The book is important not only because it reviews and explicates Machian theories, experiments, and doctrines. It also gives an evaluative account of the life of this giant of science and philosophy. Most importantly, it traces in their Machian background some roots of important segments of modern science and shows how they developed in line with one man's need not only to know but to know consistently within an embracing context. Ratliff has written an unusual and valuable book.

CLARENCE H. GRAHAM
Department of Psychology, Columbia University

Biomedical Engineering

Biomedical Electronics. Howard M. Yanof. Davis, Philadelphia, 1965. xii + 361 pp. Illus. $12.50.

With the growth of biomedical engineering, numerous attempts have been made to write electronic engineering textbooks for biologists and physicians [Brown's *Instrumentation with Semiconductors for Medical Researchers* (Thomas, 1964); Donaldson's *Electronic Apparatus for Biological Research* (Butterworth, 1958); and Whitfield's *An Introduction to Electronics for Physiological Workers* (Macmillan, ed. 2, 1960)]. The present text, *Biomedical Electronics*, tries to provide a textbook for biologists and physicians and also to educate engineers regarding problems and instrumentation in biomedicine. Its outstanding merit is the comprehensiveness of its survey of instruments and techniques, which is supplemented by a great number of excellent photographs and line drawings. It will be a very valuable source book of information about commercially available electronic instruments and systems.

The book, however, has serious inadequacies with regard to its primary purpose—that of training biologists and physicians in electronics. In this respect, it does not differ greatly from most of the other texts in this field, for none of the authors seem to appreciate fully the magnitude of the task they are undertaking. Yanof devotes seven chapters (159 pp.) to this end. He covers the appropriate topics in chapters entitled "Basic physical concepts," "Introduction to ac circuit theory," "The measurement of voltage and current," "The rectifier and the diode," "Amplification," "The oscillator," and "The power supply." The second section, comprising about six chapters (158 pp.), covers biomedical instruments, transducers, signal display and recording, noise and its elimination, and examples of biomedical instrumentation. The first section covers the material in the same fashion that a jet plane covers a terrain from 40,000 feet. If the reader is already familiar with the subject, he will recognize familiar concepts. It seems unbelievable that a novice could obtain any firm understanding of electronics from this treatment. In my experience, to educate a biology student in electronics requires four or five classroom and laboratory hours per week for several semesters of work. In order to succeed with this program, the student must be adequately prepared in general physics and mathematics including a working knowledge of the calculus. Most texts in this field, including the present volume, try to teach elementary calculus. I consider this an exercise in futility.

The second section will serve as a useful survey of current instrumentation for engineers who are trained in physiology. Biologists will not be able to appreciate fully the discussion of instrumentation problems if their training is limited to the presentation of electronics given in the first part of this book. To add to the students' problems, the text in both sections is marred by careless mistakes—for example, formulas 2.42 and 2.43 and the formula for source noise on page 308.

ROBERT L. SCHOENFELD
Rockefeller Institute, New York

Fundamentals of Botany Series

Vascular Plants: Form and Function. Frank B. Salisbury and Robert V. Parke. Wadsworth, Belmont, Calif., 1964. viii + 184 pp. Illus. $2.35.

This volume is one of a series of seven paperback volumes edited by W. A. Jensen and L. G. Kavalijian; the other volumes are *The Plant Cell* by Jensen; *Reproduction, Heredity, and Sexuality* by S. A. Cook; *Nonvascular Plants: Form and Function* by W. T. Doyle; *Plants and the Ecosystem* by W. D. Billup; *Evolution and Plants of the Past* by H. C. Banks; and *Plants and Civilization* by Herbert G. Baker.

In a volume of only 184 pages some areas of interest must be omitted. The authors wisely left out discussions of photosynthesis and respiration. They have included chapters on growth, hormones, transpiration, translocation, photobiology, biological time measurements, the physiology of flowering, and the physiology of germination.

Unfortunately some important recent work has been omitted. In the discussion of plant growth the elegant work of Erickson and others on root growth is not mentioned, nor is the concept of the Plastichron index as a new and important measure of plant growth.

No indication about the authors' intended audience is given in the foreword; presumably it is a student audience. If so, there is a serious lack of reference information; a general bibliography is included, but there are no specific citations in the text. For example, the important term *vapor pressure deficit* is mentioned parenthetically in the text. A specific reference to one of the standard works would be helpful to the reader who is puzzled about the relationship between vapor pressure deficit and transpiration.

Those parts of the book that deal with plant taxonomy and morphology are basically sound and well presented.

The first chapter includes comments on the nature and methods of classification and provides a system of classification in keeping with present-day knowledge. Some readers, however, may be startled to find the bryophytes and vascular plants included along with the green algae in the Division Chlorophyta, which is given equal rank with such units as the Euglenophyta, Cyanophyta, and Rhodophyta. In this chapter, the major groups of vascular plants are described in capsule form, a presentation that is remarkably successful despite its brevity.

Errors, such as incorrect use of the word "isodiametric" in connection with cork cambium and ray cells, are few.

As the information about plant science becomes more extensive and, at the same time, more specialized, books such as this have a place in the literature along with the research paper, the