Summary of an Order

The Life of Primates. ADOLPH H. SCHULTZ. Universe Books, New York, 1969. xii + 284 pp. + plates. $12.50. Universe Natural History Series.

This summary account of the Primates is part of a series of natural history books for the general public. Thus Schultz treads no new paths, nor does he expose any startling, exciting new notions or reinterpretations of the evolution and phylogeny of the Primates. The introductory survey reiterates and expands the well-known views Schultz presented in 1936, when he made distinctions between characters common to higher primates and characters specific to man. Now he extends this type of analysis to all of the Primates. Much attention is given to locomotion and posture and to the skeleton and associated structures.

Schultz's view of the origin of the primate radiation and the distribution of Primates in time and space is conventional. The concept of the Primates as a specific and rather unique arboreal adaptive radiation lies behind most of his interpretations of the anatomy that he knows so well. Chapters on posture and locomotion, skeleton, growth and development, and sexual and intraspecific differences are particularly good. The drawings by Schultz himself are splendid. The selection of color plates is odd. I wonder what criteria the publisher and author used for selecting them.

Schultz might well have given us a synthesis of his lifelong work on comparative primate anatomy. What he has done in this book is good, although there is insufficient detail. The book will not make a good text and is too expensive. It is unfortunate that the author did not have sufficient space at his disposal to let himself go. Publications such as the Universe Natural History Series are extremely important in presenting the nature of science and the results of scientific investigations to the general reader. We must produce more interpretations and syntheses for the public that supports us. At the same time, I would suggest that the publishers and editors be more generous with space and require or ask their authors to be less summary.

I cannot let the book pass without picking a couple of nits. The running heads for chapter 12 have a notable typographical error. The classification of recent primates, presented in the appendix, is reasonable, but it is time that our colleagues in German-speaking Europe adopt the label Anthropoidea for the suborder which they like to call Simiae.

The general reader will find the book rewarding, for the Primates are an important group and Schultz is a foremost authority on this group.

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The Ordering of Cells

Cells into Organs. The Forces That Shape the Embryo. J. P. TRINKAUS. Prentice-Hall, Englewood Cliffs, N.J., 1969. xvi + 240 pp., illus. Cloth, $6.95; paper, $3.50. Foundations of Developmental Biology.

Since the egg's way of becoming an adult is first to become an embryo, studies of development that focus on what embryos are doing are particularly important. Trinkaus's topic, the ordering of cells and tissues into organs and organisms, is one that deserves synoptic analysis at this time. This is an area of some excitement. One gets the feeling that enough information exists or is emerging to allow new major conclusions to be drawn soon about the mechanisms of cell behavior during morphogenesis.

The book fairly and completely introduces the reader to this fast-breaking and controversial field. Trinkaus discusses the chemical constitution of cell membranes, mechanisms of cell adhesion, ultrastructure of cell contacts, movements and shape changes of cells, the sorting out of cells and tissues, movements and distortions of cohesive sheets of cells, and the mechanisms of cell locomotion and tissue movement. He covers primarily early morphogenetic events, such as gastrulation and neurulation, with examples from several vertebrates and invertebrates.

Where mechanisms are still not understood, Trinkaus discusses the partial answers available and frames new questions. In some cases the reader is left with an anticipation of work that has emerged since the book went to press. Where the subject has evoked controversy Trinkaus is more than careful in citing all sides—in neutral alphabetical order in one case. He follows through with a critical analysis that is convincing in most cases. It seems to me that he does err in taking the work of Roth and Weston to be a test of Steinberg's differential adhesiveness hypothesis (p. 116). Steinberg's model of sorting out of cells and tissues is based on differential free energies, about which Roth and Weston's reaction rate measurements tell essentially nothing.

Despite the title, the book does not actually cover in detail the shaping of any one organ, especially in later development. It does not deal with selective cell death and matrix modeling. However, for this general description and analysis of mechanisms of cell behavior in morphogenesis, Trinkaus's choice of examples from tissue and cell movements in early development is good and sufficient.

Unlike some other recent small books on development, this one covers its field broadly rather than giving only the narrow view of one laboratory or clique of investigators. It has sympathetic releasors for everyone and will appeal to many researchers. Students with some background in the basics of embryology could use this text, and for them the author index and complete subject index should be particularly useful.

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The Functioning of the Fishes

Fish Physiology. W. S. HOAR and D. J. RANDALL, Eds. Vol. 1, Excretion, Ionic Regulation, and Metabolism. xiv + 466 pp., illus. $23; by subscription, $18. Vol. 2, The Endocrine System. xiv + 448 pp., illus. $23; by subscription, $19.55. Academic Press, New York, 1969.

The several classes of animals usually called fishes together constitute by far the largest (in terms of both numbers of kinds and numbers of individuals) and most diverse phylogenetic grouping of the vertebrates. The two volumes here reviewed constitute the first third of the most extensive and most successful attempt ever made to summarize what is known about the physiology, and to some extent the behavior, of these creatures and some of their relations (some cephalochordates, for example).

A comparison of the present volumes with the two-volume *Physiology of Fishes* edited by Margaret Brown in

1957 is instructive in several ways. Recent years have brought a population explosion of physiologists studying fishes, with a much smaller fraction of this group than previously concentrating upon economically important forms in possibly economically significant ways. Practical considerations still underlie much work in several fields (among them nutrition, reproduction, and growth), but it is satisfying to a dyed-in-the-wool fish fan to note the increasing awareness of fishes as organisms interesting and theoretically significant in their own right.

A proviso to this last remark is that the volumes make less use of this organismic orientation than I think would have been useful. The approach taken by the editors (in their selection of chapter headings) and most chapter authors is discussion by either physiological process or by organ system. This makes it difficult (at least for me) to develop a mental picture of how any given kind of fish, or related group of fishes, functions as living animals adapting to their environments.

There is also little play given to some other useful ways of considering physiology. There would undoubtedly have been some redundancy in literature coverage between expositions of these and some of the process- and system-oriented chapters, but I think useful insights are missed by giving only passing consideration to the coherent sets of adaptations shown by animals (such as Arctic and Antarctic marine teleosts, amphibious fishes, and cave fishes) adapted to special (particularly extreme, environments. There are also particular individual species (for example *Latimeria*) and some limited, theoretically significant, taxonomic groups (for example the Agnatha) that deserve more special treatment than they have received.

The range of subject matter covered by the present edition is far greater than that of the 1957 work. The topics of several chapters (for example, D. H. Copp's "The ultimobranchial glands and calcium regulation," and H. A. Bern's "Urophysis and caudal neurosecretory system," both in volume 2) hardly existed in 1957. Even with this expansion, however, some important topics apparently will not receive much attention (this based on lists of chapter headings for all six volumes). Two among these are the general chemical composition of fishes and the interactions of fishes with environments either drastically changed by or made by man. I hope that the latter topic will be discussed to some extent in F. E. J. Fry's projected chapter for volume 6, "The effect of environmental factors . . . ."

It is interesting to note that, even with substantial recent activity in the specific areas involved, several chapters indicate that a number of significant problems of long standing remain unresolved. Three of these are: the biochemical origin of trimethylamine oxide, the metabolic functions of the neurohypophysial hormones, and the metabolic functions of thyroxin. These volumes provide many challenges for future research by pointing up such situations.

Just as in the volumes edited by Brown, the chapter authors are mostly established and well-known workers in their areas. The editors have done well by the younger generation in selecting their authors, many of whom have developed their reputations within the last ten years.

The authors in turn have generally done good, thoughtful, reasonably well balanced jobs in covering the literature of their subjects. Bibliographic citations are thorough and as up to date as the logistics of book publishing will allow. In these first two volumes coverage is quite good through 1967, partial through 1968, and scattered in 1969. The older literature happily is not neglected. Linguistically and geographically, coverage is generally excellent for North American and Western European journals, but is quite limited and spotty for East European and Russian, Asian (especially Japanese), Latin American, and Australian journals. Some of these remarks will probably not apply to some of the chapters in later volumes which have been written by Japanese workers.

Factual errors in the text are few and of limited significance. Most appear to be due to such factors as unfamiliarity of the authors with the biology of the species involved (for example, the habitat of the stenohaline marine Chilean clingfish *Sicyases* is given as fresh water, volume 2, p. 358) or with the taxonomy involved (for example, the skipjack, *Katsuwonus*, is called a bonito, volume 2, p. 289). That physiologists are rarely familiar with taxonomy is further demonstrated by the large numbers of misspellings of the Latin names of many forms.

The technical quality of the production of these volumes is generally good. Typographical errors are few and usually minor, but occur frequently in the systematic indexes. Each volume has three indexes, author, subject, and systematic. These indexes are fairly good, but variable. The subject index in volume 1 is one and a half times the length of that in volume 2 and proportionately better. The quality of microphotographs (there is a color plate of several in volume 2) is variable, ranging from fair to good. Quality of paper, binding, and typography are all up to the usual standards of the publisher. Price per volume is also up to the publisher's usual standard.

To sum up, the first two volumes of this series augur well for its success in achieving the editors' hope that "it will serve biologists of the 1970's as *The Physiology of Fishes* served its readers throughout the 1960's." The earlier work served excellently.

[Volume 3 of the work, Reproduction and Growth, Bioluminescence, Pigments, and Poisons (502 pp., $24; by subscription, $20), is now available—ED.]

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A Plant Process

The Induction of Flowering. Some Case Histories. L. T. EVANS, Ed. Cornell University Press, Ithaca, N.Y., 1969. viii + 488 pp., illus. $18.50.

For nearly a century, plant biologists have tried to find a unified theory to account for the flowering process. Aware of the failures and difficulties in this field, the author of this book presents 20 case histories of species which are most important as experimental objects in investigations of the mechanisms of flower induction. The selected examples are "plants requiring exposure to only one day of appropriate length and which can be induced as seedlings, since these are likely to be of increasing importance in future work." Aside from the classical cocklebur, soybean, *Pharbitis nil*, and *Perilla*, the book presents such newcomers in the field as *Chenopodium rubrum*, *Anagallis arvensis*, *Cestrum nocturnum*, and even the "Ceres" cultivar of *Brassica campestris*, which has been studied very recently in the author's laboratory. Old-timers