

Evolution by Natural Selection: Confidence, Evidence and the Gap, by Michaelis Michael

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otherwise, there would be nothing for objects extending into the past or the future to stand in a spatiotemporal location relation to. But it would be odd if some (parts) of these spatiotemporal regions lacked contents—if, say, the world is somehow a four-dimensional manifold consisting almost entirely of ‘empty’ spacetime except for one slice (the present slice) with material contents. On the other hand, if spatiotemporal regions extending into the past exist (now) together with their material contents, then it would seem that Socrates *is*, after all, snub-nosed *now*—since there now exists a spacetime region that includes a snub-nosed Socrates.

A separate worry concerns Cameron’s use of facts about objects’ ages to ground facts about what time is present. If the progress of time is distributed to independent objects in this way, it is not clear what forces different objects to progress through their ages at the same rate.

Perhaps these and other worries can be addressed in an expanded discussion of Cameron’s theory. As it is, the book as whole is recommended for its thought-provoking new take on MST as well as for its excellent discussions of the epistemological argument for Presentism, MacTaggart-style attacks of A Theory, and future indeterminacy.

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Michael, Michaelis, *Evolution by Natural Selection: Confidence, Evidence and the Gap*, Boca Raton, FL: CRC Press, 2016, pp. xv + 152, £61.99 (hardback).

This book is a philosophical analysis of the Darwinian theory of evolution, in light of Darwin’s own writings on the topic. The structure of evolutionary theory has been a classical topic in the philosophy of biology over the last thirty years or so. The most highly cited book in this literature is Elliott Sober’s [1984] *The Nature of Selection*. Other classics include Elisabeth Lloyd’s [1988] *The Structure and Confirmation of Evolutionary Theory*, Robert Brandon’s [1990] *Adaptation and Environment*, and, more recently, Samir Okasha’s [2006] *Evolution and the Levels of Selection* and Peter Godfrey-Smith’s [2009] *Darwinian Population and Natural Selection*. Michaelis Michael develops many of the themes addressed in these classics.

The book starts with the analysis of an old argument which is supposed to demonstrate that the principle of natural selection is circular. A simple way to present this argument is by using the well-known phrase of Herbert Spencer when presenting the mechanism of natural selection as being ‘the survival of the fittest’. Yet if we naively

consider that the individuals that are the fittest are those that survive (and reproduce) while the less fit die, then the reasoning becomes circular. By replacing ‘the fittest’ by ‘those that survive’, the phrase ‘the survival of the fittest’ becomes ‘the survival of those that survive’, which is empty. Michael, starting from a presentation of this argument, its diverse forms, and several unsuccessful attempts to dismiss it (chapter 2) proposes his own take on the matter (chapter 3). A classic way to resolve the tautology problem is to argue that fitness is a measure not of the *actual* number of offspring produced by an individual but rather is a measure of a probability or *propensity* to have offspring. Michael is unsatisfied with this account. He shows that none of the current interpretations of probability, including the propensity interpretation, offers a successful interpretation of fitness. He proposes instead that fitness is a *disposition* of an individual organism to survive, relative to an environment. I am quite sympathetic with this idea, but it would have been useful to highlight two things: first, that propensities are a kind of disposition (namely, probabilistic dispositions); second, that there is a family of propensity interpretations of probability [Hájek 2012], some that might be compatible with Michael’s account. Like Michael, I think that only an account of fitness that is grounded in properties of individuals, rather than probabilities at the level of the population, can be successful [Bourrat 2015], and that one mistake with some propensity interpretations of fitness is to equate the probabilities themselves with fitness. Furthermore, propensities are certainly the most problematic interpretations of probability [Hájek 2012] and it is not clear that there can be genuine propensities without fundamental indeterminism.

Chapter 4 analyses Darwin’s own presentation of his theory. Michael argues that the principle of natural selection is above all a theory of persistence—what he calls a ‘proto theory of natural selection’ [57], in which persistence occurs through the inheritance of traits across generations. Towards the end of the chapter, he contrasts the view developed in chapters 3 and 4 with the most popular way of presenting natural selection—namely, as a set of three necessary and sufficient conditions for evolution by natural selection to occur in a population. According to Lewontin [1985] and many others who have proposed similar summaries, the three conditions are variation, difference in reproductive outputs between these variants, and heritability, so that the offspring resemble their parents more than they resemble other members of the population. As rightly pointed out by Michael, these three conditions do not represent necessary and sufficient conditions for evolution by natural selection, since they can be satisfied even when the evolution observed is a case not of evolution by natural selection but is instead a case of evolution due to some other evolutionary process(es), such as drift. This is one way to show that these three conditions are not sufficient conditions to grant evolution by natural selection. Another is to show that, in spite of their being satisfied, no evolution need be observed [Okasha 2006; Godfrey-Smith 2009].

Chapter 5 is dedicated to the notions of explanation and causation. How does invoking natural selection explain adaptation? After giving a short analysis of the metaphysics of causation and the concepts of function and optimality, Michael argues that to invoke natural selection is to give an explanation that is both historical and causal [74]. When invoking natural selection, we claim that the features of organisms that we observe today are the ones that we observe because these features were more advantageous than the alternative features present in the ancestor population of the current organisms. Because the claim is historical, it is prone to errors in the same way as is any other historical claim. The second part of this chapter proposes an analysis of the

concept of ‘chance’ used by Darwin, as well as some reflections on reductionism—particularly genetic reductionism, genetic determinism, the levels of selection question, and the gene’s eye view of evolution popularized by Dawkins [1976].

Chapter 6 is about the scientific status of Darwin’s theory. Michael starts this chapter by presenting the case of Philipp Henry Gosse whose book *Omphalos*, written two years after Darwin’s *Origin of Species*, argued that the fossil record should be regarded not as evidence for Darwin’s theory but rather as a Divine act. As Michael puts it, ‘Gosse who was an utter literalist about the Biblical account of the world also thought he could see that there was a gap between the evidence and the theory’ [103]. After having presented two classical problems in the philosophy of science—namely, that of confirmation (with the Raven Paradox), and that of demarcation—Michael responds to the question of whether evolutionary theory is falsifiable, a question famously asked by Karl Popper. After having discussed what senses this question can take, Michael suggests that it is not the right question to ask. He argues that ‘although the statement of [Darwin’s] theory is not falsifiable, it follows impeccably from falsifiable and analytic truths’ [126]. And for that reason Darwin’s theory is scientific.

Chapter 7 looks at the concept of heritability, one of Darwin’s theory’s key concepts. In this final chapter, after having made some important distinctions about the legitimate sense in which a trait can be considered as ‘genetic’ as opposed to ‘environmental’, Michael argues that all that is required for the Darwinian apparatus to work is that some mechanism produces heritable traits. It does not matter whether that mechanism is genetic or, for example, epigenetic. I am very much in agreement with this claim [Lu and Bourrat [forthcoming](#)]. Based on these arguments, Michael argues that there is no contradiction in claiming that speaking English is heritable while not being ‘in the genes’.

Evolution by Natural Selection successfully delivers on its promises. Within 150 pages, Michael makes a number of important distinctions that should not only convince sceptics that evolutionary theory is truly scientific but should also provide the tools for reasoning more accurately about the key concepts in natural selection. I particularly appreciated the claim that natural selection is a process that has evolutionary outcomes in virtue of heritability and that confusing this process—natural selection—with its outcome—evolution—empties the theory of its content. This is not an original claim, but it is sometimes forgotten when the notion of Evolution by Natural Selection is presented from a purely phenomenological perspective. I also appreciated the frequent links made by Michael with Darwin’s own writings.

With that said, I must point to the main weakness of the book, which is that it is not well placed in the corpus of the literature on the topic. The classics that I mentioned at the beginning of this review—with the exception of Sober [1984] and, very briefly, Godfrey-Smith [2009]—are not discussed or even cited, and the convergences between Michael’s ideas and some of these authors are not acknowledged. To mention just a few, both Okasha and Godfrey-Smith have provided a number of ideas on the concepts of heritability and fitness, and have discussed in a subtle way Lewontin’s tripartite summary for evolution by natural selection. It would have been nice to see this acknowledged and discussed. The link between natural selection and persistence is the major theme developed by Frédéric Bouchard [2008]. Here again it would have useful to see this discussed. Finally, the concept of the environment and its relation to fitness and natural selection is the major theme of Brandon’s [1990] book, which is crucially missing from Michael’s analysis.

To conclude, I highly recommend reading *Evolution by Natural Selection*: it is enjoyable and well argued. But if I was presenting the book to students, I would take care to draw their attention to the other literature on the same topics.

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Pritchard, Duncan, *Epistemic Angst: Radical Skepticism and the Groundlessness of Our Believing*, Princeton: Princeton University Press, 2016, pp. xv + 239, US\$35 (hardback).

Duncan Pritchard's *Epistemic Angst* is a well-argued and innovative reply to the challenge of radical scepticism. It is an ambitious synthesis of Wittgenstein-inspired 'hinge epistemology' and McDowell-informed epistemological disjunctivism. Pritchard's central observation is that the sceptical challenge comes in two logically distinct forms, so it requires distinct but consistent replies. The two structures of sceptical arguments that Pritchard identifies are, first, those proceeding from closure principles and, second, those dependent on underdetermination principles. These arguments target distinct assumptions about knowledge. On the one hand, closure-based sceptical arguments depend on what Pritchard calls *the universality of rational evaluation*, which is the thought that there are no in-principle limits to epistemic evaluation [55]. On the other hand, underdetermination arguments proceed from the thought that the well-established support for our beliefs is still consistent with their widespread falsity. Pritchard