stantive adaptation of the African pongid wrist to knuckle-walking clearly documented.

A useful review of statics in the interpretation of skeletal morphology (Badoux), the results of an extensive comparative analysis of primate scapular morphology (Roberts), and a survey of positional behavior in New and Old World monkeys (Rose) are also included. While the ranges of research and discussion presented in this volume are as broad as its title, much of the material is naturally integrated, giving the book a fairly unified quality. A majority of the contributions contain both valuable data and significant insight, and the book will thus prove vital to anyone interested in primate locomotion.

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Models of Development

Experimental Embryology of Echinoderms. SVEN HÖRSTADIUS. Clarendon (Oxford University Press), New York, 1973. x, 192 pp., illus. $16.

Developmental Biology of the Sea Urchin Embryo. GIOVANNI GIUDICE. Academic Press, New York, 1973. x, 470 pp., illus. $32.

Sea Urchin Development. Cellular and Molecular Aspects. LOUIS W. STEARNS. Dowden, Hutchinson and Ross, Stroudsberg, Pa., 1974. xii, 340 pp., illus. $20.

Studies on sea urchin embryos have provided important cornerstones of developmental biology, and today increasing numbers of researchers are using these organisms as model systems for studying fertilization, cleavage, determination, and morphogenesis. Early experiments probed the organization of the egg and embryo by removal of parts and assessment of the embryos' plasticity—or lack of it—in later development.

These approaches have been especially developed by Sven Hörstadius, and his monograph is a significant, personal, and provocative view of the causal analysis of development—significant because it provides in one place a complete summary of current views of the organization and progressive determination of the echinoderm egg and embryo, personal because much of this analysis is derived from Hörstadius's own research, which spans almost 50 years and successfully links classical embryology and modern developmental biology, and provocative because a major future challenge is to explain in molecular terms the remarkable organization of the egg as well as the plasticity of the echinoderm embryo.

Hörstadius's monograph briefly recounts the history of experimental embryology. This history is followed by a description of echinoid development and methods for working with these embryos. This chapter will be especially useful to embryologists for its account of methods for removing and transplanting blastomeres. There then follow chapters on the determination of cleavage patterns and on the organization of the egg and embryonic axes. The text is not restricted to sea urchins among the echinoderms, and one chapter covers experiments with the other four echinoderm classes. Finally, experiments on germ layer chimeras and interspecific hybrids are described, and the book ends with a stimulating discussion of determination.

Where Hörstadius's book is primarily a personal review of his own research, Giudice's monograph sets out to review the massive literature of the subject, concentrating on physiological and molecular aspects.

Guidice's book is not solely a compendium of research results. The diverse literature generally is integrated into an interesting and well-written discussion. The first section (175 pages) covers experimental embryology, oogenesis, fertilization, cleavage, and experimental cell dissociation and reaggregation (in which Giudice has been especially active). The second section (225 pages) covers the metabolism of the developing embryo, including one chapter on energy metabolism, three chapters on nucleic acid and protein synthesis, and finally a brief chapter on increases in enzymatic activity during development. The bibliography is extensive, containing almost 1700 references, and includes an addendum covering publications through 1972. A defect, for which the publishers are presumably at fault, is in the indexing. The subject index is sparse (only 4½ pages) and poorly cross-referenced, and there is no author index.

Considering the breadth of his subject, Giudice has done an impressive job of integrating difficult literature. The only substantive shortcoming is in the second section, where he has perhaps been too equitable and comprehensive in describing good, bad, and redundant research pertaining to nucleic acid and protein synthesis. Overall, however, he has attempted to synthesize conflicting results and point out new and unresolved problems. He has also included many unpublished observations from his own laboratory.

The contribution by Stearns covers the same ground as Guidice's monograph. It is the more readable of the two, but falls short in breadth and comprehensiveness. Its strength lies in the raising of questions and problems. Some of Stearns's points are excellent, as on the mechanism of the acrosome reaction in fertilization. In other areas, as in the chapter on protein synthesis, much verbiage is wasted on inconsequential points.

A question that is not covered in any of these books is whether sea urchins will continue to be available for embryological research. Embryologists have always competed with gastronomes for the roe of the sea urchin, but in the past this competition was on a small scale. Now commercial marketing and increased demands in Japan and Europe have resulted in the development of a large sea urchin fishery in Japan and recently in the United States. In California, the commercial harvest went from 200 pounds in 1971 to almost 2 million pounds in 1973. Japanese embryologists are already experiencing difficulty in obtaining sea urchins for research. If the U.S. fishery continues to grow, American embryologists will soon experience similar difficulties. To preclude this, the fishery should be scientifically managed, and sea urchin preserves should be established near major university and research centers. Otherwise, these magnificent models of embryonic development will be lost.

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Vertebrate System

The Third Eye. RICHARD M. EAKIN. University of California Press, Berkeley, 1974. xii, 158 pp., illus. $7.50.

Eakin has a national reputation as an excellent electron microscopist and an innovative teacher; this book shows both of these attributes. A short, well-produced and well-illustrated monograph, it summarizes some two decades

of research on the pineal-parapineal problem in lower vertebrates. The summary emphasizes the work of Eakin and his associates, as is appropriate since they have done most of the basic work in this area; experimental work by classical as well as other recent students of the topic is also reviewed, however.

The book deals in sequence with morphological, developmental, and functional aspects. Eakin confirms again the view that the parietal eye is a remnant of the left or parapineal organ seen in agnathans. Not surprisingly he concludes that the eye functions as a dosimeter of solar energy exposure in many Recent reptiles; this view was, after all, developed by his school. The monograph gives evidence that the Recent amphibians are quite aberrant, rather than represent an "intermediate" condition between the patterns observed in lower fishes and those observed in reptiles. It also documents that our knowledge of this system still depends on a phylogenetically most limited sample from among the many groups of lower vertebrates.

The book is written in a style that allows it to be read profitably by undergraduates or by any vertebrate biologist wishing a summary of an interesting subject. Eakin's treatment is historical, and he communicates the ideas that one owes a debt to one's predecessors and that science is an ongoing process that proceeds by successive approximations. He goes out of his way to define terms and to emphasize related matters, but without wasting much space on asides. It is refreshing to read a monograph that starts by thanking the taxpayer who funded the work and ends by thanking the reader.

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Visual Psychophysics

Eye-Movements and Visual Perception. R. W. DITCHBURN. Clarendon (Oxford University Press), New York, 1973. xvi, 422 pp., illus. $30.50.

Helmholtz would have liked this book. As the foremost practitioner of the art of analyzing the physical basis of perception, he would have recognized in the author a kindred spirit. Ditchburn, a physicist trained at the Cavendish laboratory, helped a generation of physics students to a better appreciation of optics through his textbook on light. During the last 25 years, however, his main interest has been the visual effects of stabilizing the retinal image, which he was one of the first to achieve. Now Ditchburn has kept a promise made by so many other scientists, namely to write a book after retirement. What is more, he has written a good book.

It opens with an excellent introduction to the optical and optomotor factors in the formation of the retinal image. There is also a great amount of information on the physiology of visual sensory processes as well as of the eye movement apparatus in man. Most of it, however, is concerned with the effect on visual thresholds of various programs of eye movements, and, in particular, the nulling out of normal micronystagmus. An appendix covers some of the techniques of making tight-fitting contact lenses to help stabilize retinal images. The book is up to date and well documented, though there are occasional mismatches between citations and references.

It is only fair to issue a warning to those who would look for coverage of what has traditionally been understood as perception. To be sure, a few sections of this book deal with changes in pattern perception when retinal images are stabilized, but the vast bulk of the material covers the psychophysicist's preconditions of visual perception—optical images, retinal excitation, thresholds. Ditchburn is at home here because his own contributions, characterized by innovation in technique and precision of attack, are in this area. What about the more global questions of perception? They are hardly touched on in this book, or for that matter in most other books with "perception" in the title. One continues to wonder what the Gestalt psychologists of a generation ago did wrong to leave such an arid heritage. Yet it is a good bet that even the most global formulations of perception will be the more securely based the more consonant they are found to be with the psychophysicists' strictures. In laying these out, both in a general way and through examples of research in the author's field, Ditchburn's monograph will have a lasting place.

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Ecological Simulations

The Structure of Marine Ecosystems. JOHN H. STEELE. Harvard University Press, Cambridge, Mass., 1974. xii, 128 pp., illus. $7.95.

Theoretical ecology got off to a good start in the 1920's with Vito Volterra's seminal, and still central, contributions springing from his interest in fish catches in the Adriatic. There are many subsequent instances of fruitful interplay between ecological theory and marine biology, and John Steele's monograph lies in the mainstream of this tradition. His general aim, which I think is fulfilled admirably, is "to show how theory, observation, and experiment may be combined, and how closely each depends on the other."

Specifically, Steele sets out to build a model describing the dynamical behavior of the populations of phytoplankton, zooplankton, and other beasties in the North Sea in spring and summer. Any such enterprise requires a skilled helmsman to steer between the Scylla of a multiparameter, computerized Goon Show and the Charybdis of total abstraction. As an applied mathematician of note, and deputy director of the Marine Laboratory maintained in Aberdeen by the Department of Agriculture and Fisheries for Scotland, Steele is well qualified for the task.

The study begins (chapter 2) with a descriptive account of the properties of marine food webs in general, and those in the North Sea in particular.

In order to gain some understanding of the dynamical structure of these food webs, the author next (chapter 3) turns to broad questions of stability, diversity, and efficiency. There is a perceptive and original discussion of the intuitive idea that "extra links in the