



REVIEWS AND BRIEF NOTICES

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HISTORY, PHILOSOPHY & ETHICS

WHAT MAKES BIOLOGY UNIQUE?: CONSIDERATIONS FOR THE AUTONOMY OF A SCIENTIFIC DISCIPLINE.

By Ernst Mayr. *Cambridge and New York: Cambridge University Press.* \$30.00. xiv + 232 p; ill.; index. ISBN: 0-521-84114-3. 2004.

Even though he had been “retired” for a number of years, Ernst Mayr’s scientific oeuvre continued to grow. Before I review his book, let us see where the man—the legend—came from. One of three boys, Ernst Mayr was “born a naturalist” over 100 years ago in Germany. He published his first scientific paper in 1923, three years before receiving a Doctorate at the age of 21 from the University of Berlin. In 1931, he was hired as a Curator by the Department of Ornithology at the American Museum of Natural History, where he stayed until 1953, when he became the Alexander Agassiz Professor of Zoology at Harvard University. Mayr, an ornithologist turned evolutionary biologist, historian, and philosopher of science, wrote approximately 700 articles and published over 20 books. This man, who has been a friend of the greatest women and men in science, has now given us a fascinating summary of why biology is an autonomous science, one that has nothing to envy from physical sciences. The basic question explored in this book is whether the foundations for the philosophy of science, which are based on physics, apply to the development of a philosophy of biology. The answer is a resounding no, and Mayr presents his reasons in 12 chapters, three of which (Chapters 3, 5, and 6) are revised versions of previously published work, and one (Chapter 9) is an identical version of a previously published article. For those not familiar with some basic termin-

ology used in philosophy, I suggest they read this book not, as in the old days, with a dictionary in hand, but with their Web connection open and Google[®] available. This approach will be enormously helpful in understanding this book. Terms such as epistemology, vitalism, saltationism, teleology, Cartesianism, and orthogenesis abound and, fortunately, Mayr includes a glossary of almost 100 terms.

In building his rejection of the physical sciences as a basis for the philosophy of biology, Mayr brings to the table some basic concepts rarely seen in the open: “There are no inanimate systems in the mesocosmos that are even anywhere near as complex as the biological systems of the macromolecules and cells” (p 29); and “[t]o the best of my knowledge, none of the great discoveries made by physics in the twentieth century has contributed anything to an understanding of the living world” (p 35). In criticizing the reductionist approach, he takes friendly swipes at many, including E O Wilson (p 36) and George Wald (pp 69–70). Furthermore, the reductionist approach so prevalent in physics has to be kept in perspective, after all “[a]s T.H. Huxley pointed out a long time ago, partitioning water into hydrogen gas and oxygen gas does not explain the liquidity of water” (p 69). The preponderance of the reductionist approach in molecular biology is evident in the recent bandwagon over “DNA barcoding,” which presumes that organisms can be cataloged by simply sequencing a single mitochondrial gene, cytochrome c oxidase I (COI). Will this be the barcoders’ limit for Occam’s razor?

As if the topic were not difficult enough, Mayr sometimes includes terms that add nothing to the argument. For example, he ends the preface to a

chapter as follows: "Such a finalistic world view, however, was only one of several widely adopted Weltanschauungen" (p 39). This is where Google[®] comes in handy, but once you find out that Weltanschauungen means "world views" one has to wonder why the German word was used. He writes the "question 'what for?' (*wozu?*) is inappropriate for them" (p 50). What is the point of including "(wozu)"? I realize it is German "for what" but, so what? There are several other examples such as this. I can only wonder why the philosophy of science remains a foreign topic to most biologists, and perhaps it has to do with the language used that, although appropriate for some journals, seems out of place in a book such as this, if one assumes the author wants to bring in the uninitiated. In some places, readers are left wondering: "A rather unexpected discovery in the 1970s was responsible for the wide acceptance of sympatric speciation since the 1970s" (p 108). Readers never find out what this "unexpected discovery" was.

Mayr's respect for Darwin's contributions is so evident that at times his statements are silly: "There can be no doubt that the thinking of every modern Western person has been profoundly affected by Darwin's philosophical thought" (p 95). Really? I would not be surprised to find out that a large percentage of the Western population has no idea as to who Darwin was. An analogy would be Albert Einstein: even though I suspect people might recognize him in a photograph, they would probably have no idea as to what his scientific contributions were. Mayr states that "[w]ithin fifteen years of the publication of the *Origin*, hardly a qualified biologist was left who had not become an evolutionist" (p 112). I wonder who conducted the survey and who decided on whether a biologist was qualified or not. Mayr's arguments are strong without having to resort to these superfluous statements.

I particularly enjoyed Chapter 9, Do Thomas Kuhn's Scientific Revolutions Take Place? (previously published in 1994. *Journal of the History of the Behavioral Sciences* 30:328-334), in which Mayr looks at whether—as Kuhn postulated—there really are "scientific revolutions" that bring forward a new paradigm that in turn dictates the science that follows. His analysis of different examples (e.g., animal and plant classification, Darwin's theory of common descent, and evolutionary biology) reveals a continuum of major and minor revolutions that in essence do not follow Kuhn's postulate of sudden paradigm shifts. The last two chapters, The Origins of Humans and Are We Alone in This Vast Universe?, are unusual because they seem totally unrelated to the topic at hand. Nevertheless, it is very interesting to read Mayr's reasoning in the final chapter for rejecting the existence of life

forms outside our planet. Although not stated, this chapter is a revised version of The Probability of Extraterrestrial Intelligent Life in *Toward a New Philosophy of Biology: Observations of an Evolutionist* (1988. Cambridge (MA): Belknap Press of Harvard University Press).

Our ignorance—as biologists—on the philosophy of science versus philosophy of biology debate is due in great part to the reductionist nature of our training, where finding a course on the history of science is a rare occurrence. We know the importance of searching the literature for areas related to our research, but we certainly never apply that concept to the science we practice. Even rarer than a course in the history of science is one that deals with our scientific predecessors; we become biologists without ever really knowing the scientific milieu in which Darwin, von Humboldt, Asa Gray, Agassiz, and many others worked. Fortunately, Mayr has now provided a basic reference that ideally would be part of the future formation of biologists. A minor quibble about the book: it is unfortunate that there are two typographical errors in the Acknowledgments, where the names of Jared Diamond and J B S Haldane are misspelled. Mayr also misspells Charles S Peirce (he calls him "Pierce"), but these errors do not even form a grain of sand in a vast sea of abundance that Mayr provides us with. This book brings forward the intellectual stasis that was shattered by Darwin—a true revolution in scientific thinking that Mayr uses as a basis to distinguish and delineate a philosophy of biology.

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[Dr Ernst Mayr passed away on 3 February 2005. Widely considered one of the world's most eminent evolutionary biologists, *The Quarterly Review of Biology* is honored to have published many of Dr Mayr's reviews and commentaries.]

DARWINIAN HERESIES.

Edited by Abigail Lustig, Robert J Richards, and Michael Ruse. Cambridge and New York: Cambridge University Press. \$65.00. viii + 200 p; ill.; index. ISBN: 0-521-81516-9. 2004.

This collection of essays is really fun. It exhibits shifts and variations between heresy and orthodoxy in evolutionary biology. The essays fall into two categories: five essays are concerned with religion and four discuss other types of heresy. Two of the contributions on other kinds of heresy include a Russian biologist who survived the Lysenko era and its biological repercussions, as well as an American specialist in ants who embraced Lamarckism. In