BOOK REVIEWS

Darwinism from France

Dictionnaire du Darwinisme et de l'Evolution. PATRICK TORT, Ed. Presses Universitaires de France, Paris, 1996. Three volumes, boxed. 4912 pp. F2980.

It is not so many years ago that a French evolutionist told me, "In France one believes in Darwin in only three places, Paris, Dijon, and Montpellier." I cannot vouch for the validity of this judgment, but there is no doubt that at that time Lamarckism was still dominant in France. The change that has come in the last 15 to 20 years is quite astonishing. There are now two excellent French textbooks on evolutionary biology presenting Darwinian thought, and French contributions to the periodical literature consistently represent a Darwinian consensus. Now France, in the illustrious tradition of d'Alembert and Diderot, has published a grand *Dictionnaire* to celebrate this victory of Darwinism. This three-volume work of 4912 closely printed pages with 4500 articles is an admirable achievement of scholarship.

The editor states quite correctly that no other critical or historical encyclopedia of this subject exists anywhere else in the world. This one is to an extent an international enterprise. Although the majority of the 139 contributors are French, Italy has supplied 12 authors, Spain ten, the United States eight, Russia and Switzerland two each, and five other nations one each. (Among the foreign contributors are Babkov, Raissa Berg, Bowler, Ghiselin, and Margulis.) The objective of the work, Tort states simply, is elucidation, a presentation of the true facts; such clarification indeed must be the major objective in a field in which there is so much misunderstanding and ignorance. However, in some of the articles there is also a critical analysis of the issues.

Darwinism, particularly for the French, is not merely a biological theory but a set of ideas with a vast impact on the historical sciences, politics, and sociology. Not surprisingly, Herbert Spencer is given more pages (33) than any other thinker. Also treated in detail are a number of Marxist authors who often promoted Spencerian social dynamism when they talked about Darwin. To provide an idea of the nature of the essays included in the *Dictionnaire*, I list here quite randomly the subjects of some of them: evolutionary progress, teratology, synthetic theory, transitions, use and disuse, variation, vitalism, the voyage of the *Beagle*, speciation, biometry, metamorphosis, milieu, mimicry, morphology, neo-Darwinism, neo-Larmackism, neutral evolution, linguistic evolution, evolutionary stasis, and symbiosis.

Besides such subject matter entries, the most important content of the *Dictionnaire* is biographical. The biographies are kept relatively short in cases of very well known people with a vast existing literature. By contrast, some important but rather neglected evolutionists receive very detailed treatment, in some cases (Berg, for example) with a good deal of previously unpublished information. Some of the persons with the longest biographies are, in addition to Spencer, Lafargue, Wallace, Dobzhansky, Vernadskij, and Berg. Authors treated relatively briefly include Lyell, Simpson, Vavilov, Timofeev-Ressovsky, and Lamarck. The coverage is most complete for persons of the 19th century. Current evolutionists, for instance Maynard Smith and Ayala, are not included.

The emphasis, throughout, is clearly on Darwin. Anyone who ever had any connection with him, even if it was only to supply him with pigeons, is included. Major chapters are devoted to the history of Darwinism in Germany, England and the United States, France, Russia, and Italy, and there are several smaller chapters for other countries. Each chapter includes an exhaustive bibliography. Anthropology in all evolutionary aspects receives special attention.

In such a vast enterprise it is only to be expected that not all articles are of the same quality. Almost all the most important entries are written by the editor himself, and they are uniformly of high quality. There are some real gems, among them Lwoff's article on Jacques Monod. Inevitably there are some lacks, such as an article on Kölreuter, whom Darwin much admired and who laid some of the foundations for genetics. If one would want to criticize the volume, however, it would not be for omissions but rather for the inclusion of too many people without any real significance.

Anyone setting out to investigate a subject connected with evolution will find the *Dictionnaire* an excellent starting point. One finds in it information that had previously been quite unavailable. Years ago I acquired in a secondhand bookstore a stimulating book on evolution by the Swiss zoologist Tschulok. Ever since then I have been wondering how a Swiss came by such a name. Now the *Dictionnaire* tells me all about him, including the fact that he was Russian by birth.

There is no likelihood that the *Dictionnaire* will soon be superseded. It surely should be in the library of every institution where there is an interest in evolution. I am full of admiration for Patrick Tort for having been able to bring together a staff of contributors qualified to consider such a wide range of subjects influenced by evolutionary thought.

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Mathematical Discoveries

Celestial Encounters. The Origins of Chaos and Stability. FLORIN DIACU and PHILIP HOLMES. Princeton University Press, Princeton, NJ, 1996. xviii, 234 pp., illus. $24.95 or £19.95. ISBN 0-691-02743-9.

Chaos theory is hardly a new science. According to the authors of this book, the phenomenon we now call chaos was first encountered by the French mathematician Henri Poincaré in 1890. Several years earlier, King Oscar of Sweden had offered a prize to the first mathematician to solve the n-body problem of celestial mechanics. The problem is to understand the motion of n point masses moving in three-dimensional space subject only to their mutual gravitational attraction. While this problem remains unsolved to this day (when $n > 2$), Poincaré came closest. In a far-ranging paper, he introduced a number of new, qualitative techniques that are now standard tools in the study of differential equations. The referees correctly anticipated that his paper would "open a new era in the history of celestial mechanics," and so Poincaré claimed the prize.

Unfortunately, Poincaré had made a mistake in his prizewinning paper. Along the way he made the tacit assumption that what we now call stable and unstable manifolds match up, that they cannot cross at an angle. This allowed him to deduce many