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.