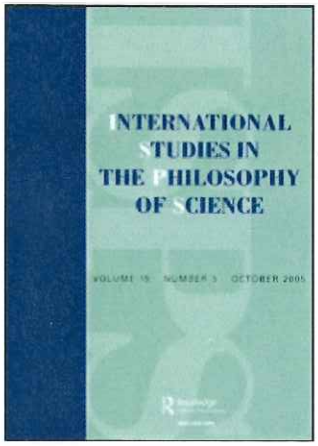

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REVIEW ARTICLE

Debates in Philosophy of Biology: One Long Argument, or Many?

Catherine Kendig

Contemporary Debates in Philosophy of Biology
FRANCISCO J. AYALA AND ROBERT ARP (EDS)
Chichester, Wiley-Blackwell, 2010
xii + 426 pp., ISBN 9781405159982, £50.00, US$89.95 (hardback); 9781405159999, £21.99, US$39.95 (paperback); 9781444314939, US$89.95 (e-book)

An unsystematic survey of syllabi from a range of UK and US universities posted online reveals that the popular texts for introductory courses to the philosophy of biology are those by Kim Sterelny and Paul Griffiths (1999), Elliott Sober (2000), Marjorie Grene and David Depew (2004), and Marc Kirschner and John Gerhart (2005), and the most frequently used anthologies those edited by Evelyn Fox Keller and Elisabeth Lloyd (1992), Sober (1994), David Hull and Michael Ruse (1998, 2007), and Sahotra Sarkar and Anya Plutynski (2008).

Although many of those teaching philosophy of biology rely on the same core texts, they may have diverse intended learning outcomes—and may be operating within different theoretical frameworks. And the range of subjects they cover may diverge significantly from others using the same text. Amid these variations, three broad (and frequently overlapping) conceptual approaches seem to dominate. These can be roughly classified in terms of what each takes to be explanatory of biological phenomena. A woefully incomplete but hopefully helpful thumbnail of these would include the traditional evolutionary or neo-Darwinian approaches (those that typically rely on discussions of population genetics, adaptationism, and fitness to explain biological phenomena); developmental or evo-devo approaches (that rely on developmental plasticity, epigenetic mechanisms, and modularity); and ecological approaches (that rely on niche construction, biodiversity, and conservation). A strength of some (but perhaps not all) of the popular texts mentioned above is that they attempt to reflect these different approaches.

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Within these broad perspectives there are also epistemological and methodological differences that focus on the types of questions asked and answers sought. For instance, philosophy of biology can be an integrated discipline responsive to the history of biology. It can provide answers to classic problems in philosophy of mind, metaphysics, and general philosophy of science. And it can also address philosophical issues that arise within biology itself by providing a set of tools to critically assess different theoretical approaches and applications of new technologies. In his *Stanford Encyclopedia of Philosophy* entry, Griffiths (2008) uses similar criteria for subdividing different approaches to philosophy of biology mentioned in this paragraph: those that rely on philosophy of science, classic problems in philosophy, and problems within biology.

A balanced introductory text on contemporary debates in philosophy of biology is therefore a difficult remit. A common tendency is either to emphasize the history of the debates in biology and classic philosophical issues or to focus exclusively on newer discussions and hot topics. A truly successful introduction would do both—it would provide a foundation of knowledge that enables students, interested professional philosophers, and biologists to engage with historical texts and classic journal articles, as well as to go on to read and engage with the newest work at the bleeding edge of biology.

The most recent attempt to provide an anthology which is both comprehensive and accessible is published by Wiley-Blackwell in its Contemporary Debates series. Advertised as a textbook that can be used to introduce students to philosophy of biology, that 'puts top scholars head to head to debate the central issues in the lively and fast-growing field of philosophy of biology', and that includes 'original essays on ten of the most hotly debated questions in philosophy of biology' (Wiley-Blackwell 2010[1]), it sounds promising albeit ambitious.

Twenty chapters cover ten topics. A short introduction to each topic is followed by two papers which in some sense present opposing views. Short responses to the opposition paper are given by each author. This structure provides readers with contrasting accounts of the crucial arguments and perspectives in each section after a preliminary overview of how these have been used to understand present problems concerning the subject under discussion.

The general introduction to the anthology describes how the subject matter of philosophy of biology relates to philosophy, philosophy of science, and biology. It highlights which topics the editors consider central and those they consider peripheral to philosophy of biology. Most of the central topics are unsurprising—reductionism, function, species, units of selection, micro/macroevolution, evo-devo, and adaptation. Others may be surprising: for instance Intelligent Design (ID), evolutionary ethics, memetics, and evolutionary psychology all count as central topics according to Ayala and Arp. Bioethics, evolutionary epistemology, and biomedical ontology are taken to lie at the periphery while others, such as synthetic biology, are not even mentioned. Ayala and Arp's demarcation of what is central and what is peripheral clearly motivates the choice of topics included. What is unfortunately absent is an adequate explanation of why certain topics are included and others omitted, as well as their own criteria used to justify the distinction between central and peripheral topics.

The full list of topics, listed by chapter authors and stance, is: reductionism (Evelyn Fox Keller—for, John Dupré—against); function (Mark Perlman—selectionist, Robert Cummins and Martin Roth—systematic); the reality of species (Michael Claridge—species are uniquely real, Brent Mishler—species are not uniquely real); units of selection (Carmen Sapienza—gene is primary unit, Richard Burian—gene is not primary unit); the distinction between macrobiology and microbiology (Michael Dietrich—if macro exists it is of minor evolutionary significance, Douglas Erwin—there are unique macrobiological processes); the challenge of evo-devo to neo-Darwinism (Manfred Laubichler—evo-devo is counter-revolution, Alessandro Minelli—evo-devo is an integrative synthesis); Pleistocene mind thesis (Valerie Starratt and Todd Shackelford—basic components of mind set in the Pleistocene, Stephen Downes—not just in the Pleistocene); memes (Susan Blackmore—memes explain cultural evolution, William Wimsatt—memes don't provide a deep understanding of cultural evolution); evolutionary ethics (Michael Ruse—morality is an adaptation, Francisco Ayala—morality is an exaptation); and intelligent design (Del Ratzsch—ID has a legitimate role in philosophy of biology, Francisco Ayala—ID doesn't have a legitimate role in philosophy of biology).

As with many discussions in philosophy, opposing sides often agree on many points, disagreeing mainly on the details. This is especially true of the chapter pairs discussing reductionism, evo-devo, and function. As a result, some of the best debates in this volume are those where the initial positions of the authors are quite similar. Rather than trotting out a simple survey of the key debates in that area, they instead focus on a specific but crucial philosophical problem. Many reconsider traditional problems in light of new discoveries which challenge previous views based on erroneous assumptions. This is especially true of the debates between Dupré and Keller, Perlman and Cummins and Roth, Claridge and Mishler, Burian and Sapienza, and Laubichler and Minelli.

The issue Dupré and Keller are concerned with in Part 1 is whether or not the fact that all biological entities are physically constituted entails that all biological phenomena are 'nothing but' their physical parts. Although both are materialists, Dupré argues that the latter does not follow from the former, arguing ultimately for a version of strong emergence. Keller argues that the entailment does hold. Keller's chapter also introduces a sketch of a minimalist conception of function that is consistent with reductionism as well as an innovative discussion of how Kant's 'natural purposes' (*Naturzwecke*)—the term he used to characterize those things that act as if they have a goal or end of their own (e.g. organisms)—could be used as as-if teleological functions. Dupré highlights how systems biology has shown that although reductive bottom–up explanations of the capacities of parts are needed, these make sense only in terms of higher level descriptions of whole systems. This section (especially Keller's chapter) connects in many ways to the discussion of functions in Part 2.

Another pair of chapters that provide innovative approaches to old ideas are those by Perlman and by Cummins and Roth (Part 2). Perlman offers a clear discussion of the selection account of function, including the problems posed by Swampmen thought experiments, the difficulties selectionist accounts have in explaining

malfunction, and how the selectionist account can claim that traits inherit present functions from past functions. Cummins and Roth argue that the selectionist view introduces illegitimate normative aspects to functions whereas the systematic approach retains a legitimate instrumental normativity that is relative to the capacities of a particular containing system. The trait's function is always understood relative to a target explanandum. Rather than being a rival to systematic explanations, they conclude that selectionist accounts simply emphasize one capacity of the containing system over many others.

Rather than attempting the impossible task of outlining the range of interrelated issues that fall under the heading of 'the species problem', the chapters in Part 3 focus on the narrower question of whether species are uniquely real (or not) because they are able to interbreed, thus sharing a gene pool, or because they are monophyletic. The entomologist Claridge introduces a very catholic but still monist understanding of Ernst Mayr's Biological Species Concept (BSC), which he calls the 'modern biological view of species'. He focuses in particular on problems with the BSC raised by both Alfred Russell Wallace (1889) and more recently James Mallet's studies on interspecific hybridization in butterflies (Mallet 2005, 2008). While admitting species can't always be reproductively isolated, Claridge relies heavily on a genetic conception of species in terms of gene pools and genotypic clusters to underlie his phylogenetic approach. He thinks species are real because they are interbreeding groups that share gene pools. Mishler agrees with Claridge that species are real but disagrees on the reason why. He believes it is because they are monophyletic groups and that there is nothing special about the rank of species that makes them real and other monophyletic groups unreal. If other taxonomic levels are also monophyletic then they are equally real. He then responds to his opponent's reliance on shared gene pools and reproductive relationships in explaining why species are uniquely real. Mishler points out that gene pools occur at nested levels within a lineage and are not uniquely species specific. Horizontal gene transfer, intergeneric and interphyletic hybridization mean the gene pool that is shared is frequently not found at the species level. So species are neither uniquely monophyletic nor do they uniquely share gene pools. Therefore they are not uniquely real.

In Part 4, Sapienza, a leading geneticist working in epigenetics, argues that high heritability implies genetic inheritance. For him, selection is best understood as a process that operates primarily on genes (although it operates on other things as well). Burian, in perhaps one of the best papers in the collection, partially agrees with Sapienza that selection can, and in certain cases has, acted on genes, but disagrees with his stronger claim that genes are its primary targets. He argues convincingly against this claim by describing a number of examples of non-genetic inheritance including the different morphologies of the offspring of genetically identical all-female generations of aphids. Depending on what the mothers ate, some daughters developed wings while others were wingless. He concludes with a particularly relevant discussion emphasizing the role of exploratory experimentation, the evolutionary importance of RNA in eukaryotes, and heritable epigenetic changes to RNA regulatory networks.

Two leading proponents of evo-devo contribute an innovative debate in Part 6. Relying on a largely Kuhnian understanding of scientific revolutions and shifting paradigms, Laubichler claims that evo-devo is revolutionary because it ushers in a phenotypic conception of evolution radically different from the gene-centred approach of the neo-Darwinian paradigm. Instead of treating phenotypes as the epiphenomena of genes and effectively black-boxing development, evo-devo seeks to integrate an organism-centred ontogenetic approach into the traditional population-centred phylogenetic approach. Minelli responds by arguing that evo-devo is more than just a developmental addition to evolutionary biology; it is instead best thought of as an independent field rather than a composite of two. Both chapters elaborate on some of evo-devo's key concepts. These include heterochrony, developmental constraints (Minelli), modularity, and phenotypic plasticity (Laubichler).

Evolutionary psychologists Starratt and Shackelford argue from a gene-centred perspective that the psychological mechanisms of the mind were solidified during the Pleistocene. My main complaint about their paper is that it wasn't entirely clear what process or mechanism 'solidified' was meant to capture. My guess is that it was a place-holder for a number of possible processes (e.g. canalization, modularity, and genetic stability). Apart from that, the two chapters in Part 7 complement one another well. Downes's chapter develops a kind of niche constructionist view of the mind and argues that psychological characteristics and human behaviour are products of more than one epoch—these include those before and after the Pleistocene, including the current Holocene.

Part 8 contains one of the most controversial contributions. Taking genes to be information carriers and copiers, Blackmore suggests that memes are a second replicator—replicating not genetic information but cultural information. She argues that many opponents criticize memetics on the basis of drawing too close an analogy between genes and memes or parasites and memes, analogies she admits other memeticists frequently misuse. She goes so far as to assert that not only are memes real, but so are memotypes, memetic drive, and meme pools. She concludes by introducing a third replicator. Search engines and other selection machines unmediated by human minds are what she calls 'temes'—new 'technological memes'. Wimsatt's companion paper provides an admirably careful and considered criticism of Blackmore's suggestions. Wimsatt is sceptical of the existence of memes. But rather than offering a flippant refusal that memes don't exist, he argues that although memes might be useful in limited ways, they can only contribute to a quite impoverished understanding of cultural evolution. Memetics is both too broad—nearly all artefacts count as memes, and too narrow—it relies on an overly restrictive understanding of inheritance. Using parallels to Eva Jablonka and Marion Lamb's (2005) different extra-genetic inheritance systems—epigenetic, behavioural, and symbolic—Wimsatt suggests that there are many ways that things which appear meme-like (what he charmingly dubs 'meme-like things' or 'MLTs') can be inherited. But these are always inherited in socially structured contexts, e.g. mathematical ideas are learnt in mathematics classes. As it currently stands, memetics ignores these developmental structures—and lacks a guiding structure and predictive power. Wimsatt's discussion of the developmental structures or

'scaffolding' (281, 284) necessary for the inheritance of MLTs and cultural evolution makes a vital contribution to this debate and is another highlight of the anthology.

Although their inclusion within an anthology of this kind may be itself a subject of heated debate, the chapters on evolutionary ethics in Part 9 and ID in Part 10 are well-articulated. If one chose to include these subjects as part of an introductory course in philosophy of biology one probably couldn't do better than rely solely on the discussions in these chapters.

In the remainder of this review article, I will make some general remarks on the recent expansion of subjects and perspectives in the philosophy of biology and challenge a view common to many but not all of the chapters in the anthology.

Philosophy of biology is often understood as unpacking the theoretical and methodological baggage implicated in Theodosius Dobzhansky's claim that 'nothing in biology makes sense except in light of evolution' (Dobzhansky 1973). Sometimes it is understood as figuring out what Charles Darwin meant in referring to his discussion of natural selection and evolution in the *Origin of Species* as 'one long argument' (Darwin 1999 [1859]). Both understandings of the aim of philosophy of biology rely on an assumption of a conceptual unity that is now being challenged by some (including some in the present volume), who claim that it misrepresents biological reality as best described, explained, and understood using the concepts of evolutionary theory.

This assumption of unity is both conceptually and pedagogically motivated. It attempts to shore up the subject matter of biology (and the philosophy thereof) as autonomous and irreducible to physics or chemistry (and their respective philosophical subjects). It also aims to exclude those lines of argument that deny evolution as illegitimate. While perhaps once an historically appropriate response, continuing to define philosophy of biology exclusively in terms of one long Darwinist argument presents a woefully impoverished view of the discipline.

The introduction and many of the chapters seem to assume such a unity and simplicity. Treating unity as an unquestioned truism strikes me as odd, as unity is, and has long been, itself a topic of philosophical discussion (see for example Dupré 1993; Galison and Stump 1996). There is also more than a twinge of reductionist genes-for talk throughout the collection and in many chapters the assumption that genes are information carriers is accepted without justification—notable exceptions include Dupré, Laubichler, Minelli, and Wimsatt. Richard Dawkins's gene-centred approach is very much the heir apparent in this volume. This is perhaps unsurprising. The editors note that 'his ideas have contributed to forming several of the basic topics found in the philosophy of biology as they exist today, and he has been an important source for popularizing and clarifying many of the principles surrounding evolutionary theory' (253). True, to some degree.

But philosophy and history of biology did not begin with Darwin—nor end with Dawkins (although there is no doubt of their enormous influence). Current philosophical discussions (of astrobiology, developmental biology, ecology, epidemiology, embryology, ethology, histology, homology, microbiology, and physiology) can be traced to diverse historical and cultural traditions—not exclusively Anglo-American.

I think it is not too much at least to suggest that some subjects in philosophy of biology make sense without reference to evolution. In looking at the current state of

philosophy of biology, we may be justified in asking whether philosophy of biology is one best thought of as made up not of one long argument but rather many long arguments.

By this, I am not suggesting expunging philosophy of evolution from philosophy of biology. On balance, the twenty chapters of *Contemporary Debates in Philosophy of Biology* reflect a wide range of what would be called philosophy of evolution as well as other philosophies of biology (even though the latter are in the minority). One of the strengths of the volume is that most chapters avoid simple revisitings of old debates in favour of reinterpretations with new discoveries. Another of its strengths is the diverse selection of contributors—philosophers, historians, and biologists—some of whom rely on Continental rather than purely Anglo or American perspectives.

Many current topics in philosophy of biology were mentioned in passing within the chapters. It would have been nice to see more discussion of the practise-based and experiment-driven questions of philosophy of biology that one finds regularly addressed in the current literature.

Noticeably missing from the present volume are extended discussions of current debates in philosophy of ecology, philosophy of microbiology, ethics of genetic testing/cloning, debates about whether selection is a cause or force, different levels of selection, genetic engineering, philosophy of ethology, anthropology, mechanisms and their discovery, health/disease, debates about what genes/genomes are, biological individuality, and synthetic biology. I'd also have hoped to see more biochemistry, cell biology, and ecology (or even to the more applied areas of immunology or clinical epidemiology). To be fair, including chapters on some of these topics would have substantially increased the size of the volume. But perhaps a selection of them could have been included.

Two decades ago the subject of philosophy of biology was frequently considered in terms of philosophy of selection and evolution and often valued as a handmaiden to philosophy of mind or psychology. In their introduction, Ayala and Arp promisingly say 'there are countless other ways in which the biologist and the philosopher have been helpful to one another' and that 'it is through the fruitful interactions of the biologist and the philosopher that the subject-matter of philosophy of biology has come to be the way that it is in its present state today' (5). However, the main justification they discuss with regard to the importance of philosophy of biology falls a bit short, relying almost entirely on how neurobiology can be used by philosophers of mind to resolve the mind/body problem and justify physicalism (3–5). This was a bit of a let-down. Although these remain interesting questions, there are plenty of exciting topics in contemporary philosophy of biology that are not parasitic on the epistemological and ontological questions of the philosophy of mind. And it would have been helpful in an extended introduction to explicitly mention these areas where philosophers and philosophically minded biologists have contributed to the understanding of biology itself.

Philosophy of biology, perhaps more than any other philosophy of science, is a discipline in flux. What counts as consensus and key arguments in certain areas changes rapidly. In the last few years, the term 'Lamarckian' has been reclaimed by proponents of evo-devo as a legitimate description that fits with a wider understanding of a diverse

set of epigenetic inheritance systems, rather than as a term of abuse (Jablonka and Lamb 1995, 1). How we understand ourselves is also changing. Consider the fact that there are ten times as many microbes in and on our bodies than there are human cells, we can—at least in terms of our cellular constitution—consider ourselves to be only 10 per cent human (Zimmer 2010). The totality of our microbial flora or *microbiome* is now thought to be responsible for changes that were long thought to be the result of simple Metazoan evolution. This year lumpers and splitters have seriously debated (as well as emotionally twittered) about the virtues and vices of the proposed change of nomenclature of the most famous of model organisms. The fruit fly, known since 1830 as *Drosophila melanogaster* and later made famous by Thomas Hunt Morgan, may now be renamed *Sophophora melanogaster* due to a reorganization of the *Drosophila* genus (Dalton 2010). And in May, the first living cell, *Mycoplasma mycoides*, was created using a synthetic genome (Callaway 2010). This form of synthetic life brings with it a new understanding of life and a challenge to the long-standing distinction between natural and artificial life. Capturing the exciting panoply of ideas in philosophy of biology in an introductory volume is no easy task. But, it would have been nice to see a few more up-to-date pieces in a collection entitled *Contemporary Debates in Philosophy of Biology*.

There aren't many introductory anthologies (if any) that take the form that this collection does. And although not exhaustive, with twenty chapters there is plenty to choose from. *Contemporary Debates in Philosophy of Biology* is an introductory anthology with more breadth than many recent offerings. It provides enough background both in philosophy and biology for students to grasp the relevance of the debates as well as acquaint them with much of the biology necessary for a richer understanding of them. Admittedly, there are some chapters, such as those by Sapienza, Burian, and Minelli, that may be more challenging to some philosophy students without any training in biology, as they assume some basic understanding of genetics. But despite their more technical nature they are still relatively accessible. And the inclusion of these more demanding pieces is a real strength of the anthology.

Although I have been critical of the selection of the topics covered in this anthology, the breadth of topics and the accessibility of the debate style make it a fine text to teach the philosophy of biology to philosophy or biology students. It would also make a very good background text for an advanced course for students unfamiliar with certain subjects in the discipline, a useful resource to professional philosophers offering a varied tasting menu of topics for those unfamiliar with the subject, and for biologists who want to know what philosophers can contribute to their subject.

Note

[1] Similar text is included on the back cover of the book under review.

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