

Book Review: A Key Conceptual Tool for ALifers

Arantza Etxeberria*

Euskal Herriko Unibertsitatea—
University of the Basque
Country (UPV/EHU)

Jon Umerez*

Euskal Herriko Unibertsitatea—
University of the Basque
Country (UPV/EHU)

Conceptual Issues in Evolutionary Biology (3rd ed.). Elliott Sober (Ed.). (2006, Cambridge MA: MIT Press.) \$42.00 (paper), 640 pages.

Evolution on earth is a primary source of interest and inspiration for artificial life, which aims to study life-as-it-could-be by synthetic means. The study of several aspects of evolution has been an essential part of the work done in this field since its official origins about 20 years ago. In particular, modeling evolution has been important for the exploration of living properties, and it also has provided methodological insights to devise a substantial portion of the characteristic tools used by ALife workers, tools that have in fact passed the strict limits of ALife and have been used with many other different purposes. Given the interdisciplinary nature of this research field, many people needed resources for biological inspiration to bring in interesting problems, as well as to analyze how they are known to be solved in nature. Discussions on the conceptual problems of evolutionary biology, either by biologists or by philosophers, may be an interesting way of finding key issues for which an artificial model can provide an answer, or at least an illustration.

Sober's anthology offers the basics for starting a discussion on the philosophy of evolutionary biology, containing the primary sources a teacher could use in a college or university course. It is, perhaps together with Mark Ridley's Oxford reader [4], the best selection of articles dealing with evolutionary issues and, considering its recent third edition, the most updated. There are, of course, other collections of special interest for ALifers—both more specific, as, for instance, those dealing with the debate on the units of selection and/or evolution (but slightly outdated [1, 2]), or more general, such as the anthology on the philosophy of biology edited by David Hull and Michael Ruse [3] and others forthcoming.

This is the third edition of a compilation work of which the first and second editions are still worth keeping. The volume has got smaller and slimmer in each new edition since the first [5], which was almost oversized, making it easier to handle. The first had 35 articles distributed in seven sections: Guiding Ideas in Evolutionary Biology, Fitness, The Units of Selection, Adaptation, Function and Teleology, The Reduction of Mendelian Genetics to Molecular Biology, and The Nature of Species. The second had 23 articles, of which 13 were new with respect to the first (mostly from the 1980s and 1990s) and distributed in eleven sections, with the inclusion of three new sections on phylogenetic inference, ethics and sociobiology, and cultural evolution and evolutionary epistemology; the division of the section "The Nature of Species" into one section on species and another on systematic philosophies, and also changes the title of one section from "Guiding Ideas" to "Essentialism and Population Thinking." Finally, the third edition, which is the object of this review, contains 27 articles, out of which 13 are new and subsequent to 1994 (with two exceptions), distributed in 13 sections. The former sections on function and teleology and on systematic philosophies have been discarded, and four new ones, on women in the evolutionary process, evolutionary

* Department of Logic and Philosophy of Science, Euskal Herriko Unibertsitatea— University of the Basque Country (UPV/EHU), Tolosa hirib. 70, 20018 Donostia, Spain. E-mail: arantza.etxeberria@ehu.es (A.E.); jon.umerez@ehu.es (J.U.)

psychology, laws in evolutionary theory, and race, have been incorporated. This time, as in the second edition, a preface written by the editor introduces the chosen subjects. We make this comparison mainly as a demonstration of the timeliness and *evolution* of the contents chosen by the compiler.

The 13 sections of the present volume may be loosely categorized into three main themes. The first is natural selection, the main issue and defining concept of Darwinian evolution (and on which the compiler already has a very influential book). It includes three central questions about fitness, adaptationism, and levels of selection, and two applied issues, one on how evolutionary biology explains some characteristics of women, and another about evolutionary psychology.

Fitness (Section I) has to do with why something is selected; it involves the reason why a given feature implies an advantage for the organism, and therefore, why it will be favored by natural selection. Therefore, it is crucial for ALife, because models of artificial evolution need to provide the means by which some traits will be selected over others. Here, the first article included is a classical one by Mills and Beatty, which put forward the *propensity account of fitness* aiming to save evolutionary theory from tautology by saying that, instead of depending on the rate of survival, one can give objective dispositional criteria for the fitness of a given trait. The second article, by Sober, discusses some problems with this proposal.

The section on Units of Selection (Section II) is composed of two clearly opposed contributions. On the one hand, some excerpts from the now classical book (1966) by Williams on *Adaptation and Natural Selection* [6], intended as a “purge” in biology of recent “qualifications and additions to the theory of natural selection,” in particular, proposals of selection at higher levels of organization, advocate at the same time a focus on individual adaptation at the genetic level (the allele). On the other hand, an ambitious article on “Levels of Selection: An Alternative to Individualism in Biology and the Human Sciences” by David S. Wilson, one of the most outspoken defenders and rescuers of forms of group selection and of pluralistic views, who claims that “natural selection operates on a hierarchy of units from genetic elements to multispecies communities.” In this article he even attempts to extract some consequences for the human sciences of abandoning the dominant individualistic tradition.

The section on Adaptationism (Section III) includes Gould and Lewontin’s seminal article, which will become thirty soon and will presumably be the object of major revision, especially in view of the importance that evo-devo has acquired in the last few years and, in light of new findings on the influence of development on evolution. The term “adaptationism” was coined in this article to refer to the way neo-Darwinism had ended up attributing all organismic features to natural selection, and forgetting other sources of influence in the morphology and function of living systems, such as developmental processes or architectural design. Its counterpart in the section is also a classic: Maynard Smith’s survey of the mathematical methods used by evolutionary biology to study adaptation as an optimization process. This article is already well known in ALife.

Two sections expand the theoretical questions on natural selection with the discussion of examples on how it can be implied in the study of human characteristics.

Section IV, Women in the Evolutionary Process, includes a classic by Hrdy on the myth of the coy female, which reviews the origins of the idea that the mechanism of sexual selection consists of male active competition for partners and passive female choice in light of more recent research, and suggesting that the empathy of female researchers may have influenced a change of views. Lloyd’s article focuses on how pre-theoretical assumptions shape evolutionary explanations of female sexuality, especially in what concerns research on the female orgasm.

Section V, on Evolutionary Psychology, includes a target article by Tooby and Cosmides explaining the main tenets of the field, such as the hypothesis that brains are composed of cognitive modules that are adaptive problem-solving devices evolved to adapt to particular situations. This is followed by a critique by Buller that subscribes to an evolutionary psychology that goes beyond Tooby and Cosmides’s proposed paradigm, and considers plasticity to be the main adaptive feature evolved instead of specific mechanisms.

The second theme is varied and consists of several classical epistemological, methodological, and ontological topics as they emerge out of the idiosyncrasies of evolutionary biology. They constitute, so to say, the hottest philosophical issues as viewed by the compiler.

Section VI addresses whether there are laws in evolutionary biology, a topic especially relevant for artificial life, a discipline willing to identify the most general and universal traits of life not only in any space or time, but even in any matter, at least in principle. The compiler offers here two articles. On the one hand, there is a clear and strong defense by Beatty of the lawlessness of evolution formulated as “The Evolutionary Contingency Thesis.” Here, Beatty claims that all biological generalizations describe evolutionarily contingent states of nature, and therefore cannot be considered laws in any sense. On the other hand, there is another article by Sober himself, in which he assesses critically the arguments of Beatty as representative of a particular line of argument, and as representative of others, such as Rosenberg, who deny the existence of laws (except a peculiar one called the theory of natural selection in the case of Rosenberg) based on the supervenience of biological properties.

In Section VII, the only section that has three articles, the question of reductionism is addressed through representative articles. The first criticizes the reductionist rendering in the case of genetics, in particular, the alleged reduction of Mendelian genetics to molecular genetics, in “1953 and All That. A Tale of Two Sciences” by Kitcher. The second is the challenging attempt by Kenneth Waters to reverse what he labels the “antireductionist consensus” in the philosophy of biology by scrutinizing the details of the actual science and the explanatory routines of practicing geneticists. Finally, Sober contributes again with a meticulous survey of the limitations of certain criticisms against reduction based on the multiple realizability argument.

Section VIII is dedicated to another hot topic of contemporary philosophy of biology, the dichotomy of typological and population thinking. This is one of the enormously influential distinctions proposed by biologist Ernst Mayr. It implies that Darwinism inaugurated a new way of thinking about the diversity of life in which taxa are not defined by types of similarity, but by population criteria such as interbreeding (subsequent in the biological species concept). Mayr’s excerpt presents this distinction, elaborated further by Sober himself in a very influential article of 1980, which is included. This expands on the issue of essentialism and the fact of biological variability, implying that biological categories cannot be defined via genetic essences. Today this distinction is highly contested in both the philosophy and the history of biology, and many evo-devo authors commit to a notion of type to account for evolvability.

Related to this is the discussion on the nature of species in Section IX, presented through a much-cited article by Hull, in which he developed his (and Ghiselin’s) theory of species as constituting individuals of which organisms are parts, instead of the classical view of species as classes of individuals. This comes along with an article by Baum and Donoghue that discusses different criteria, especially those based on character or history, to define the concept of species.

Section X deals with the methodological question of phylogenetic inference—how to recognize the relatedness of species to build the phylogenetic tree—including articles by Felsenstein and Ferris.

The third theme revolves around the evolution of culture and ethics; three sections belong to this category.

The first (Section XI) involves a discussion on the reality of human races, with an article (by Oppiah) denying the existence of human races, mostly based on the lack of similarities between individuals that make it possible to correlate skin color with other traits. The other article (by Andreasen) attacks this problem on the grounds of systematic biology and contends that “race theorists have been too quick to reject the biological reality of race” and “cladistic classification... shows that biological races once existed, but they may no longer exist” (p. 495). Thus the constructivist idea that races are social constructs does not conflict with systematic conclusions.

The second section (Section XII), which covers cultural evolution, begins with a sharp analysis by Fracchia and Lewontin, who ask “Does Culture Evolve?” and offer a very critical picture of evolutionary explanations of culture and the trend to replace cultural history with culture evolution. They distinguish what they consider to be the main two sources of such a trend: one is an internal attempt to attain a status, akin to that of the natural sciences, that uses a pre-Darwinian, developmental and directional approach based on an arbitrary idea of progress; the other is the biological endeavor to extend the range of applicability of evolution to culture itself by using simplistic

isomorphisms between biological evolutionary mechanisms and cultural history. In the other article in this section, Sober analyzes some “Models of Cultural Evolution” (those of Cavalli-Sforza and Feldman and of Boyd and Richerson) that—despite sharing with other biologically minded projects, as for instance sociobiology, the aim to extend evolutionary ideas to social phenomena—distance themselves from that school. In order to clarify this divergence, Sober provides a taxonomy of selection models, which leads him to a moderately positive assessment of the models examined.

The last section (Section XIII), which covers evolutionary ethics, discusses the suitability of naturalistic explanations of ethics. It opens with a clear defense by Wilson and Ruse of “Moral Philosophy as Applied Science,” which explicitly breaks with the prohibition of the *naturalist fallacy* to bridge the gap between *is* and *ought*. The analysis offered by Kitcher develops a set of distinctions that surveys “Four Ways of Biologizing Ethics” for the “aspiring sociobiological ethicist” to take into account when making their claims, from the more radical ones (such as those of Wilson himself) to others less so.

All in all, Sober’s selection represents in itself an established conception of the philosophy of evolutionary biology. However, some interesting subjects are missing from this collection. One worth mentioning is the philosophical work around evolutionary developmental biology (evo-devo). A different case is the notion of function, which was discussed in previous editions, but dropped out in this edition. The absence of these motifs may perhaps reduce the comprehensiveness of the compilation as a general tool. But the selection stands as a good overview for the kind of problems that have occupied a big part of the philosophy of biology in the last decades.

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