triumphs of neurophysiology since Sherrington and instead will leave it to the interested reader to explore them from this biography.

What makes genius will continue to haunt us. Sherrington's accomplishments were evident early in life and were sustained throughout decades of scientific achievement. Philosophical and historical writings occupied much of his later—but not declining—years in matters of mind. Granit's warm and sensitive biography of a great scientist and great man should prove rewarding to anyone fascinated by the history and progress of neurophysiology.

T. C. RUCH
Regional Primate Research Center and *Department of Physiology and Biophysics, University of Washington, Seattle 98105*

Hydrozoans

The Cell Biology of Hydra. THOMAS L. LENTZ. North-Holland, Amsterdam; Interscience (Wiley), New York, 1967. 211 pp., illus. $12.95.

This book will be welcomed by readers looking for a thoughtful and stimulating discussion of hydra. There is sufficient coverage of the general biology of hydra (including notes on its discovery and subsequent cultivation) to ease even the nonspecialist into the quite detailed presentation. About half the book deals with the structure, ultrastructure, and histochemical composition of hydra. This anatomical picture is then correlated with their physiology and development, particularly as related to cell permeability, the control of nematocyst discharge, and the influence of the nervous system on regeneration. Lentz's theme is that we must narrow the gap between form and function at the cellular and subcellular level.

Hydra specialists will be most grateful for the chapters on the nervous system, which provide the most comprehensive available discussion of this lively subject. Three types of nerve cells (ganglion, sensory, and neurosecretory) are catalogued, although there is an unfortunate lack of light-microscopic characterization. Also discussed are many biochemical and physiological characteristics attributed to the nervous system.

The Cell Biology of Hydra is not a critical review of any general or particular aspect of hydra, and it goes well beyond the cell in scope. As a review it is rather saltatory in treatment and has undue emphasis on Lentz's own work (although good literature references are included at the beginning of each chapter). As a research monograph (as the author terms it) it lacks precision in statement, especially in the presentation of experimental data (one is not even told with which species [pl.?] the book deals, and many statements are not applicable to all hydras). Also, observations are treated in a very speculative fashion. This volume might be best described as a record of Lentz's experiments with, observations on, and thoughts about hydra. As such it imparts a sense of direction and excitement to current research on hydra and covers in depth a wide spectrum of topics.

This book is generally attractive, although I did find the abundant illustrations to be disappointingly poor and errors in the text annoying. Nevertheless, many diverse types of readers will find this a modern and informing discussion.

RICHARD D. CAMPBELL
Department of Organismic Biology, University of California, Irvine

Magnetic Processes

Hyperfine Interactions. ARTHUR J. FREEMAN and RICHARD R. FRANKEL, Eds. Academic Press, New York, 1967. 774 pp., illus. $16.

The hyperfine interaction, or magnetic interaction of the electrons in ions, atoms, and molecules with the magnetism of the internal or neighboring nuclei, is weak and plays no significant role in basic structural perturbation compared with the more important spin-orbit or exchange interactions. Nevertheless, and perhaps even because of this, the hyperfine interaction is an important indirect tool for the determination of structure and in influencing magnetic processes. It is probably only a slight exaggeration to say that there are more physicists and physical chemists whose research interests have some important specialized contact with the hyperfine interaction than with any other single interaction per se. Nuclear physicists and others concerned with nuclear magnetism, and most optical and radio-frequency spectroscopists, find many effects and complications arising from this interaction. Whether it is more effective to deal with the subject inclusively, as is done in this book, or to introduce it in review books devoted to particular fields of research in which it plays a role depends on the sophistication of the reader.

Starting with a general introduction, by B. Bleaney, to the hyperfine interaction and its role in paramagnetic resonance, this collection of papers continues with a discussion of the Hartree-Fock determination of electron density at the nucleus, methods of calculating the interaction, and general articles on the most important methods of studying the interaction—namely, atomic-beam resonance, high-resolution optical spectroscopy, and paramagnetic-resonance techniques. The remainder of the articles are rather unique discussions of special topics in which the hyperfine interaction plays a role. There are papers on nuclear and paramagnetic resonance in metals and magnetic solids, nuclear relaxation and polarization phenomenon, effects involving the conduction electrons in metals, nuclear specific heats, Mössbauer absorption, angular-correlation experiments, low-temperature orientation, rotational cooling, and additional topics in nuclear resonance. Of these special articles, several on perturbed angular correlation and Coulomb-excited Mössbauer effects seemed to this reviewer to be unique and difficult otherwise to find in the review literature.

With an often uneasy blend of textbook style and concise, review-article style, this is clearly a reference book for specialists and research students. It is probable that the most interested readers will appreciate the book for individual contributions, and in this respect the editors are to be thanked for selecting predominantly young and currently active contributors. If an attempt to find weak points were really to be called for, it could include the comments that some of the subjects have been more completely, informatively, and naturally covered in well-known textbooks concerned with atomic and molecular beams, nuclear magnetism, or paramagnetic-resonance spectroscopy, and that the bibliography in many articles is rather restricted. A collection with this title might well have included a discussion of the role the hyperfine interaction plays in experiments for the precision determination of physical constants such as the g factor of the electron, the Lambe shift, and the fine-structure constant, or the

measurement of time with atomic frequency standards. This particular reviewer finds astonishing the omission of the subject of optical double resonance and pumping and its relation to the measurement, at least, of excited-state and ion hyperfine measurements, even though there is included a brief description of level-crossing spectroscopy. Thus, in summary, it is probably correct to say that the more general articles are rather thin and brief and that the real value of the book is in the specialized contributions.

THOMAS R. CARVER
Palmer Physical Laboratory,
Princeton University,
Princeton, New Jersey

Environmental Analysis

Light as an Ecological Factor. British Ecological Society Symposium No. 6, Cambridge, March–April 1965. RICHARD BAINBRIDGE, G. CLIFFORD EVANS, and OLIVER RACKHAM, Eds. Wiley, New York, 1967. 464 pp., illus. $13.50.

This symposium reflects the increasing interest of ecologists in quantitative measurement of environmental components while at the same time they are increasingly bringing the principles of systems analysis to bear on the study of environment as a whole. Obviously the demand for informational synthesis, along with increasingly better instrumentation, is providing unusual opportunities for analysis of the aquatic, terrestrial, and space environments. Although the representation of subjects in the individual papers of the symposium is partly fortuitous, most of the topics considered are presented in remarkable breadth and depth. The treatment of the topics is, of course, uneven. The papers are substantially enhanced by the inclusion of selected aspects of the discussions which followed their presentation at the symposium.

As the editors point out in their introduction, the symposium centered its attention successively upon (i) the light climate, broadly considered; (ii) micrometeorology and methods of light measurement and characterization in the open; (iii) problems of measurement and instrumentation; (iv) the light climate in forest communities; (v) light in the sea and rivers, including effects on pigmentation, growth and movement of organisms, penetration, scattering, and contrast perception, ocular sensitivity, and submarine visibility.

An excellent background paper on general principles of radiation meteorology by Collingbourne introduces the volume. Collingbourne calls attention to the growing availability to ecologists of good radiation data from national networks. Where field measurements of light are to be made, workers are urged to use instruments that can be calibrated against acceptable standards. The recommendation is soundly made that, where appropriate, photometric measurements be replaced by radiometric ones in which filters are used to isolate desired regions of the spectrum.

Light measurement and characterization in plant communities and in water occupy about 80 pages. About 140 pages are devoted to light and plant growth and condition, including diseases. The next 10 pages present an examination of the role of light in echinoid coloration, movement, reproduction, covering reaction, and dermal photosensitivity. Light influences on zonation in periwinkles and marine algae are given about 40 pages, and light-induced behavioral and cytological changes in a diatom about 20. Underwater visibility, vision, and visual feeding (of herring) are treated in about 50 pages. The last dozen pages of text report on demonstrations—of data-logging equipment, turgidity of plants in open and shaded habitats, solarimeters, herring larvae, bimetallic actinograph, hemispherical photography, light climate surveying apparatus, radiation recorder, and thermopiles for measuring field surface temperatures.

Most students of light in ecosystems and in plant and animal physiology and behavior will find information or references of use in this volume; it is equally true that they will conclude that much of what is being studied or is known on the subject is not included. Publication of this volume is particularly timely because of the concern of the International Biological Programme with the measurement of organic production in the terrestrial and aquatic spheres.

KARL F. LAGLER
School of Natural Resources,
University of Michigan, Ann Arbor

Social Research for Social Practice

Methods for Experimental Social Innovation. GEORGE W. FAIRWEATHER. Wiley, New York, 1967. 262 pp., illus. $7.95.

In the 1960's social scientists have been moving into the arena of social action in greater and greater numbers, and as they move they are beginning to define and develop a new field which could be called "social engineering." Fairweather is a part of this movement. He believes that the social scientists can and should foster social progress by designing and evaluating new solutions to major social problems in carefully controlled field experiments.

This book has two primary objectives: the first is to present an argument for this special approach to social engineering, which Fairweather calls the "social innovative experiment," and the second is to offer a methodology or how-to-do-it manual for those who would accept this argument and follow his path. It would seem to this reviewer that the author succeeds better with the first than with the second objective.

Fairweather thinks that the social scientist should work with the practitioner to define significant social problems and a range of possible solutions, together with appropriate and consensually established criteria for outcome that are "acceptable and meaningful for those who are acquainted with the problem." Beyond this, however, compromise with the practitioner's needs and values is strictly out of order. The researcher should exercise strict control over the experiment, following such traditional canons of methodology as random assignment of subjects to experimental and control conditions, control on all potentially confounding variables, and stringently conservative interpretation of results (". . . a .001 level one-tailed test should be established as the acceptable level for recommending changes"). Although this scientific tough-mindedness might be useful as an antidote to the looseness and vagueness of much that passes as social action research, it is probably unrealistic and even inappropriate in many settings. Action research is necessarily a collaborative activity between research and practice to an extent which severely restricts the application of traditional research methodology.

As a methods handbook the would-be social-innovation experimenter will probably find this work inadequate.