refer to as the "anecdotal era." Most of us who have undertaken primate field studies have gone into the field with virtually no instructions or training either in how to obtain an adequate and representative sampling of the behavior and ecology of an animal community or in how to analyze the data when we returned. Each problem has been dealt with as it arose.

Under such conditions it is a tribute to the discernment and hard work of these authors that they have been able to provide us with clear, coherent accounts of the lives of several primates in their natural environment. This volume presents a unique survey of primate life.

The publishers of both surveys have done an excellent job with their material. The Academic Press volumes are comparatively expensive, perhaps because they are aimed at a more advanced and thus more limited group of readers, but some of the expense is probably attributable to the fact that the survey has been unnecessarily bound as two volumes. By comparison the field studies volume is a book bargain, particularly in view of the large number of figures.

In looking back over these two surveys, it is hard to imagine two more different presentations of the same phenomena, behavior, in the same group of animals, the primates. I wish that the cleavage between the two surveys was only a result of two publishers trying to avoid competition between their products but such is not the case.

The basic difference is not just that one survey is based on laboratory and the other on field studies. Rather, the difference is a reflection of two, more general antipodes in behavioral research, and it is a difference that hinges, basically, on whether the research is relevant to an understanding of adaptations and evolution.

This basic difference is reflected in the organization of the surveys. The core of the volume on field studies consists of a series of chapters each devoted to a presentation of the basic ecology, behavior, and social organization of some one species. This is followed by chapters on special topics each of which is based on the data that are available for the various species. In contrast, the volume concerned with laboratory studies is organized around a number of common psychological problems or techniques—for example, discrimination-learning sets, delayed response, and operant conditioning; most of the research that is reviewed under each of these topics was done by people who apparently knew little and cared less about the behavioral adaptations of their animals.

These comments are not meant to imply that laboratory studies of primate behavior cannot be relevant to an understanding of naturalistic behavior, but only that, judging by the contents of the two volumes based on laboratory research, they seldom are. Some of the authors of these chapters (Mason and Butler, for example) clearly are aware of such relations. Other authors attempt a biological interpretation *ex post facto* and thereby produce statements that are in some cases unfounded—"Indeed, the complex adaptive behavior of primates in the world outside the laboratory is usually controlled by intermittent reinforcement" (p. 240)—and in other cases incredibly naive statements are made—". . . What is the most complex type of discriminative behavior that can be developed in a given animal? . . . If [this] question could be answered for a number of species, the degree of complexity attained by a given animal would provide an objective behavioral measure of its phylogenetic status" (p. 240). Running rhesus and squirrel monkeys, marmosets, cats, rats, and squirrels on variations of the old Mississippi river gamblers' shell game (now known as WGTA, the Wisconsin General Testing Apparatus), and completely ignoring the gross adaptive differences among these species, simply will not tell us much about mammalian phylogeny (p. 262). Nor is such biological naivety restricted to laboratory workers. In the volume on field studies we find the following statement: "When the results of these field studies are available the present confusion of taxonomic relations of these very closely related forms should be settled . . ." (p. 198). Field research provides only a portion of the many lines of evidence that are required for sound analysis of primate systematics.

Learning, sensory discrimination, intermittent reinforcement, delayed responses, learning sets—all of these are undoubtedly vitally important to a primate in its native habitat. But most of the work that is presented on these topics is only remotely related to problems in the natural environment. Biological considerations cannot just be dragged in as an afterthought. Unless considerations of adaptation and evolution are part of the planning of laboratory research on behavior, the chances are remote that the results will have much relevance to problems that animals face in their natural environment.

Many of those who were trained for laboratory research in psychology are adroit experimenters; some of them are masters at experimental design, statistical tests, mathematical models, checks on observer reliability, and other aspects of scientific methodology that are the weak points of most field work. The field worker, in contrast, sees primate behavior in the context of adaptations to cope with the problems that these animals face in their natural environment, a perspective with which most laboratory workers are unfamiliar. These surveys of the literature present us with some of the best of both worlds. Let us hope that subsequent editions will reveal that each group has learned from the other—indeed, to such an extent that only a single, unified review will be necessary.

Radiological Physics

Röntgen- und Kernphysik für Mediziner und Biophysiker. Richard Glocker and Eckard Macherauch. Thieme, Stuttgart, Germany, ed. 2, 1965. xii + 520 pp. Illus. DM 69.

This book is the second edition of a volume by Glocker, which was published in 1949 under a slightly different title. The object of the book, as stated in the preface, is to present the physical concepts and laws of modern radiological physics needed by physicians, biophysicists, and radiation biologists who are active in radiological work. Judging from the breadth and depth of the material presented, the authors have achieved their objective admirably.

The present edition is divided into nine chapters. In the chapter entitled "Foundations of nuclear physics," the authors discuss nuclear reactions and reactors, and natural and artificial radioactivity. Particle accelerators, corpuscular radiation of charged particles, and neutrons (their production and interaction with matter) are included in the chapter "Production and characteristics of corpuscular radia-

tion." The chapter on radiation effects and radiation measurement contains sections on ionization, luminescence, photographic effects, discoloration and extinction, and photoconductivity. X-ray, fast-electron, and γ- and β-dosimetry are discussed in the chapter on dosimetry, together with dosimetry of internal isotopes and neutrons. The chapter on radiation protection includes a section on the rather standard health physics problems as well as a section on raising radiation resistance of biological systems by chemical means. Under diagnosis and therapy, there is a discussion of conventional x-ray therapy as well as therapy with ultrahard x-rays, electrons, and some heavy particles. There are also basic chapters on radiation and matter, and on the production and characteristics of x-rays. The final chapter treats the application of radioactive isotopes in medicine and biology, including radioactive indicators and isotope therapy.

It is interesting to note that this book discusses the concept of "ion dose" which is used in Germany, but not in many other countries. Several references are made to recent reports by the International Commission on Radiological Units and Measurements (ICRU), which do not include this concept. ("Ion dose" is defined in reports of the German standards committee on radiology.) The book includes a good but brief discussion of the similarities and differences between "ion dose" and "exposure" as defined by ICRU.

The book is well illustrated with pertinent photographic material. The numerous graphs and tables are intended to give a concept of the magnitudes of the physical quantities discussed, and they are likely to be valuable for the reader's own scientific work as well. A number of the concepts presented in the body of the book are amplified and, in some cases, derived in the 70-page appendix, which also contains supplementary formulas and sample calculations. In addition, there are seven pages of English-to-German translations of technical terms.

The bibliography, with 1000 references, is conveniently and usefully organized according to subjects. There is a subject as well as an author index.

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Feldafing Summer School

Circadian Clocks. Proceedings of the Feldafing Summer School, September 1964. Jürgen Aschoff, Ed. North-Holland, Amsterdam, 1965. xx + 479 pp. Illus. $15.

Looking for an expensive new conversation piece? If most of your colleagues are nonbiologists, then this volume, with its whimsical jacket motif of Disneyesque rodents meditating on an hour-glass and its stark title *Circadian Clocks*, is just the thing to brighten up your coffee table.

The initiated may also find some delights within, especially the thoughtful essays by Victor Bruce on the significance of mitotic rhythms *vis à vis* circadian rhythms, by Ludger Rensing on ontogenetic timing and circadian rhythms, by Felix Strumwasser on circadian rhythms in a single neuron, and by J. W. Hastings and Alex Kenyan on some molecular aspects of circadian systems.

One of the most valuable contributions is the short "circadian vocabulary" compiled by Aschoff, Klotter, and Wever; still it is somewhat surprising to find that such fundamental hardware as *clock, calendar*, and *escapement* are not in the list. About the remainder, one may say that the old war horses wrote dutiful papers, that for the most part they "belong" and are fit to be consulted here like so many miscellaneous entries in an unabridged collection. But because of this, the biologist who has grown accustomed to the novelty and the richness in the display of critical issues in the earlier Gatlinburg and Cold Spring Harbor volumes and who knows his Bünning (*The Physiological Clock*, 1964), with its singular verve and broad scholarship, will feel somewhat cheated. In view of the summer school's stated aim to stimulate students, one also asks where (apart from a few already cited) were all the bright Young Turks? Discussions after the papers would have been most helpful, else these papers could as well have been published in the open literature (and some in more expanded and advanced form have already been so published!). Time for a new journal?

The editor deserves credit for holding down the number of typographical errors of the sort that one expects in a work such as this in which French and German papers have been translated into English. More disturbing than the errors is the poor quality of the reproduction of graphs and figures—some are reduced in size to the point of illegibility. All things considered, especially the volume's high cost and its small quantity of new information, the heuristic intent of the Feldafing Summer School might have been better accomplished had its faculty invited an editor who is familiar with popular science writing to sit in—perhaps someone from the *Scientific American* or the *Life Science Library* series. At this stage of the game, we should all have profited from such a volume, professionals, old prophets, and proselytes alike.

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Mathematics

Functional Analysis. Albert Wilansky. Blaisdell (Ginn), New York, 1964. xviii + 291 pp. Illus. $9.50.

Functional analysis, which entered adolescence with the publication of F. Riesz's classic book in 1913 and began adulthood with the appearances of Banach's treatise (1931 and 1932), is now in a portly and fatherly, but still active and occasionally nimble, middle age. In this setting Wilansky's book may be regarded as a careful and expertly organized primer designed to instruct the grandchildren, newcomers to the family, and interested visitors in elements of the household's organization and accomplishments. "Primer" is not pejorative here; this text is an excellent introduction, with its only prerequisite a modest amount of advanced calculus and its intention that of serving seniors and beginning graduate students.

The first eight chapters, totaling 135 pages and ending with Banach and Hilbert spaces, deal only with linear spaces having metric topologies; they form an excellent introduction to such spaces for anyone who does not wish to tackle Bourbaki, or Dunford and Schwartz, or Kelley and Namioka. The remaining six chapters are less classical; they begin with nets and end with local convexity, duality, and Banach algebras. The "three fundamental principles of functional analysis"—Hahn-Banach, uniform boundedness, and the closed graph theorem—occur on pages