Jacques Roger, *The Life Sciences in Eighteenth-Century French Thought*. Edited by Keith R. Benson. Translated by Robert Ellrich. Stanford: Stanford University Press, 1997. xliv + 760. Notes, bibliography, and index. $75.00 US (cl). ISBN 0-8047-2578-0.

Review by Richard Lebrun, University of Manitoba, for H-France, November 1998.

Published in French in 1963 under the title *Les Sciences de la vie dans la pensee francaise au XVIIIe siecle*, Jacques Roger's massive volume on the life sciences in the thought of the French Enlightenment has won a well deserved reputation as a masterwork of intellectual history. Its appearance in an excellent English translation will further enhance the work's fame. The brief foreword by editor Keith R. Benson explains how and why the present translation was undertaken, as well as the editorial decisions to work from the original 1963 edition (rather than the subsequent French editions of 1971 and 1993), to drop a chapter on Diderot and the *Encyclopedie* (to be published separately), and to include, under the title "Preface to the 1993 Edition", a paper Roger had presented at a conference in Venice in 1987. Benson tells us as well that the translation project was initiated in 1985 with the approval and collaboration of the author, and completed after his death in 1990 with the collaboration of his widow Madame Marie- Louise Roger. The result is certainly an event to be celebrated.

Perhaps the most striking characteristic of this book on biology in the Enlightenment is the depth of the treatment, a depth that is both chronological and contextual. The whole of Part I of the work, in fact, deals with "The End of the Renaissance, 1600-1670". Part II deals with the period from 1670 to 1745, and Part III carries the story through to 1770. Examples of the work's contextual depth abound from the very first pages of the opening chapter, where Roger introduces the ridiculous doctor from Moliere's *Le Malade imaginaire* as a dramatic way of insisting that in the first half of the seventeenth century there were no real biologists, but only doctors who devoted part time to biology, through to the brilliant Epilogue, in which Roger explores the complex relationships between evolving scientific knowledge and the philosophical, literary, and general cultural developments of the Enlightenment.

Roger states that his aim had been simply to study biological thought in France (p. xlii). Apologizing for having written a book on this topic without being either a biologist or philosopher, he insists that he has not investigated how man is able to know the world or how modern science has taken shape. How these epistemological and methodological problems are to be dealt with today he explicitly leaves to philosophers and scientists. Expressing his intention to stay with a historical perspective, Roger says he has "simply investigated... how the scientists of the seventeenth and eighteenth centuries saw nature, how they defined themselves with respect to it, and how they thought it possible to know it" (p. xli). And yet as Roger

himself admits in his Epilogue, biological questions about life, its origins, and animal reproduction inevitably engaged fundamental philosophical and religious concerns. "All the problems of life, of the power of nature, of the order of the universe, and of knowledge" (p. 543) were involved. To a greater extent than the physics and astronomy of time, which were already offering powerful challenges to older (largely Aristotelian) philosophical views and Christian religious doctrines, new observations and new theories in the life sciences threatened established orthodoxies. Despite his opening disclaimer, Roger explains these interactions in detail, and with sensitivity and wisdom.

It is in its narrative of the development of the life sciences, however, that Roger's book makes it major contribution. The subject is difficult, since the biological views and theories which prevailed all through this period appear strange and even silly to us today. In an era with at first no microscopes and then primitive and hard-to-use instruments with very limited capabilities, even the best scientists were struggling beyond their depth in trying to achieve understanding of the "mysteries" of life and reproduction. Roger describes their struggles (which he characterizes as a "battle with shadows"), their misperceptions, their errors, their theories, and their limited achievements with both sympathy and good humour.

Roger begins by examining the situation of the life sciences in the first half of the seventeenth century. He reviews the professional education and concerns of medical doctors (who knew most about biology), and their theories of animal and human reproduction, where gender assumptions about the supposed primary role of the male "seed" long precluded appreciation of the role of the ovum. In tracing how views changed in the seventeenth century, Roger stresses especially the complexity of developments, which saw struggles between "spiritualists" and "materialists", and between protagonists of "spontaneous generation" and their critics. The "search for clear ideas" (perhaps best exemplified by Ren, Descartes) did little to advance biological knowledge. Despite the stature of his name, contemporary thinkers soon realized that Descartes' attempts to create a "mechanistic" biology on the model of his mechanistic physics had failed.

By the last decades of the seventeenth century, however, a new scientific spirit was in the air. Royal support for new scientific societies, the appearance of scientific journals, increasingly useful microscopes, and even the fact that science was becoming fashionable were all developments contributing to the accumulation of new knowledge. Making sense of the new factual knowledge proved to be more challenging than expected. By 1670, Roger suggests, almost all scientists had come to share mechanistic assumptions about the nature of the physical universe, including the biological world. But by 1745, the "mishaps of mechanism", which led to the gradual realization that the world and life were much too complex to be understood and

explained as a simple mechanism, resulted in a new crisis of conscience. Some came to the conclusion that God was, after all, still needed as the guarantor of the intelligibility and regularity of nature; others concluded that God's design surpassed human reason, and that there was no hope of fully understanding the universe.

In biology, in the period between 1660 and 1680, new discoveries in animal reproduction (that of eggs in viviparous females and that of spermatozoa in male semen) led to the development of opposing doctrines which both stimulated research and held back the development of a synthesizing theory taking account of both discoveries (it would not be until 1875 that the fertilization of an ovum by a sperm cell would be observed, and the debate brought to fruitful conclusion). Complicating these developments, was the theory of the preexistence of germs, which was conceived around 1660 and survived into the nineteenth century. Much of the central part of Roger's book is devoted to describing and explaining how eighteenth-century scientists wrestled with the contradictory implications of these discoveries and their associated theories.

If the focus of the first two-thirds of the volume is on intellectual currents, in the last third, which deals with the biological science of the *philosophes* of the high Enlightenment (between 1745 to 1770), Roger concentrates on individuals, including Pierre-Louis Moreau de Maupertuis, Julien Offroy de La Mettrie, the Abbe John T. Needham, and Georges-Louis Leclerc, Comte de Buffon. These men were philosopher/scientists who aimed at using scientific knowledge as the basis of a world system, a complete explanation of the universe. In one sense they failed. As Roger puts it, "the new science had succeeded in removing the mystery of God from nature, but it had not been able to explain life rationally" (p. 542). On the other hand, as part of the Enlightenment, they nevertheless "supplied our intellectual universe with some of its fundamental characteristics" (ibid.).

Roger concludes by observing that the "history of ideas and of sensibility should... enable us to distinguish the roles played by individuals, their professions, their classes, their nations, [and] their times," and that this goal is worth pursuing "not just because it should make possible a better understanding of the past, but because it should lead us to a better understanding of humanity" (p. 558). To our great benefit, Roger achieves this goal.

Robert Ellrich's translation of Roger's elegant French prose leaves almost nothing to be desired; it is generally accurate and very readable, and it captures much of the author's wit. Perhaps, however, it would have been helpful to provide a glossary of scientific and medical terms, especially since the meanings of many terms were evolving in this period. For example, at times both the author and the translator treat the terms *semen* and *sperm* as synonyms, and at other times both use the words in

their modern senses. Other words, such as *epigenesis*, will send all but the most highly educated readers scrambling to their dictionaries. An occasional word choice seems strange. Why, for example, translate the French word "monstre" as "teratism" (a word not to be found in standard English-French dictionaries) rather than as "monster" or "freak of nature"? Apart from the lack of a glossary, this volume offers a full complement of reference matter; there are some 129 pages of end notes, a 53-page bibliography, and a 25-page index. The book has been handsomely produced by Stanford University Press and appears quite free of typographic faults.

In summary, this is a translation which can be recommended to all readers interested in the intellectual history of eighteenth-century France.

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