Biophysical Research Methods. Fred M. Uber, Ed. New York-London: Interscience, 1950. 667 pp. $9.50.

In the seventeenth century theoretical medicine developed along two pathways, the iatromathematical, and the iatrochemical, the former school regarding physiological processes as consequences of the laws of physics, the latter assigning chemical explanations to vital phenomena. Although not your *Compleat Iatromathematician,* the present publication, comprising contributions from a diversity of laboratories, both here and abroad, effectively covers modern basic areas of operation:

Avoid Fruitless Experiments, F. M. Uber; Osmotic Pressure Measurements, D. R. Briggs; Centrifugation, E. G. Pickels; Viscosity Measurements, L. V. Heilbrunn; Temperature Determinations, L. R. Prouty and J. D. Hardy; Calorimetric Measurements, M. Kleiber; Quick-Freezing and the Freezing-Drying Process, E. W. Flosdorf; Bioelectric Measurements, H. J. Curtis; Electrophoresis, D. R. Briggs; Ultrasonic Vibrations, E. C. Gregg, Jr.; When to Use Special Microscopes, O. W. Richards; Electron Microscopy, J. Hillier; Action Spectra and Absorption Spectra, H. F. Blum; X-Rays and X-Irradiation, J. W. Gowen; Electrons, Neutrons, and Alpha Particles, L. H. Gray; Stable Isotopes as Tracers, F. M. Uber; and Radioactive Tracers, A. F. Voigt.

In general there is a combination of theoretical and practical considerations of some of the most useful techniques of modern biophysics. Much of the information is standard and readily available in existing texts, whereas other portions deal with relatively recent developments, e.g., thermistors. The book represents a convenient grouping of a number of methods for a brief but comprehensive survey, with about 31 percent of the volume devoted to x-rays, nuclear physics, and isotopes. There is a subject but not an author index, and each chapter gives adequate references to earlier literature, in many cases arranged under distinctive headings.

A refreshing down-to-earth initial chapter by the editor, on "How to Avoid Fruitless Experiments," is enlivened by several homey cartoons. These considerations are of general value not only in biophysics, but in any science. Expanded into a formal course of lectures, they would be useful to the graduate student embarking on his career. The chapter could well have been amplified into a survey of the techniques of recording observations, indexing notebooks, making calculations, plotting results, checking one's work, and efficiently presenting data in tabular form.

Brief statements or tables of typical values for biological fluids or living cells would have been enlightening in certain instances, but the reader can remedy some of these omissions by reference to *Tabulae Biologicae.* The chapter on centrifugation devotes itself exhaustively to the use of centrifuges for determination of sedimentation constants of materials in solution. No reference is made to such applications as determinations of surface forces of, and interfacial tensions within, living cells or separation of groups of cells from heterogeneous mixtures. The evaluation of the ingenious centrifuge microscope in chapter 4 strikes this reviewer as captious, in view of the results obtained with it and recorded in the literature. Moreover, the facile generalization (p. 128) "that the correlations between protoplasmic activity and viscosity appear to be much more satisfactory than any correlations between such activity and respiration" is at least debatable. Likewise, to state (p. 108) that "the only plausible theory of stimulation and response is a colloidal theory that involves the assumption of marked viscosity changes within the protoplasm" is to ignore the work of numerous observers in the field of nerve and muscle activity.

L. R. Prouty and J. D. Hardy ably cover the techniques of temperature measurement. The section on "Theory of the Master Reaction" contains some misconceptions of Crozier's views. "Sharing" of control of frequencies (e.g., heart beat) by several processes with different μ's is impossible—in that event, Arrhenius plots concave upward would necessarily be common. Only three have been found, and their mechanism is understood; μ sometimes changes in the range of free reversibility but not always. Crozier did not conceive of simple successive reactions as determining apparent abrupt change of μ. It was early pointed out that these abrupt changes, when they occur, cluster at particular critical temperatures, and that this denotes physical change in the reaction matrix.

The chapter on bioelectric measurements, by H. J. Curtis, fills a real need. In the material on ultrasonics, it would have been more helpful to point out the practical biological significance of the theoretical considerations of ultrasound; for example, reflection coefficients are concisely covered, but nothing is said about cellular or tissue morphology where this might appear. In Chapter 12, before dealing with technical aspects, the author considers the economic and personnel factors involved in the acquisition and operation of an expensive and space-consuming instrument like the electron microscope. Another chapter discusses the factors involved in setting up a radiochemical laboratory.

There is no separate treatment of the basic problem of cell permeability, nor an introduction to methods of mathematical biophysics. A special chapter might well have been devoted to the cathode-ray oscilloscope, one of the most versatile tools in the biophysical laboratory.

The volume should prove useful for the worker who, in seeking the solution to his problem, wishes to survey the potentialities of different biophysical techniques.

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