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REVIEW

Did Darwin Write the Origin *Backwards? Philosophical Essays on Darwin's Theory*

by Elliott Sober
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reviewed by Doren Recker

Elliott Sober's most recent book covers a variety of topics in the history, philosophy, and practice of Darwinian evolutionary biology. It contains five chapters, on: (1) the relationship(s) between common ancestry and natural selection in the *Origin*, (2) group selection, (3) sex ratio theory, (4) naturalism, and (5) a postscript, providing a more detailed, formal account of several issues contained in the first four chapters. The style is fairly informal, with statistical analyses sprinkled here and there, but the main text is understandable without knowledge of formal probability theory. The main audience would be philosophers and evolutionary theorists, though there are some interesting claims concerning more historical issues as well.

Sober is certainly among the leading philosophers of biology of this generation, and much of his work has also been influential among practicing evolutionists. His *The Nature of Selection* (Sober 1984), for example, remains one of the best introductions to and analyses of selection theory, and his co-authored book with David Sloan Wilson, *Unto Others: The Evolution and Psychology of Unselfish Behavior* (Sober and Wilson 1998), pretty much resurrected the concept of group selection as a serious evolutionary force. Both issues are revisited in his new text, with some new wrinkles added. I will concentrate on a few areas of interest to give some idea of the contents, rather than reviewing each chapter.

Others (including myself, Recker 1987) have noticed that there are at least two main positions defended in the *Origin*: (a) that common ancestry accounts for the main patterns of data within comparative anatomy, paleontology, biogeography, systematics, and so on; and (b) that natural selection provides the chief means by which populations change over time. Evidence for natural selection is predominantly provided in the first four chapters of the *Origin*, while common ancestry is defended in most of the remaining chapters. What is the relationship between the two, and how do they both relate to the argument structure of the *Origin*?

Sober argues plausibly that these two main concepts are "entangled," and that natural selection has *causal* priority while common ancestry has *evidential* priority in Darwin's work (p 33–34). That is, while natural selection is the main ("ultimate") cause of species change over time, the main *evidence* that these changes occurred at the macro level is the evidence provided for common ancestry. While no one has seriously denied that natural selection occurs (that is, denied its status as a *vera causa*, supported by Darwin primarily with examples from and facts about domestic cases, and by more recent experimental work

on natural selection—differential populational resistance to pesticides, antibiotics, and so on), opponents have always claimed that it is unable to produce *large* phenotypic changes. Evidence that *these* have occurred is, again, largely attained from comparative anatomy, systematics, paleontology, and so on. So Darwin's "extrapolationist" (p 21) claims about macroevolution, based on evidence provided in chapters five through thirteen of the *Origin*, also provide the main support for the causal efficacy of natural selection.

The situation here is similar to opponents of evolution claiming that "it's not possible for natural selection to produce x." An appropriate response involves what Philip Kitcher has called "Darwinian Histories" (Kitcher 1985), which are basically the "adaptationist, just-so stories" that have elicited such ire among many evolutionary theorists (for example, Gould and Lewontin 1979). But as possible *hypotheses*, as appropriate responses to *impossibility* claims, good Darwinian Histories play an important role in defending the causal efficacy of natural selection. To further *support* such adaptationist stories, however (that is, to provide reasons to believe that such *have* occurred), independent evidence is required (such as appropriate fossil evidence or DNA comparisons). Similarly, evidence that natural selection *occurs* and can be shown to produce appropriate changes in certain populations does not, by itself, show that it can account for all or most current biological phenomena. *That* requires support from the various areas of biology. Natural selection may be the primary causal factor in evolutionary change, but evidence that it *has* acted on a grand scale requires support from the various areas of biology (again, it is causally prior, while support for common ancestry is evidentially prior).

The idea of group selection was anathema to most evolutionary biologists at the time I began reading books and articles on natural selection. One of the main reasons for this was the great influence of George C Williams's *Adaptation and Natural Selection* (Williams 1966), followed by the popularization of "gene-selection" models (such as Dawkins 1976), which seemed to bring the "Paradox of Altruism" back under evolutionary control. Roughly, this paradox is: (i) altruists are (by definition) less fit than selfish individuals within the same group; (ii) due to natural selection, fitter traits increase while less fit traits decrease in frequency within a group; so (iii) natural selection cannot cause altruism to evolve (p 57–58). Both premises are true. So if traits and behaviors cannot evolve for the "good of the group," then how does evolutionary biology account for obvious altruistic behaviors throughout the animal kingdom? Gene-selectionism dealt with this problem by arguing that traits and behaviors which are comparatively deleterious at the level of the individual organism can be beneficial at the level of individual *genes* (which are shared by multiple individuals, especially by close relatives—kin selection). Or among non-relatives, a relatively deleterious trait or behavior can still "pay off" for an individual in an act of cooperation, provided the individual can expect similar acts of cooperation from other members of the group over time (reciprocal altruism), as long as the cost/benefit ratios come out positive in the long run. So, the story went, we don't need group selection as an explanation for altruistic behaviors.

One of the most striking aspects of Sober's and Wilson's reanalysis of group selection (Sober and Wilson 1998), was to show that kin selection is an example of group selection. Sober again argues for this in chapter two. Basically, when an individual sacrifices some of her fitness for another member of the group, this "pays off" at the group rather than the individual level. That's what group selection *means*. Paying off for other carriers of specific

genes is still paying off at the group level (here, if you want, a group of close relatives). What matters in all discussions of levels of selection is what is selected *for* (whose fitness is enhanced, at whose expense?). For group selection to occur, there has to be competition between groups, and this has to outweigh the deleterious effects on individuals within groups. Sober again provides scenarios where these conditions can be met, and argues (rightly!) that discussions concerning levels of selection need to be data-driven (with evidence concerning *particular* cases), rather than theory-driven (where the theory requires that one or another "level" is always preferred). This is an important point, and an important chapter.

Readers of *Reports of the NCSE* may be most interested in Sober's discussion of naturalism. He rightly points out that there seem to be a number of theological arguments in the *Origin*, preferring God as a "majestic law-giver" rather than a persistent "meddler" in the biological realm; the problem of evil being better addressed by a law-giver than one who individually creates each organic being; and God's goals being hidden, rendering Paleyian design arguments untestable (among others, p 123–130). Does this sacrifice the scientific status of Darwin's work? No. Methodological naturalism is not concerned with whether God or supernatural entities of any kind are *mentioned*, or even with whether or not they *exist*. They cannot be used as scientific *evidence* for a claim, nor can they be used to rule out scientific evidence for a claim. And contrary to some recent disclaimers (such as Dawkins 2006), the existence or non-existence of God is not relevant to "good science" either (p 130–133). That is, *metaphysical* naturalism is not a commitment of science, and evolutionary biology is neutral with respect to it (p 134).

On at least some interpretations of the status of mathematical entities, science may also be committed to the existence of *some* "supernatural" entities. That is, if "supernatural" is defined as being "outside spatio-temporal boundaries" (p 134), then mathematical entities (on some standard interpretations—for example, mathematical Platonism), are supernatural. And yet, of course, science uses mathematics all the time! While I am not a fan of mathematical Platonism as the best account of mathematics, Sober's point here is nevertheless a good one. It would not "destroy science" if mathematical Platonism turned out to be true. Nor are a number of beliefs about God's existence and role in the universe in themselves "science stoppers". Scientific claims need to be *testable* at some level and to some degree, and *that's* essentially methodological naturalism (since only "natural" entities and processes have been susceptible to scientific testing).

Hence, divine intervention isn't part of science, *in so far as* no one has been able to make such claims empirically testable (nor does the prospect seem promising). But the theory of evolution does not necessarily entail that no such interventions occur. If you believe they do, you believe this for non-scientific reasons. And if you want to do science or get a hearing for a scientific hypothesis, you cannot transcend the limits of methodological naturalism. This seems to me to be all that is needed to protect science from the various flavors of creationism. And it has the virtue of not disenfranchising the myriads of scientists (including evolutionary biologists) who *also* have religious beliefs of various kinds (one important example is Ken Miller). We shouldn't let extraneous programs and prejudices interfere with biological (or *any*) science. But we shouldn't extend science beyond its proper boundaries to place extraneous limits on philosophy or religion either. Good fences make good neighbors (and vice versa).

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