mutation depends on which varieties there are to be modified. It is also clear that a useful mutation is more probable given a large sample. Since the appearance of fitter mutants will often result in an increase in absolute numbers, circumstances that are favourable to T can thus be said to increase the probability of further refinements that are more probable given T than given the alternatives. Karen Neander (1995a, b) appeals to these considerations in arguing for the creativity of selection, and it is no doubt what Fisher had in mind when speaking of selection as a mechanism for generating improbable results. Razeto-Barry and Frick rest their support of the Creative View on these considerations as well (349). The problem is that this is hardly the crux of the debate. The probabilistic dependence that is at issue here is nowhere being denied, at least not to my knowledge. The thing to note is that we are not, in this situation, addressing Paley's question. That is, the specific interactions we refer to do not tell us why there are complex traits rather than all and only non-complex traits, but why there is this kind of complexity rather than some other kind of complexity. We presumably take the predators to be a necessary condition - on pain of exceeding improbability - for some ancestral prey organism to have descendants with this very adaptation, but not as being necessary for the ancestors to have descendants with n rather than $n-1$ complex adaptations. So, instead of asking Paley's question we are really asking: Given that there can be complex adaptations, why this one rather than something else?

The upshot is that the Creative View is either false or trivial. It is false if understood as affirming that natural selection provides an answer to Paley's question, and trivial if it merely states that the existence of specific complex adaptations depends counterfactually - barring the very improbable - on specific environmental factors of the past.

Conclusion

There is no doubt that appeals to specific environmental conditions of the past will help explain the existence of particular adaptations. This is true whether we treat the dependence involved as a causal one or not, and whether we find the term 'creative' appropriate or not. The point that has been argued here is that we are not thereby answering Paley's question: Why complexity rather than not? Darwin provided us with ample evidence to the effect that

there has been a massive accumulation and diversification of adaptive complexity on this planet. But the theory of natural selection doesn't tell us why Earth isn't like Dull Earth.

Literature:

- Behe, M. 1996. *Darwin's Black Box*. New York: Simon and Schuster.
- Darwin, C. 1998/1859. *The Origin of Species*. New York and Toronto: Random House.
- Dawkins, R. 1983. "Universal Darwinism", in D. S. Bendall (ed.), *Evolution from Molecules to Man*. Cambridge: Cambridge University Press: 403-425.
- Dowe, P. 2000. *Physical Causation*. Cambridge: Cambridge University Press.
- Huxley, J. 1936. "Natural Selection and Evolutionary Progress", *Nature* 3: 571-573.
- Maynard Smith, J. 1969. "The Status of Neo-Darwinism", in C. H. Waddington (ed.), *Towards a Theoretical Biology*. Edinburgh: Edinburgh University Press: 82-89.
- Neander, K. 1995a. "Pruning the Tree of Life", *British Journal for the Philosophy of Science* 46: 59-80.
- . 1995b. "Explaining Complex Adaptations: A Reply to Sober's 'Reply to Neander'", *British Journal for the Philosophy of Science* 46: 583-587.
- Paley, W. 2008/1802. *Natural Theology*, Oxford University Press.
- Razeto-Barry, P. and R. Frick. 2011. "Probabilistic Causation and the Explanatory Role of Natural Selection", *Studies in History and Philosophy of Biological and Biomedical Sciences* 42: 344-355.
- Reichenbach, H. 1957/1928. *The Philosophy of Space and Time*. New York: Dover.
- Salmon, W. 1984. *Scientific Explanation and the causal Structure of the World*. Princeton, N. J. and Guildford: Princeton University Press.
- Schaffer, J. 2004. "Causes need not be Physically Connected to their Effects: The Case for Negative Causation", in C. Hitchcock (ed.), *Contemporary Debates in Philosophy of Science*. Malden, MA, Oxford and Carlton: Blackwell.
- Walsh, D. 2000. "Chasing Shadows: Natural Selection and Adaptation", *Studies in History and Philosophy of Biological and Biomedical Sciences* 31: 135-153.