completed in the early 1870s). For soft-rock technology, discussion concentrates largely on projects designed to connect the two sides of the Thames in London. For tunneling machines West examines a variety of mechanical devices used to expedite construction under a wide range of geological conditions. As part of this last section, he provides brief, yet fascinating, discussion of late–19th-century efforts to tunnel under the English Channel.

In summary, is this a book warranting widespread general interest among historians of technology and the engineering community? No. Is it a scholarly, readable treatise that will appeal to engineers and historians specifically interested in tunnel construction? Most decidedly yes. Although it does not pretend to be a definitive treatment of tunnels and their place in the growth of civilization, it is an excellent reference work that will be useful for years to come. With luck, it may spur others, or even West himself, to undertake further research into the broader impact of tunnels on social and economic development in both ancient and modern society.

DONALD C. JACKSON
504 South 46th Street,
Philadelphia, PA 19143

Primate Sociobiology

Primate Social Systems. ROBIN I. M. DUNBAR. Comstock (Cornell University Press), Ithaca, NY, 1988. viii, 373 pp., illus. $49.50; paper, $24.95.

Descriptive accounts of the social behavior of the nonhuman primates, both in the laboratory and the wild, have been available for some time. Dunbar has set himself the ambitious task of going beyond descriptive studies to examine the diverse social systems in which behavior is embedded, demonstrating in the process how these systems result from, and at the same time set limits on, individual behaviors. Emphasizing the importance of theory-building and testing throughout, he takes an approach to the analysis of behavior that is steeped in sociobiology, acknowledging nonetheless that ecology and demography shape the arena within which sociobiological principles operate.

After several chapters that provide necessary factual and theoretical background, the book covers the basic biological problems that primates must confront in order to survive; special attention is paid to the effect of the environment on demographic processes and the way these animals adjust the amount of time expended on different behaviors in order to cope with changing conditions. The second half of the book is devoted largely to different behavioral strategies pursued by individuals within particular social systems, strategies that allow them to survive, acquire mates, and rear young. The last two chapters are intended to tie together the points made earlier and deal with models of socioecological systems and the evolution of social systems respectively.

There are many stimulating ideas to be found here, for Dunbar is not one to accept conventional wisdom unquestioningly. For instance, he challenges the notions that avoidance of inbreeding is the ultimate cause of emigration in primates (p. 82), that monogamous mammals arrive at this particular mating system because of female dispersal (p. 274), and that territoriality in primates evolved as a means of protecting access to resources (p. 290). In the current debate over whether primates live in groups in order to acquire and protect resources or in order to provide a defense against predators, he supports the latter hypothesis. Kin selection need not be the main reason why animals form groups with relatives, he suggests; convenience and efficiency may be more plausible causes. Dunbar's positions on these and other issues are often bolstered by mathematical modeling, much of which derives from his earlier work with gelada monkeys in Ethiopia.

Perhaps, the least satisfying part of the book is its concluding chapters. Under the heading "Socio-ecological systems" Dunbar explicates a model taken from his 1984 gelada monograph, briefly shows how the model may be applied to other primates, and then devotes most of the chapter to a discussion of monogamy with an afterword on territoriality. Rather than draw general conclusions, the final chapter seeks to apply previously derived theoretical principles to account for the social evolution of baboons (*Papio*, *Theropithecus*, and *Mandrillus*) and the great apes. Although it is probably not possible, given the present stage of our knowledge, to create an overarching theory that accounts for the social organization of all the living primate species (and Dunbar does not pretend to do this), still the reader is left with a sense of anticlimax, a feeling that a more general resolution may have been close at hand but eluded the author's grasp.

The book is a valuable one, nonetheless. Perhaps its most useful contribution is the author's uncompromising refusal to oversimplify, as others have done, in the face of the complexity that characterizes the relationship between these unusually intelligent animals and the environmental and demographic pressures that shape their behavior. The mathematical models that he has developed to deal with this complexity may or may not be appropriate, but testing them and pursuing their implications should lead to a fuller understanding of primate social systems.

ROBERT S. O. HARDING
Department of Anthropology,
University of Pennsylvania,
Philadelphia, PA 19104–6398

Some Other Books of Interest

A History of Neurophysiology in the 19th Century. MARY A. B. BRAZIER. Raven, New York, 1987. xvi, 265 pp., illus. $69.

This account of neurophysiology in the era in which it "began to be recognized as a specific field (though it did not yet have its name)" takes a biographical approach, discussing under separate headings the work of some 60 experimentalists. Chapter 1 begins with the statement that "for students of the nervous system the 19th century opened with the shock of Galvani's claim for animal electricity," and the first three chapters describe work centered on this claim. There follows a chapter on investigations of the spinal cord. Further chapters cover work by researchers who opened "the great era of experimental physiology" and by the "great German schools," studies of nerve and muscle stimulation and of localization of function in the brain, findings made through microscopy, elucidation of the neural origins of muscular movement, electroencephalography, and the work of the "great Russian schools." A portrait of each researcher and an illustration from his work are included, and each chapter includes, in addition to bibliographic footnotes, a selected bibliography. The book also includes author and subject indexes.—**K.L.**

Evolution and Coadaptation in Biotic Communities. SHOICHI KAWANO, JOSEPH H. CONNELL, and TOSHIKATA HIDAKA, Eds. University of Tokyo Press, Tokyo, 1988 (U.S. distributor, Columbia University Press, New York). viii, 256 pp., illus. $72.50. From a symposium, Kyoto, Japan, Nov. 1986.

In 1985, to celebrate the 60-year reign of the Emperor of Japan, an International Prize for Biology, to be awarded by the Japan Society for the Promotion of Science (an institution set up by the Japanese Ministry of Education, Science, and Culture) was established. The first prize was awarded to E. J. H. Corner of Cambridge University, and the proceedings of the symposium held in conjunction with that award were pub-

lished under the title *Modern Aspects of Species* (K. Iwatsuki, P. H. Raven, and W. J. Bock, Eds., University of Tokyo Press). The present volume stems from the 1986 symposium, at which the awardee was Peter Raven. The volume opens with Raven's Special Lecture, "Biological resources and global stability." There follow papers dealing with social organization in primates (J. Yamagiwa on mountain gorillas and T. Kato on pygmy and common chimpanzees) and in eusocial insects (B. Hölldobler on ants and T. Abe on termites). Adaptations of animals to the extreme environments of terrestrial caves and glaciers are reported on by S. Uéno and by S. Kohshima, and plant-animal coadaptation is discussed as related to volatile chemicals, pollination energetics, and "universal parasitism" by G. Bergström, T. Yumoto, and R. Dawkins. The volume concludes with two papers representing community ecology—J. H. Connell on maintenance of species diversity and M. Hori on a study of mutalism and commensalism among Lake Tanganyika fish. Author, taxonomic, and subject indexes are included.—**K.L.**

Lattice Defects in Ice Crystals. X-Ray Topographic Observations. AKIRA HIGASHI, Ed. Hokkaido University Press, Sapporo, 1988. viii, 156 pp., illus. ¥6,000.

Akira Higashi and his colleagues at Hokkaido University have been studying lattice defects in ice crystals by means of x-ray diffraction topography for over 20 years. In the course of their work, Higashi reports, they have accumulated many topographs that were poorly reproduced in the professional journals in which they appeared or that have remained unpublished though they "are interesting in themselves, and supplement the published data in addition to being simply photographically beautiful." The primary intent of this book, printed on heavy, coated paper in a 21-by-29-centimeter format, is to show many of these topographs at a large scale. An introductory chapter by Higashi gives a brief history of the work and an explanation of the technique. The topographs are then presented in chapters devoted to dislocations in natural ice crystals and in artifically grown single crystals; stacking faults; generation, multiplication, and motion of dislocations; interactions between dislocations and point defects; and large-scale grain boundaries. Each chapter, in addition to the topographs and their captions, contains a discussion of the structures shown and the procedures by which they were revealed. A bibliography and index complete the volume.—**K.L.**

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The Additives Guide. Christopher C. Hughes. Wiley, New York, 1987. x, 146 pp. $37.95.

Advances in Applied Psycholinguistics. Sheldon Rosenberg, Ed. Cambridge University Press, New York, 1987. Two volumes. Vol. 1, Disorders of First-Language Development. xii, 303 pp. Paper, $21.95. Vol. 2, Reading, Writing, and Language Learning. x, 326 pp. Paper, $21.95. Cambridge Monographs and Texts in Applied Psycholinguistics.

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