Not So Innocent: Methodology And Metaphysics Of Evolution

Author: Haber, Matt

Source: BioScience, 58(11) : 1088-1089

Published By: American Institute of Biological Sciences

URL: https://doi.org/10.1641/B581113

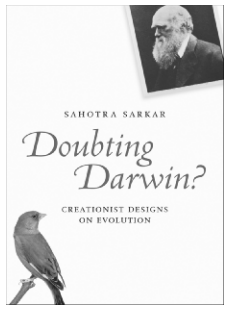
NOT SO INNOCENT: METHODOLOGY AND METAPHYSICS OF EVOLUTION

Doubting Darwin? Creationist Designs on Evolution. Sahotra Sarkar. Blackwell Publishing, Malden, MA, 2007. 232 pp., illus. $64.95 (ISBN 9781405154901 cloth).

Sahotra Sarkar has set a difficult task for himself: to assess intelligent design (ID) creationism as a science without consideration of political motivations. What makes this task so difficult is that ID creationism is predominantly politically motivated, and it is just those motivations that explain, in large part, why ID creationism is such lousy science and lousy philosophy. Sarkar, a professor of philosophy and integrative biology at the University of Texas, is well suited for the job. Technically sound in both philosophy of science and evolutionary theory, he also appreciates the social responsibility of his position. Indeed, Sarkar cut his philosophical teeth visiting southern African refugee camps in the Frontline States in the early 1980s to lecture on and debate political and economic philosophy in the struggle against apartheid. He is not afraid to wade into a charged political atmosphere.

The power of the ID creationist arguments is not that they are convincing, coherent, or compelling; it is that they are presented with a veneer of complexity that is taken as a sign of authority—namely, scientific authority. Dismantling these arguments requires a certain level of technical proficiency, but it is not altogether effective. The risk of providing ID creationists with the cover of legitimacy is often greater than any payoff would be in confronting the arguments directly. It is, after all, legitimacy that they are typically after. Politically, it can be more valuable simply to air your ideas in debate without much regard as to how such debates play out. Nonetheless, exposing the absurdity of the seemingly technical ID creationist claims is a vital component in the push back against creationism. For as much as what is at stake concerns a political or ideological debate, it must be underwritten by good science.

Sarkar accepts the ID creationist gambit for the sake of argument, taking seriously the claim that ID creationism should be considered *on scientific grounds* as a credible scientific alternative to evolutionary theory. He is even gracious enough to provide an argument for this where the ID creationists have not, by providing historical examples of cases where new theories replacing old ones entailed major shifts in our metaphysical assumptions (e.g., Newton's mechanics required acceptance of action-at-a-distance). Drawing on these examples, Sarkar identifies



criteria by which to judge such proposed adoptions and then proceeds to demonstrate why ID creationism fails badly by every measure. He includes a useful history of conceptual debates within evolutionary theory, culminating in a nice encapsulation of the modern framework of evolutionary theory and current controversies. This is coupled with technically sound dismantlings of ID creationist arguments concerning design, complexity, and information. My favorite chapter title makes for a nice rejoinder: "Complexity Is Complicated" (chapter 6).

Sarkar argues that the adoption of ID creationism would include the acceptance of a worldview that is radically different from our current scientific theories, namely, the rejection of methodological naturalism—the claim that scientific inquiry is limited to those facts accessible by naturalistic methods (i.e., through logic and our senses). A metaphysical strain of naturalism beyond the epistemological claim asserts that the world *consists of* only what we can experience through naturalistic methods. A common line of argument proffered by ID creationism critics is that these two lines of reasoning are independent; the former does not entail the latter. (Sarkar cites Michael Ruse as an example.) Sarkar rejects this characterization of metaphysical naturalism, instead agreeing with the 19th-century physicist and philosopher of science Pierre Duhem, believing that "science is never innocent of metaphysics."

By demanding a broadly naturalistic methodological framework, Sarkar establishes criteria that ID creationism will not meet.

At first glance, it may seem that this characterization of naturalism plays right into ID creationist hands by acknowledging that accepting evolutionary theory does carry metaphysical weight. Yet Sarkar's characterization carries both greater and fewer commitments than many ID creationists and critics suppose. Yes, one must make certain metaphysical commitments in accepting methodological naturalism and evolutionary theory, but they are not as broad as those characterized by Ruse. We are merely to accept the metaphysics implicit in the theory: biological variation arises by chance, natural selection is lawlike in operation, design in nature is not teleological, and other general principles of physical science, including the principle that all such commitments are revisable in light of experience. These commitments are simply silent regarding what might exist beyond the scope of methodological naturalism; however, what is included (the natural) or excluded (the supernatural) from that scope is itself revisable.

Strategically, this defense of naturalism is very clever. By demanding a broadly naturalistic methodological framework, Sarkar establishes criteria that ID creationism will not meet. Satis-

fying such a framework would entail revisions so radical as to either be unpalatable to proponents of ID creationism or render a completely neutered (and thus harmless) version of ID creationism. ID creationists must either argue that the designer is accessible by naturalistic means or reject methodological naturalism altogether. Sarkar has effectively taken just what ID creationists identify as being distinctive of their work and rendered it unscientific—all the while rejecting a hard line of demarcation. Creationists may object that excluding the possibility of the supernatural directing evolution is itself a roadblock to progress in science—if they were to be so forthright in front of school boards and responsible media, then Sarkar will have accomplished his goal.

Although Sarkar's book overall is extremely well written and carefully rendered, I found some shortcomings. If his goal is to reach an interested lay public, a primer on assigning probabilities would be helpful. This is especially the case given how much of Sarkar's criticism of Dembski turns on the incoherence of trying to assign probabilities without a reference class. These are technical arguments, and more help should be offered to the reader. Sarkar can also get a bit carried away in rhetorical flourish, producing fuel for the fire. Describing Alfred Wallace's panselectionism as "heresy," for example, plays into the ID creationist ploy to characterize evolutionary theory simply as Darwinism, and is all too easily exploited or misunderstood. That this occurs a page after Sarkar (rightfully) argues, "ID creationists misrepresent the practice of evolutionary biology when they present it as Darwinism, as if it were a doctrine based on a prophet like their own theologies of revelation," is that much more striking (p. 29).

I would strongly recommend *Doubting Darwin? Creationist Designs on Evolution* to anyone interested in why biologists find ID creationism objectionable. It would make a wonderful textbook for an undergraduate course in either biology or philosophy, and could also be effectively used as a jumping-off point into a deeper exploration of a host of topics. My copy will be close at hand on my bookshelf when ID creationists present themselves at my door.

MATT HABER
Matt Haber (e-mail: mhaber @philosophy.utah.edu) is an assistant professor in the department of philosophy at the University of Utah in Salt Lake City.

doi:10.1641/B581113
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THE BIRDS AND THE BEES, FROM THE FLOWER'S POINT OF VIEW

Understanding Flowers and Flowering: An Integrated Approach. Beverly Glover. Oxford University Press, New York, 2007. 256 pp., illus. $75.00 (ISBN 9780198565963 paper).

Understanding Flowers and Flowering has the ambitious goal of unifying molecular genetic and ecological viewpoints on floral production, development, and morphology—and it largely succeeds in that aim. Author Beverly Glover, of the University of Cambridge, is a specialist in floral color and epidermal cell morphology, and therefore has particular insight into aspects of floral biology that link ecology with genetics. The book covers topics ranging from angiosperm evolution to floral genetics to the ecological interactions of pollinators and floral form. As might be expected, some sections are stronger than others, but on the whole, this work fills a considerable gap among available texts by integrating evolutionary, ecological, and developmental genetic materials.

The 19 chapters are logically divided into three sections that can be described generally as evolution, developmental genetics, and ecology. The first section is perhaps the weakest (it is also the shortest), highlighting several questionable or out-of-date hypotheses and results. Among these, the most problematic is the assertion that the "mostly male" hypothesis is the "currently favored" model for the evolution of the hermaphroditic floral axis. This hypothesis holds that an important gene for promoting floral meristem identity, called *LEAFY,* was duplicated in the ancestor of all seed plants (angiosperms and gymosperms). The resulting two types of *LEAFY* evolved sex-specific functions—one primarily controlling male reproductive identity, and the other, female. These two flavors of *LEAFY* function are posited still to be present in extant gymnosperms, whereas in angiosperms, only the "male" *LEAFY* function persists. The explanation for this condition is that somehow the genes responsible for promoting ovule development came under the control of the male *LEAFY* in the ancestor of angiosperms, producing ectopic ovules on some male reproductive organs that ultimately evolved into carpels.

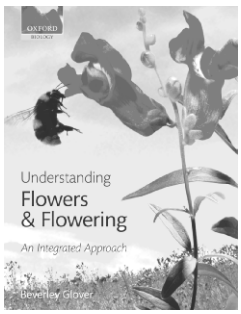
Although this hypothesis represented an important transition in models of angiosperm evolution by invoking simple changes in gene expression as potential mechanisms for evolutionary change, it cannot be considered viable at this point because substantial contradictory data also exist (i.e., the two gymnosperm *LEAFY* homologs are not, in fact, male and female specific). Of much greater importance are the homeotic models for flower evolution, which Glover references in subsequent chapters but incorrectly suggests are equivalent to "mostly male." Aside from this point, I particularly missed the presence of any kind of angiosperm phylogeny figure, even a simplified one that glosses over the controversial points. This absence is also felt in later chapters that, to the author's credit, do an admirable job of including data from taxa other than the standard *Arabidopsis.* At least one angiosperm phylogeny would have been useful to help readers orient themselves in an evolutionary context when these different taxa are discussed.

The second section encompasses the developmental genetics of flowering time and floral development from a relatively broad perspective, with some consideration of the evolution of these

genetic pathways. This section begins with a useful introduction to *Arabidopsis* biology and genetic manipulation as well as to the often confusing terminology used in flowering time control. Glover defines three major pathways—autonomous, photoperiodic, and vernalization—which feed into the floral pathway integrators that actually promote flowering. In this regard, Glover does not do herself any favors by using atypical terminology when discussing the flowering-repressor gene *FLC* (*FLOWERING LOCUS C*), included as part of the "autonomous inhibition" pathway. The odd point here is the use of the term "autonomous" in relation to *FLC*. There is also a well-characterized floral induction pathway that is more commonly referred to simply as the "autonomous" pathway. These autonomous loci act through several different genetic mechanisms to deactivate the floral repressor *FLC* and thereby allow flowering to occur. This is the first time I have seen *FLC* termed an "autonomous inhibitor," and I can understand Glover's logic, but, as a rule, *FLC* is discussed in the literature as a component of the vernalization pathway.

One can always quibble about terminology, but I found the use of autonomous inhibition versus autonomous induction to be tricky in two regards. First, readers have to pay very close attention to catch which pathway is being discussed at any particular time (not necessarily a bad thing), and second—and more problematically—it may lead to confusion when readers go to the primary literature and do not see the same usage. This being said, the complexities of flowering time control in *Arabidopsis* make it one of the hardest subjects to explain clearly. Glover has achieved that quite well, and the data covered are very up to date, which will extend the shelf life of this text.

The latter part of the molecular genetic section focuses on the genetic control of floral meristem and floral organ identity. This subject is the one area that has been thoroughly covered in many other texts and literature reviews, so it is hard to add much that is new, but Glover does an excellent job of explaining the work from first principles. In particular, she gives full coverage to the fact that the A-class component of the ABC model of floral organ identity, which is often considered essential to the development of sepals, does not actually appear to be well conserved. This point often gets short shrift in other reviews, but it is very important for students to grasp as early as possible.



The last section, covering variation in floral form, represents the most integrative material. What is the ecological value of zygomorphy (bilateral floral symmetry), and how is it genetically generated? What are the biochemical, genetic, and morphological bases for floral color, and how do the components interact with floral ecology? These questions are among the best-addressed points in this section and are very useful for students coming from both sides of the genetics/ecology divide. (The first half of the section could benefit from labeled illustrations of the genetic models, and the figures throughout the book are of variable quality.) The second half of the section focuses more on evolutionary- and ecological-minded questions concerning the role of pollination interactions in plant fitness. In particular, Glover takes on some of the controversy concerning "pollinator syndromes," and she presents both sides evenhandedly.

Flowers and Flowering is a well-written text that would well serve undergraduates, early graduate students, or anyone with a solid biology background who is interested in floral biology. Although I found some points to criticize, I would still recommend the book, especially for those from an ecology perspective who want to learn more about floral genetics. I do think that further integration is needed among the disciplines of evolution, genetics, and ecology—both in this text and in others to follow—but this work will initiate that important process.

ELENA M. KRAMER
Elena M. Kramer (e-mail: ekramer @oeb.harvard.edu) is a professor of biology in the department of organismic and evolutionary biology at Harvard University.

doi:10.1641/B581114
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