

Philosophy of Biology

Philosophy of biology is the branch of philosophy of science that deals with biological knowledge. It can be practiced not only by philosophers, but also by scientists who reflect on their own work. The distinctive mark of philosophy of biology is the effort to achieve generalizations about biology, up to various degrees. For instance, philosophy of biology makes biology relevant to classic issues in philosophy of science such as causation and explanation, chance, progress, history, and reductionism. It also works to characterize how knowledge is acquired and modified in different areas of biology, and sometimes to clarify the criteria that demarcate science from non-science.

Philosophy also performs constructive criticism of biology. For example, it has an important role in analyzing cases of "naturalization"—when science becomes able to study issues that traditionally were the exclusive domain of philosophy. The life sciences and their objects are changing and growing exponentially. A challenge for philosophy of biology is thus to keep the pace, not only with new knowledge modifying long-standing ideas (for example, the "Tree of Life"), but also with new scientific practices and unprecedented kinds of data. Accordingly, philosophy of biology is constantly provoked in shifting its own methods and attention. In some cases, philosophy of biology can aid the life sciences to reach their goals, by means of conceptual analysis, linguistic analysis, and epistemological analysis.

Hybridizations and intersections between scientific fields are particularly conducive to philosophical considerations. Contemporary examples are 'EvoDevo' (the recent integration between development and evolution) and 'cultural evolution' (an approach to cultural change inspired by evolutionary biology). Theses and analyses of philosophy of biology are often entwined with history of biology and with the history of evolution. Finally, philosophy of biology can elaborate messages and general views out of biology, and has a crucial role in caring for how science is publicly interrogated and communicated.

Introduction

According to several reconstructions of the history of philosophy of biology, the field emerged gradually in the 1960s with a first generation of self-identified philosophers of biology, especially Morton Beckner, David Lee Hull, Marjorie Grene, Kenneth Schaffner, Michael Ruse, and William C. Wimsatt. As an explanation for such branching of philosophy of science, some philosophers put forth the decline of logical positivism in the 1960s and 1970s. For others, logical positivism did not actually decline, and anyway it had never suppressed philosophy of biology (Callebaut 1993). At times, the 'official' chronology gets questioned. For Byron (2007), proper philosophy of biology was already there in early philosophy of science, since the 1930s, as shown by a bibliometrical analysis. The most quoted philosopher in this article is David Lee Hull (1935-2010). He is a noncontroversially important figure in the founding generation of philosophers of biology. His meta-reflective papers "What philosophy of biology is not" (1969) and "Recent philosophy of biology" (2002) are particularly useful.

Philosophy of biology turned into a professional subdiscipline since the mid-1970s, with a 'second generation' of philosophers, the most cited being Ronald Amundson, John Beatty, Robert N. Brandon, Richard Burian, Lindley Darden, David J. Depew, John Dupré, James R. Griesemer, Philip Kitcher, Elisabeth A. Lloyd, Alexander Rosenberg, Elliott Sober, and Bruce H. Weber. Some of them were experienced philosophers who progressively shifted to biological issues. The first journal partially devoted to philosophy of biology – History and Philosophy of the Life Sciences – began to be published in 1979, and in the mid-1980s the discipline was fully established, Specialized journals flourished. In the early 2000s, a growing number of scholars, institutions, and journals specialized in philosophy of biology, and the discipline gained more and more room in scientific books, journals, and conferences (see the resources at the end of the article).

As we shall see, philosophy of biology provides accounts of biological knowledge, asking: how are explanation, causation, evidence and other epistemological primitives elaborated in the explanations that are typical of biology, such as natural selection, genetic drift, and homology? Does biology differ from other sciences? How? And how do we understand the epistemological diversity across different branches of the biological sciences? Philosophy of biology also considers whether biology may contribute to redefine classical demarcations of science from other forms of knowledge and human creation.

Philosophy of biology can be seen as a possible aid for scientific advancement in the life sciences. Contributions of philosophers were widely appreciated by scientists, for example, in the areas of classification, taxonomy, and related activities, and in the abstract formulation of natural selection in the development of biology after Darwin. Scientists themselves may reflect philosophically on their own field of research, justifying and correcting their practices, or denouncing biases and transformations in their own community. Concepts, such as 'adaptation' or 'species,' are underlain by complex, inferential structures that can be revealed and sometimes criticized by philosophical analysis. Multiple and conflicting meanings may be uncovered and systematized to help the progress of science and to develop more general messages.

Phenomena studied by biology make this science particularly sensible and interesting for philosophy. Humans are organisms, and quite a few fields of biology have potential or direct implications for our self-understanding. Interesting philosophical debates have stemmed, for example, since the 1970s from the provocative proposal of a 'sociobiological synthesis'; such synthesis claims to provide evolutionary explanations for human prosocial (and anti-social) behaviors that were traditionally covered by ethics. Philosophy overcame mere self-defensive attitudes, and its important role lied in epistemological analysis and in deep reflections on the limits and conditions of naturalization, which may be understood as the transition of a problem into the domain of empirical science. Neurobiology offers a particularly fertile ground for reflections about how human phenomena can be related to, or even explained by, biology. And how should a philosophical field like moral philosophy take biology into account? (For more on the topic of the naturalization of morality, for example, see ethics.)

Philosophy of biology may study and support the interaction among different life sciences, as in the case of evolutionary developmental biology, where workers claim to be reuniting genetics and evolution with embryology, recomposing a historical divide in biology. How do different research traditions integrate or replace each other? This question illuminates classic issues such as progress and scientific change with new light. Philosophy of biology also monitors the natural hybridization of biology with extra-biological fields, such as cultural transmission, and enriches the debate among scientists where extreme positions often pop out: does biology offer more rigorous methods to replace the failing methods of the social sciences? Are we facing, instead, a case of mutual inspiration? Or methodological integration? Which reciprocal prejudices are well-grounded? And how can they be overcome for fruitful scientific collaborations?

Philosophy of biology also has a mandatory critical role towards biology. For example, it can unveil the progressionist, anthropomorphic, and anthropocentric biases that affect scientists as human beings who live immersed in a society and in a cultural environment. Critical attention must be particularly high when scientific classifications of humans (for example, through measures such as IQ or ethnicity) may lead to justify and increase social discrimination, segregation or oppression.

Philosophy of biology may also develop ways of thinking up from biological research, providing an inspiring and readable encompassing view of the living world that will hardly be found in any standard, scientific publication. Furthermore, philosophy of biology is called upon to work on the interface between science and society, contributing to both the common misunderstandings and the best strategies for citizens to become conscious and informed, as they are called to decide what kind of research and intervention will be allowed or actively pursued by society.

It is hard for philosophy of biology to keep pace with the fast development of biological knowledge. But the effort of following the moving frontier of knowledge allows philosophy of biology to study the fall of influential ideas, such as the universal Tree of Life, and the rise of new scientific practices, such as intensive computer modeling. Philosophy also has the unsettling opportunity to constantly rethink its own approach, avoiding drifting too far away from scientific practice so as to become detached. In this dynamic, philosophy of biology is also well integrated with history of science, so that it is often hard to distinguish between the two. An analysis of the relationship between molecular biology and Mendelian genetics, for example, is intertwined with the historical account of the birth and early development of molecular biology in the 1980s. In turn, the philosophical framing of genetics and developmental biology as either ontology-based disciplines or research styles transforms radically the way in which the history of the two fields is told.

Philosophy of biology belongs to philosophy, therefore, no fixed procedure or protocol constrains its research (what is philosophy?). Philosophy of biology consists in free and critical — although rigorous and informed — thought on biological knowledge as the latter

develops through time. However, as a mature and recognized field with its own interconnected practicing community, philosophy of biology seems to feature some methodological principles:

Philosophy of biology is supposed to be scientifically informed and up-to-date, capturing how recent research modifies established knowledge and creates new scientific practices. In turn, these novelties transform philosophy's problems and approaches, especially in the current explosive growth of biology.

Philosophy and biology are not always clearly distinct. Scientific work can routinely require, for example, conceptual or epistemological. On the other hand, philosophy can turn out to be effective in setting up scientific research projects. However, philosophy can be characterized by its leaning towards generalities about biology, namely general philosophical problems, general characterizations of fields and approaches within biology, or conceptualizations of biology as a whole or even of science as a whole.

Philosophy of biology should try to be understandable and possibly useful to biologists. Its tools — conceptual analysis, epistemology, traditions of thinking and debates — should be put to use for improving scientific research.

Biologists can do philosophy of biology. This happens, for example, when they become interested in general features of biology and try to contribute with principles derived from their work or when they think about the inferential patterns employed by themselves and their colleagues. Also, scientists can do philosophy and speak to philosophy when particular objects of philosophical study, such as human morality, get naturalized (see below).

Philosophy of biology cares for working across disciplinary contexts. For example, it studies novel contacts between previously separated fields, develops general views of the living world from some aspect of the life sciences, or reveals complex connections between science and the socio-cultural context in which it is carried out. It also takes advantage of its knowledge for monitoring and assisting how science is publicly communicated and interrogated.

Philosophy of biology is increasingly seen as one piece with history of biology, since philosophical and historical theses are mutually necessary, and their results reverberate reciprocally.

These six methodological principles are usually tacit, but sometimes they are made explicit by philosophers of biology, who may also disagree on some of them. The principles will be presented here by means of exemplar studies. Any set of examples is anyhow partial and biased, since philosophy of biology is a huge field full of fascinating topics, growing exponentially along with biology. For a more complete picture, the interested reader will have to navigate the resources listed at the end of the article, such as philosophy of biology journals or programs of conferences such as the biennial meetings of the International Society for the History, Philosophy, and Social Studies of Biology, the main reference society of the field. A number of textbooks in philosophy of biology are available, often in the form of anthologies. A list of all these resources is provided at the end for further reading.

Given the vastness of the philosophy of biology literature, this article can only indicate some of the main topics and the richness of discussions. The examples in this article are mainly