

seen if, how, and which chimps adapt to the changing options.

In the first 25 years of the Gombe project, Goodall and the chimpanzees of Gombe have been instrumental in engaging the interest of a large portion of the public and popularizing fieldwork, conservation, and the richness of primate behavior, the benefits of which extend far beyond Gombe. In recent years, Goodall and the chimpanzees have increasingly begun to face complex conservation issues that are now among the most critical for the future of wildlife and of major economic importance for the developing countries in which most of the wildlife resides. If she and the chimps can again lead the way to public awareness, they will again provide an invaluable service.

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From Gene to Embryo

Gene Activity in Early Development. ERIC H. DAVIDSON. Third edition. Academic Press, Orlando, FL, 1986. xvi, 670 pp., illus., + plates and loose charts. \$49.50.

As the author points out, this edition is made up of almost entirely new material. It is half again as long as the second edition, an on RNA accumulation and distribution during development. Davidson also discusses in detail spatial regulation of gene expression in the embryo and its relationship to lineage determination, providing a strongly comparative point of view and generating broad and well-balanced interpretations of large bodies of connected facts. The result is an excellent book that represents the field from a personal yet broadly convincing vantage point.

As the author points out, this edition is made up of almost entirely new material. It is half again as long as the second edition, an increase that, though justified by the level of recent progress, nevertheless creates some burden for the reader. The present edition is divided into six chapters. After an introductory chapter on gene regulation in development, chapter 2 considers maternal transcripts in considerable detail; quantitation and complexity of oocyte RNA populations are described in different species. Chapters 3 and 4, on transcription and on differential gene function in the embryo, are closely related but differ in the type of material considered: chapter 3 emphasizes the quan-

titative and kinetic aspects of RNA populations, whereas chapter 4 deals with the establishment of cell lineages and the activation of individual genes in these lineages. The latter approach is more likely to advance our understanding of the genetic mechanisms of embryogenesis. Discussion of cell lineages is a key feature of the book; the sea urchin lineage presented in a detailed figure is particularly valuable since it not only provides a critical compilation of data from the literature but adds much unpublished new material from Davidson's laboratory.

Chapter 4 also points up an interesting dichotomy in developmental work in *Drosophila* and in other animals: in the other animals developmentally regulated genes encoding enzymes, structural proteins, and the like are studied, whereas in the fly the focus is on homeotic and segmentation genes. To some this simply indicates the superiority of the *Drosophila* system with its unequalled genetic possibilities. Yet we must remember that we do not at present know the functions of, say, *Ultrabithorax* and *fushi tarazu*, nor has it been demonstrated beyond question that they are more interesting in the context of development than, for example, actins or keratins. Many biologists will say that they are; we may conclude from the volume under review that its author is not among them. (Perhaps the reviewer should not be let off the hook: Do I believe that *Ubx* and *ftz* are more interesting? Yes I do, but I'm hedging my bet.)

After an interesting though perhaps too long chapter on oogenesis, the book concludes with a discussion of cytoplasmic localization. To me this final chapter is unquestionably the highlight of the volume. Here the discussion achieves a perfect mixture of historic and modern perspective and mixes facts and concepts in a way that is both clear and exciting, providing the definitive statement on the subject since E. B. Wilson's *The Cell in Development and Heredity*. Perhaps the strength of this chapter relative to others in the book conveys a message about the field of developmental biology. Many of the basic questions were raised and many fundamental biological observations made a long time ago. In the past 25 years or so, molecular approaches have been applied increasingly to developmental problems. Yet until quite recently, molecular work on single genes and single RNA species was restricted to a few examples, for instance, ribosomal genes. Consequently much work dealt with RNA populations and global properties, providing necessary baseline information but no direct insight into genetic mechanisms of development. With recombinant DNA technology all this has changed, but neither developmental bi-

ology as a field nor this book has absorbed the full impact of these changes. Parts of the book are philosophically products of the period of the first and second editions, emphasizing issues that, I believe, could well be treated more concisely. Thus I find those parts strongest that are totally recent or primarily classical. Perhaps the avenues of study treated mostly in chapters 4 and 6 will form the main subjects of the fourth edition of *Gene Activity in Early Development*, creating a new balance. Yet, some disagreements on emphasis notwithstanding, this volume is an important achievement that, like the earlier editions, will have considerable influence on the field. Every biologist concerned with development will want to read it.

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IRAS Observations

Light on Dark Matter. F. P. ISRAEL, Ed. Reidel, Dordrecht, 1986 (U.S. distributor, Kluwer, Norwell, MA). xxiv, 541 pp., illus. \$98. Astrophysics and Space Science Library, vol. 124. From a conference, Noordwijk, The Netherlands, June 1985.

Whenever a new window to the universe is opened the only result that can be predicted with certainty is that there will be numerous unexpected discoveries. The Infrared Astronomical Satellite, IRAS, a superfluid, liquid-helium-cooled telescope system launched in January 1983, provided such a window for astronomers. Until its cryogen was exhausted in November 1983, IRAS performed a sensitive survey of the sky at infrared wavelengths of 12, 25, 60, and 100 micrometers. *Light on Dark Matter* is devoted to exploring results from the IRAS survey. The variety of topics covered in these proceedings is striking. Subjects include but are by no means limited to the zodiacal background emission (infrared radiation from interplanetary dust particles), stars, star-forming regions, the infrared "cirrus" emission of our galaxy, extremely active galaxies thought to be undergoing bursts of star formation, and cosmology.

One of the most useful aspects of this work is that because of the broad range of subjects covered the review papers provide overviews of the subdisciplines that are quite lucid even to the nonspecialist. As a result this book will benefit everyone, from the expert who wants to update a reference list to the novice who wishes to find out current

thinking on a subject or explore some of the nuances of the field. For instance, a review by F. C. Gillett updates results on the Vega phenomenon, discovered by IRAS, for four nearby stars. This phenomenon is an infrared excess attributed to thermal emission by orbiting circumstellar grains that can be interpreted in some cases as indirect evidence for planet formation around other stars. A review by H. J. Habing demonstrates that by careful selection of infrared colors and source brightness we can explore the distribution of stars in our galaxy. Because interstellar extinction has little effect on infrared wavelengths (compared to the visible), IRAS has provided us with an unprecedented view of the Milky Way, revealing for the first time the nuclear bulge and stellar disk of our galaxy.

Other noteworthy contributions include a thought-provoking review by B. G. Elmegreen, who discusses how infrared observations can be used to deduce information on the luminosities of newly forming stars (protostars) and star clusters and the distribution of dust particles around young stars. Elmegreen outlines how our current theories of star formation can be modified by these results, indicating the important role dust can play on the magnetic diffusion rate in dense molecular clouds, an effect that will influence the masses of the stars that form. The three reviews on the composition and properties of interstellar grains by H. C. van de Hulst, J. S. Mathis, and J. M. Greenberg, leaders in the field, are clear and illuminating. These are just some of over 20 invited reviews and over 80 contributed papers contained in this volume.

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Fossils in Phylogeny

Phylogeny Reconstruction in Paleontology. ROBERT M. SCHOCH. Van Nostrand Reinhold, New York, 1986. xii, 353 pp., illus. \$52.95.

The revolution in taxonomic practice brought about by cladistics in the last two decades not only has brought method and rigor into the field of systematics but has also led some to question or reject the traditional role of paleontology in phylogenetic reconstruction. A clear exposition of where paleontology stands in phylogenetic reconstruction is therefore long overdue. Unfortunately, this book is not about what role fossils play in phylogenetic reconstruction but about concepts and methods of analysis that can be applied to fossil data.

Schoch defines phylogeny in an unusually restricted manner to mean the establishment of relationships (taxonomy) and specifically excludes the construction of phylogenetic trees, which he calls "evolutionary phylogeny." Yet this book is about much more than "phylogeny" in Schoch's terms. Of the three sorts of data retrievable from fossils—morphological characteristics, stratigraphical range, and geographical distribution—it is morphology and morphology alone that provides the information on which phylogenetic relationships have to be decided. Only after relationships have been established by the most rigorous method possible can stratigraphical and geographical data be analyzed in a meaningful way to produce phylogenetic trees or biogeographical histories of vicariance. So, although rigor in both stratigraphical and biogeographical analysis is to be applauded, the two chapters dealing with these themes seem largely irrelevant to Schoch's main thesis. Even further removed from phylogenetic reconstruction is the final chapter on macroevolution, since macroevolution theories attempt to explain the patterns of diversity that result from combining stratigraphical and geographical data with hypotheses of relationship. Furthermore, it appears to me that there is insufficient resolution in paleontological data to be able to distinguish unambiguously between any of the competing hypotheses.

I found little to criticize in Schoch's clear analysis of the vast amount of literature that phylogenetic reconstruction has prompted recently but was somewhat disappointed not to find a more paleontological slant or any concrete examples in the text. Fossils provide the only unambiguous guide to past life and their character associations, and the character transformations deduced from paleontological lineages are no more susceptible to problems of interpretation than are ontogenetic character transformations in determining homology and character polarity. It is a shame, for example, that only the briefest mention of Hennig's stem and crown group concept is given, since this seems to me to be one of the most fruitful approaches to the placement of fossils. The plesion concept gets rather more of an airing before being rejected as unnecessary (though for my group, echinoderms, trying to fit all living and fossil forms into a unified taxonomy without plesions would produce the most incredibly unwieldy hierarchy).

Finally, although Schoch is to be commended for trying to provide a guide to the extensive literature covering the theory behind phylogenetic analysis that has appeared over the last 10 to 15 years, I fear that because of all the jargon used only those fully conversant with current arguments will

find this book digestible. There is a glossary, but it is certainly not comprehensive, and the two words that sent me scurrying to it were not included. For anybody starting out in phylogenetic analysis, considerable background reading is required before tackling this book.

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