The books are nicely produced, though it is irritating that nearly 70 pages of preliminaries and indexes are identical in the two volumes and there is no author index. The editors have, however, done their job well. For a compilation the general standard of the contributions is high. Though much of their content is clearly for specialists, they tackle problems and issues relevant to acoustics, ecology, and evolution as well as ethology, so many biologists will benefit from dipping into them. Though more "long awaited" than they should have been, these books do more than just summarize a field: they identify problems and provide signposts to future developments that will be a positive stimulus to it in the years ahead.

P. J. B. SLATER
Ethology and Neurophysiology Group, School of Biology, University of Sussex, Brighton BN1 9QG, England

Neuromorphology

The Central Nervous System of Cartilaginous Fishes. Structure and Functional Correlations. W. J. A. J. SMEETS, R. NIEUWENHUYS, and B. L. ROBERTS, Springer-Verlag, New York, 1983. x, 266 pp., illus. $150.

Although they constitute a relatively small radiation of vertebrates, fewer than 600 species, the cartilaginous fishes exhibit extensive morphological and functional diversity. This diversity and their long evolutionary separation from other vertebrate radiations offer biologists the opportunity to identify examples of certain evolutionary processes: one can recognize primitive features that are shared by cartilaginous fishes and other vertebrate radiations and thus gain considerable insight into the ancestry of jawed vertebrates; moreover, one can identify ways in which cartilaginous fishes have independently "solved" a number of biological problems encountered by other vertebrates. Although they are frequently said to represent a simpler grade of organization than so-called "higher" vertebrates, some cartilaginous fishes have independently evolved endothermy, complex yolk sac placentas or placental analogs, and brains as large relative to body size as those of many birds and mammals. A growing body of data reveals many similarities in addition to relative size among the brains of these vertebrates.

Experimental studies of the brains of cartilaginous fishes have been hampered by the absence of a systematic survey of their neuromorphology, and this problem has now been greatly alleviated by Smeets, Nieuwenhuys, and Roberts. Their contribution will be noted for its thorough and scholarly treatment of a difficult topic. The volume includes chapters that survey major divisions of the central nervous system, and, for a number of species, there are atlases based on line drawings and photomicrographs. The chapters dealing with CNS divisions include information from the primary literature as well as many new observations by the authors. These chapters are clearly and succinctly written, and the literature review is thorough except for the unfortunate omission of many Japanese and Russian studies.

In the second part of the book, the authors focus on the histological variation in brains of cartilaginous fishes and present an excellent series of line drawings and photomicrographs of four genera: *Hydrolagus, Squalus, Raja, and Scyliorhinus*. Although these genera were selected from each of the major taxonomic groups of cartilaginous fishes, they do not represent the diversity seen in the brains of these fishes. For example, both *Raja* and *Scyliorhinus* possess brains that are among the most generalized in their respective groups. Thus the large and complex brains exhibited by most batoids and most galeomorph sharks are not illustrated. Despite these omissions, researchers will find the atlases and summaries of major cell groups and known connections invaluable.

To me, the most disappointing aspect of the book is the absence of a biological context. The authors have scrutinized the literature and have presented a clear summary of what is known about the brains of cartilaginous fishes. As precise and thorough as this summary is, the analysis is not extended beyond this point. The authors do not suggest which features of the brains of cartilaginous fishes are primitive and which derived, let alone the possible origin and advantage of any derived features. In fact, there are few comparisons with the brains of other vertebrates, and there is no speculation regarding the significance of the independently evolved, complex brains of some sharks and rays. By restricting themselves to a summary of what is known, the authors have failed to communicate much of what is exciting about the brains of cartilaginous fishes.

R. GLENN NORTHCUTT
Division of Biological Sciences, University of Michigan, Ann Arbor 48109

Evolutionary Theories

The Eclipse of Darwinism. Anti-Darwinian Evolution Theories in the Decades around 1900. PETER J. BOWLER. Johns Hopkins University Press, Baltimore, 1983. xii, 292 pp. $25.

In a letter of 1878 in which he observed that "now there is almost complete unanimity amongst Biologists about Evolution," Charles Darwin did not fail to add: "There is still considerable difference as to the means, such as how far natural selection has acted, and how far external conditions, or whether there exists some mysterious innate tendency to perfectibility." Indeed, the most ardent champions of Darwin in his own day—T. H. Huxley in England and Ernst Haeckel in Germany—differed from Darwin (and each other) in their understanding of how evolution works. By the turn of the century, disagreements regarding the causes of evolutionary change were greater than ever. Though August Weismann was touting the "all-sufficiency of natural selection," a great many of Weismann's contemporaries doubted his claims about natural selection and were furthermore highly skeptical that Weismann's style of theorizing could resolve the problems confronting them. Amidst a luxuriant growth of diverse evolutionary theories, "Darwinism" could claim no clear preeminence. One of Darwinism's least prescient critics went so far as to proclaim that Darwinism was on its "deathbed."

Until now, there has been no broad historical examination of the proliferation of evolutionary theories at the turn of the century (though Vernon Kellogg's *Darwinism To-day*, published in 1907, provides a superb contemporary review of the subject). Peter Bowler's book is thus an extremely welcome contribution to the literature of the history of biology. Generous in scope and containing a wealth of valuable insights, Bowler's book explores the different theoretical alternatives that were available to evolutionary biologists at the end of the 19th and the beginning of the 20th centuries. Though Bowler may not convince the reader that natural selection's popularity *before* the turn of the century was sufficiently widespread to justify speaking of an "eclipse of Darwinism" in the early 1900's (a phrase borrowed from Julian Huxley), Bowler does clearly demonstrate the great diversity and historical interest of the anti-Darwinian evolutionary theories that flourished in the decades around 1900.