Primatology in East Africa

The Chimpanzees of Gombe. Patterns of Behavior. JANE GOODALL. Belknap (Harvard University Press), Cambridge, MA, 1986. xiv, 674 pp., illus., + plates. $30.

There are several books within these covers. There is, of course, the core of detailed case history descriptions for the 50 or so chimpanzees that have resided in the Gombe Stream National Park of Tanzania during the 25-year period of Jane Goodall's research there. These are presented in richly illustrated topical chapters that cover all aspects of chimpanzee social behavior and much about the world in which the chimpanzees live and with which they interact. Until now, this slowly accumulating body of observations has only been found scattered through Goodall's films, lectures, and writings for the general public or in the technical writings of the graduate students and other colleagues who worked at Gombe through the mid-1970s. In *The Chimpanzees of Gombe* Goodall brings together for the first time the information provided by the numerous Tanzanian and foreign observers.

Interwoven throughout the volume, among the comings and goings of chimpanzees, are parallel themes that also unfolded over the quarter-century at Gombe and that are an inevitable part of the lives of the chimpanzees and the conduct of a long-term project such as this one. The 25 years of the Gombe study span much of the history of primate field studies and of modern African wildlife research. It also spans most of the period since achievement of independence for East Africa, a period of both stability and change, of rapid population growth, agricultural development, and economic pressures, of changing levels of education and ecological and conservation awareness. Inevitably, the scientific and human history of this period has, to varying degrees, affected Gombe, its animals, and the research. The story of those effects and issues is scattered, at some times explicit and at others implicit, throughout the volume. The issues raised by these subplots each provide ample material for separate books. They may, in the long run, be of comparable or greater importance for the future of the chimpanzees and of the other plants and animals with which we share this world and from which we seek to understand that world and ourselves.

The present volume, reasonably priced though expensively produced with an abundance of photographs, large margins, and colored diagrams and graphs, is surely aimed at the large and diverse audience that Goodall and her chimps have reached through the years. This audience will not be disappointed. The book is full of detailed reports of chimpanzee adventures, big and small, heroic and shocking and routine. Taken as a whole, the descriptions provide a testament to the rich diversity of behavior among the chimpanzees. Goodall emphasizes the considerable variability in the behavior of different individuals and of single individuals over time and the disproportionate effects on others that single events or individuals sometimes have. For some sections (for example, on most demographic topics, the sociograms, and family associations), the lucid descriptions are well complemented by useful quantitative data provided in graphs and tables. Sometimes, however, the usefulness of quantitative information is limited by the techniques of data collection, problems Goodall had in extracting data from the many years of handwritten notes, and presentation of values apparently uncorrected for differential observation time for different animals or differential preponderance of age-sex classes in the population. In these cases, the reader may wish to focus more exclusively on the compelling descriptive examples. One can hardly open to any page of the volume without becoming engrossed in some finely reported series of observations. It is difficult to imagine a reader who comes away from this book without a tremendous respect for the variety and complexity of chimpanzee life, the necessity of longitudinal, life-history data, the importance of rare events and unusual individuals, or the necessity of studying processes at several levels of organization. Reductionists and generalizers will not find comfort here.

Field research can pose some complex dilemmas about the interventive role of the observer. Goodall candidly discusses the extensive feeding of the Gombe chimpanzees that she did to facilitate observations, her recognition that this was a mistake, and the demonstrated and possible effects of the feeding on the animals. A low level of feeding continues at Gombe, however, as does some level of interaction with chimps and some medical care. Goodall feels that the present level of feeding is insufficient to affect behavior, and the medical care is defended as a balance to the considerable negative human effects on the lives and numbers of this increasingly endangered species. The arguments are debatable, and I disagree with a number of the specific decisions. What is important, however, is that Goodall is open about these decisions and activities. What is even more important is for others to take decisions about such interventions, and their consequences, at least as seriously as Goodall does. Field studies of this and other species often include examples of at least as much human intervention. In addition, researchers and conservationists increasingly translocate individuals or groups of animals from their home areas to other regions, rehabilitate and release captive animals into natural habitat, and perform experiments and biomedical procedures on wild animals in the field. For the most part we remain ignorant of the effects on behavior, on stability within the natural communities of the same and other animal species and plant species, on gene distribution, and on patterns of disease. Some of these interventions have major potential benefits in terms of scientific knowledge or conservation. They therefore form an important link between traditional laboratory and field research. The potential costs are also great, however, and usually irreversible. With natural areas dwindling and the list of endangered species growing, it is increasingly urgent that the scientific community, and those entrusted with the care of natural areas, attend more to the issues of direct human intervention in the wild areas that Goodall has grappled with.

During the 25 years of the Gombe research, indirect human intervention has changed the chimpanzees' world in some major ways. One of the most important for the future, highlighted by Goodall through maps as well as words, is the fact that the Gombe chimps are no longer a part of a larger, continuous population. Essentially, they now constitute a small, isolated population on an ecological island. As a result of human population growth, settlement, and increasing agricultural development, Gombe is cut off from dispersal opportunities. The larger connected areas would ordinarily allow for behavioral and genetic exchange and provide buffer areas that damp the effects of highly local or short-term fluctuations in factors such as food availability and population size and composition. This pattern of habitat and population fragmentation is occurring throughout the world and for many of our most familiar large mammals. Longitudinal, long-term studies such as Goodall's are essential for documenting and investigating the consequences of such changes. Goodall makes it clear that large-scale patterns of movement have played an important role in chimp society. It remains to be

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 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 quantitative 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 unequaled 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 biology 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