sights into cellular morphology and cortical microcircuitry and into the functional role of individual cortical connections.

This volume is meant to be the first of a series on the cerebral cortex. Later volumes are projected to cover cortical function, afferent and efferent connections, and development and plasticity. The fact that the present volume is descriptive, with little information on cortical function and its relationship to cortical structure, reflects the limitations of the field. One hopes that over the next few years the development of various pharmacological, immunochemical, and combined anatomical and physiological techniques will enable one to go beyond the descriptive. The book serves a useful function in that it provides a common understanding of the cellular components of the cortical circuit and provides a basis for anatomists, physiologists, and theoreticians to develop ideas about the relationship between cortical function and the structural components of the cortex.

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Actinopterygian Neurobiology

Fish Neurobiology. R. GLENN NORTHCUTT and ROGER E. DAVIS, Eds. University of Michigan Press, Ann Arbor, 1983. In two volumes. Vol. 1, Brain Stem and Sense Organs. viii, 414 pp., illus. $45. Vol. 2, Higher Brain Areas and Functions. viii, 375 pp., illus. $45. From a symposium, 1977.

Why study the brains of fish? Three reasons are presented by Bullock in the last chapter of volume 2 of *Fish Neurobiology*: comparative neurology helps us appreciate our ancestral "roots," as inferred from the characteristics of our vertebrate relatives; some general "rules" can be proposed about physiological mechanisms, brain size, and the general organization and modification of the nervous system; and the "relevance" of studies of the nervous systems of other species to the understanding of the human brain, which is often taken for granted by researchers but should be emphasized more strongly for the benefit of those who fund the research.

Fish Neurobiology is not as wide-ranging as its title suggests. It concentrates on the topics of brain anatomy, sensory systems, and behavior. It does not include chapters on development, somatic sensation, the spinal cord, swimming, respiration, or the autonomic nervous system. However, some of the subjects it does not cover have been reviewed in the series *Fish Physiology*, edited by Hoar and Randall. It also does not consider all types of fish but focuses on the actinopterygian or ray-finned fishes, including the relatively primitive bichir, sturgeon, gar, and bowfin, but especially the teleosts, which number about 23,000 species of the total of 40,000 species of all vertebrates. Since this group is amazingly diverse, the first chapter, on taxonomy, is very useful as a reference while reading the subsequent chapters. Taxonomic nomenclature can be heavy reading, but this chapter, by Lauder and Liem, is clearly written and includes interesting comments on the biology of representative species.

These volumes are useful as references for specialists and as reviews for general neurobiologists. For the specialist the volumes have good indexes, clear diagrams and plates, summary tables, and extensive bibliographies, although most of the cited references are from earlier than 1979. For the general reader, a review by Powers and Easter of fish retinas and vision is clearly written, interesting, and thorough. Likewise, a review by Finger of the cerebellum in fish is authoritative yet written in a style that can be read and appreciated by non-specialists. Neuroanatomy is the major subject of eight of the 22 chapters. Five of these are presented in the traditional style of comparative neurology, with an abundance of neuroanatomical nomenclature. Non-anatomists most often want simple answers to the questions, where in the brain can a particular structure (such as the nucleus glomerulosus) be found? and what is the anatomical location of a particular electrode site or of a region with some type of reaction? The worst fears of non-specialists are stated clearly by Braford and Northcutt: "There are numerous instances in the literature in which the same name has been applied to different cell groups or the same cell group has received several names. Although this problem is not unusual in comparative neuroanatomy, it is particularly acute and vexing in the diencephalon and pretectum of actinopterygians." Diagrams of the brains of several species, sections, and up-to-date nomenclature are presented in the anatomical chapters. However, it would have been useful to have included a separate listing of all published atlases of the brains of different species of fish as well as additional tables with corrections of any previously mislabeled structures. The remaining chapters include thorough reviews of the physiology of the vestibular system, audition, electroreception (with a comparison of mormyrids and gymnotoids), chemoreception, visual physiology of tectum and forebrain, and neuroendocrinology. In addition, the functions of higher brain centers are inferred from electrical stimulation and from the effects of lesions on behavior, both ethological and associative. Chapters by Little and by Davis and Kassel include interesting discussions of fish behavior, including feeding, schooling, alarm, migration, and nesting.

These two large volumes are well prepared and well illustrated and should be part of any biology or zoology library. Most of the chapters are too detailed for beginning students but are well suited for advanced graduate students. In particular, actinopterygian neurobiologists should have both volumes in the laboratory or office for ready reference.

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Marine Zoogeography

A Comparative Atlas of Zooplankton. Biological Patterns in the Oceans. S. VAN DER SPOEL and R. P. HEYMAN. Springer-Verlag, New York, 1983. vi, 186 pp. $49.50.

Few scientists since Darwin have achieved the comprehensive knowledge required to synthesize the many kinds of observations relevant to zoogeography into inclusive schemes that would explain why given species occur in particular areas to the exclusion of other areas. In their *Comparative Atlas of Zooplankton* van der Spoel and Heyman have undertaken to simplify our task by presenting us with a book of maps upon which are sketched the occurrences of oceanic zooplankton, and to distill innumerable distributions into a few patterns that might provide the reduction needed as part of a comprehensive theory. Sections at the end of the book then look at geomorphology, plankton patchiness, and changes in climate and sea level as factors that might have contributed to the speciation associated with these generalized zoogeographical patterns.

The authors' attempt is a valid one, and the accomplishment of compiling thousands of distributional notes and maps into a few patterns is admirable.

The authors have wisely used the same map of the world through most of the book and have redrawn on it the distributions from the odd and varied projections favored by those of us who have presented the original works. Certainly, zoogeography needs a reductionist approach, and the attempt to distill many patterns of distribution into a tractable number is an essential step to developing an explanation of how all this happened. The authors present a system of classification of zoogeographic patterns using a known species as a "type species" for each pattern. For instance, the distribution pattern for those animals endemic to the North Pacific Central Water Mass is called the "*Sagitta pseudoserratadentatoides* type." Though the collectivization of many species into a single pattern is valid, this system of nomenclature is fraught with troubles. Several of the patterns are based on poorly known distributions; if in the future we find the distribution pattern of the type species changed, do we change the type species of the original distribution? Or do we change the pattern to fit the type species? For instance, the copepod *Clausocalanus paululus* (misspelled throughout the book as *C. paupulus*) is used as a type for the pattern in which a species does not occur in the Indo-Malayan waters but is found in the Indian and Pacific Oceans on either side. Fleminger and Frost, whose work (*Bull. Scripps Inst. Oceanogr.* 12 [1968]) served as the source for the authors' designation, showed no Indo-Malayan continuity in the distribution, chiefly because they had only two samples from the Indo-Malayan Archipelago. Indeed, their chart 9A indicates they found *C. paululus* in one of those two samples, although it is not reflected in their chart 15A. Tying the nomenclature of a zoogeographic province to something as uncertain as the known range of a poorly known species creates a less than perfect system.

Van der Spoel and Heyman have chosen to locate all references in the back of the book, as is common; however, they have not cited these references in the text or on the maps. It is unnerving to be presented with unsupported statements when a simple citation in the text or a note of the type "after Beklemishev, 1977" on the map would have made the statements seem less arbitrary. To search through a (frequently inaccurate) list of references to try to figure out who made a particular statement is a nuisance.

The authors, who are from Holland, were writing in a language that was not their maternal tongue; though the intent of their writing is apparent after study, the writing does not flow smoothly. The fault is that of the editors, who should have recast certain sentences, removed or added commas, and checked for misspellings. It is commonplace and acceptable to be required to reread a sentence that deals with a complicated subject. However, it is only irritating to be forced to reread a sentence because it has not been well crafted. The editors also should have indented and cleaned up the figure captions (the decision to print many of the plates in red or blue was perhaps made after the authors had sent in the text, for the legends refer to hatching in black and white).

The usefulness of the book will be to those who describe species or revise genera, and to those who seek generalizations for schemes of climatology, sea-level change, glaciation, and the like. Systematists will be given guidelines within which they can assign expected occurrences of new species. Others will appreciate that van der Spoel and Heyman have condensed an enormous literature into a tangible number of spatial patterns that may be incorporated into hypotheses concerning global phenomena.

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Some Other Books of Interest

Science in Government. J. RONAYNE. Edward Arnold, Baltimore, 1984. vi, 250 pp., illus. Paper, $19.95.

This book, which originated in a literature review commissioned by the Australian Science and Technology Council, is intended as a textbook for use in "courses with a science policy studies component" and for the use of public servants and others on whose concerns science policy impinges. An opening chapter traces the history of ideas concerning science policy from the time of Francis Bacon, Antoine de Condorcet, and Charles Babbage to about 1960. A chapter is then devoted to the sources of technological innovation, discussing the literature of the subject and presenting a number of examples from recent (mostly British) history. The third chapter is devoted to governmental support of science—justifications that have been offered for such support, the performance of research by government agencies, mechanisms for enacting science policy, and analytical methods that have been brought to bear on science policy issues. There follows a series of chapters describing science policy systems in various countries: the United States (including brief descriptions of the functions of the Office of Science and Technology Policy, the National Academy of Sciences, the National Science Foundation, and the National Institutes of Health); the United Kingdom; Australia; the Federal Republic of Germany, Canada, and Japan; and Belgium. A final chapter discusses science policy in the "new economic context" (that is, since the 1973 oil crisis). Reference citations are gathered at the end. There is an index but no general bibliography.—K.L.

Uncommon Sense. J. ROBERT OPPENHEIMER. N. Metropolis, Gian-Carlo Rota, and David Sharp, Eds. Birkhaüser, Boston, 1984. x, 195 pp., illus. $14.95.

For this volume the editors "have collected . . . some of Oppenheimer's opinions on science, society and mankind, expressed . . . in his numerous public lectures and addresses." The 16 essays included, some apparently in shortened form, range in date from 1948 to 1966. Eight have not been published previously, according to the editors. The remainder are reprinted from various sources, including Oppenheimer's *Science and the Common Understanding* (1954) and *The Open Mind* (1955). A brief biographical foreword by the editors and 15 photographs are included.
—K.L.

Explorations in the History of Psychology in the United States. JOSEF BROŽEK, Ed. Bucknell University Press, Lewisburg, Pa., 1984 (distributor, Associated University Presses, Cranbury, N.J.). 333 pp. $39.50.

Six monographic studies make up this volume. In the first, Rand B. Evans traces the origins of American academic psychology from the 1630's to the 1880's. James G. Blight then examines the "applications and implications" of Jonathan Edwards's theory of the mind. The career of David Jayne Hill (to whose memory the book is dedicated) is recounted by Josef Brožek. William R. Woodward examines William James's psychology of will and its impact on the thought of various figures in American psychology. Psychology laboratories in clinical settings between the 1890's and