Yet the latest edition of Webster's Dictionary persists in making Joule rhyme with jowl, and the Standard Dictionary gives the preference to this pronunciation.

In time, I presume, the editors of those two dictionaries will concede that Joule knew how to pronounce his own name.

JOSEPH O. THOMPSON
AMHERST COLLEGE

SCIENTIFIC BOOKS

BIOPHYSICS

An Introduction to Biophysics. By OTTO STUHLMAN, JR. 375 pp. 155 figures. New York: John Wiley and Sons, Inc. $4.00.

THIS book on biophysics was written to serve the needs of students in biology who have had one year of college mathematics and one year of college physics. The treatment of the subjects is sufficiently clear and restricted so that a student with the above preparation should have little difficulty in reading the book. The author has exercised admirable restraint in terminating his treatment of a subject before reaching the more complex aspects and has avoided the excessively descriptive treatment characteristic of biological subjects. The treatment of subjects ranges from mere descriptions of applications of physical instruments to attempted interpretations of biological processes in terms of the principles of molecular physics.

One objective in writing such a book should be to reveal the scope of biophysical investigation. This the book does well, since the chapters include discussions of cell membranes and surfaces, of properties of nerves and the special sense organs, of the action and use of various radiations and radioactive materials, and, finally, a description of the principles and uses of the compound microscope and the electron microscope. This array of subjects, though not exhaustive, serves well to illustrate the application of physical principles, methods and instruments in the solution of biological problems.

A second objective, of great importance in a first course in any science, should be to reveal or formulate a logical structure of the subject-matter. In a textbook this can be achieved not only by choice of material but by the order of presentation of this material. From this viewpoint the book is deficient because the arrangement of chapters is dictated largely by the divisions of classical physics rather than by the systematic development of a science of biophysics. Thus the first four chapters deal with some aspect of radiation in relation to organisms. Chapter one is about x-rays, chapter two deals with radioactivity, chapter three with the properties of the eye, and chapter four discusses the emission and absorption of light by biological materials. The field of chemical or molecular physics is represented to some extent by chapter five on the properties of surfaces and membranes. Chapter six is primarily about the electrical properties of nerve; sound and auditory mechanisms are taken up in chapter seven. The last chapter is a discussion of the properties and use of the compound microscope and the electron microscope. Thus are represented most of the usual divisions of physics: radiation, molecular physics, electricity and sound.

This text structure is an unfortunate one, since it has no logical order which defines the field of biophysics as a unique scientific approach to the interpretation of living processes.

However, the order of presentation of material can be rearranged, since understanding of the content of any one chapter of the book does not depend in any important way upon that of other chapters. Therefore, this book could be used to advantage even in a course organized for the purpose of giving the student an impression of a logical science based on the principles of biology and physics. In such a course the chapters dealing primarily with physical instruments and methods could be brought in as a group representing the methodology of biophysics. The limited material directly relating to cells and organisms in chapters one, two and four could be discussed in relation to cellular mechanisms rather than physical methodology. The latter is extremely important to the subject and should never be omitted. It should not, however, define the organization of material contained in a course in biophysics.

Although it may be questioned whether this book adequately represents the scope of biophysics as a distinct science, it will be a very useful adjunct to a course in physics designed for students in pre-medical and biological fields.

FRANK BRINK

POTASH

Potash in North America. By J. W. TURRENTINE. 6×9 in. 186 pp. Illustrated. New York: Reinhold Publishing Corporation. 1943. $3.50.

ABOUT sixty years have passed since potash fertilizers in this country were first prepared from inorganic sources. During the first half of this period the entire supply was imported from Germany. The disadvantages of dependence on a foreign source for such an essential commodity was repeatedly stressed, and the demand for a domestic source of supply increased with increase in consumption of potash in fertilizers. With a view to meeting this demand, Con-

gress in 1911 made a specific appropriation for the Bureau of Soils, U. S. Department of Agriculture, for "exploration and investigation within the United States to determine a possible source of supply of potash, nitrates and other natural fertilizers." At the same session in 1911, the Geological Survey was authorized to make exploratory borings to determine the possible existence of potash deposits within the United States. In 1916 another item was added in the appropriation act for the "investigation and demonstration within the United States to determine the best method of obtaining potash on a commercial scale."

The book under review is the second of a series of two books by the same author describing the research, exploration and development work on potash that followed the enactment of these appropriation acts. The first of these two books entitled "Potash: A Review, Estimate and Forecast," covers the period 1911 to 1926. The second of the series begins where the first left off and covers the fifteen-year period following 1926. The first chapter reviews the progress that has been made in the production of potash during this period in various countries of the world as well as in the United States. It reviews also the purposes and activities of the American Potash Institute, which was organized in 1935. The second chapter outlines the uses of potash in agriculture and in the chemical industries and gives statistical data on American and World Trade in potash salts between 1926 and 1941. In the third chapter detailed information is given on the technology of potash production at Searles Lake and in the New Mexico field.

This book is one of the American Chemical Society Series of Scientific and Technologic Monographs and it is in keeping in every respect with the high standards set by the society for this series of publications. The author is recognized as having taken a leading part in all research and development work on potash since this was first undertaken in 1911. The present book, as with the first of the series, can, therefore, be recommended without reservation to those who are interested in securing the most authoritative information available on the history and development of the American potash industry.

WILLIAM H. ROSS
DIVISION OF SOIL AND FERTILIZER INVESTIGATIONS,
U. S. DEPARTMENT OF AGRICULTURE,
BELTSVILLE, MD.

SPECIAL ARTICLES

THE DISINTEGRATION OF MACROMOLECULAR TISSUE LIPOPROTEINS[1]

THE thromboplastic protein (inducing the formation of thrombin) isolated by the ultracentrifugal fractionation,[2] or, in considerably less pure form, by the fractional salt precipitation[3] of beef lung extracts is a macromolecular lipoprotein. As has been described previously,[2] preparations may be obtained under proper conditions that exhibit homogeneity of sedimentation and electrophoretic mobility, have the extremely high particle weight of 170 million (from rate of sedimentation), and appear in electron micrographs as spheres with a diameter of 80 to 120 mμ. Apart from their extremely high thromboplastic potency (as little as 0.008γ being demonstrable by clotting tests), these preparations were distinguished by a marked phosphatase activity.

The thromboplastic protein of beef lungs resembles in certain outward respects, *e.g.*, its analytical composition and content of acetal phosphatides, the submicroscopic particles isolated from a number of tissues.[4] As is true of most natural lipoproteins,[5] the lipids forming part of the thromboplastic protein[3, 6] are held vigorously and can be removed only by exhaustive extraction with alcohol-ether which renders the protein moiety insoluble and inactive.

It was recently shown by McFarlane[7] that a large proportion of the serum lipids, ordinarily not extractable with ether, may be transferred into the ether phase, when ether-containing serum is frozen below $-25°$ and allowed to thaw. The application of a similar technique to the thromboplastic protein and other lipoproteins gave interesting results.

In a typical experiment, summarized in Table 1, a solution of 330 mg of the thromboplastic protein in 15 cc of borate buffer of pH 8.5 was mixed with 10 cc of ether (free of peroxides and alcohol), kept for 4 minutes at $-30°$, and permitted to thaw. This operation was, after replacement of the ether layer by fresh solvent, repeated six times. From the aqueous phase, freed of the remaining ether by careful evacuation, a large proportion of the protein could be isolated by centrifugation at a low speed as Fraction A which exhibited somewhat higher thromboplastic and phosphatase activities than the original material. A small amount of practically unaltered thromboplastic

[1] This work has been supported by a grant from the John and Mary R. Markle Foundation.

[2] E. Chargaff, D. H. Moore and A. Bendich, *Jour. Biol. Chem.*, 145: 593, 1942.

[3] S. S. Cohen and E. Chargaff, *Jour. Biol. Chem.*, 136: 243, 1940.

[4] A. Claude, SCIENCE, 97: 451, 1943.

[5] E. Chargaff, "Advances in Protein Chemistry," vol. 1, 1944 (in press).

[6] S. S. Cohen and E. Chargaff, *Jour. Biol. Chem.*, 139: 741, 1941.

[7] A. S. McFarlane, *Nature*, 149: 439, 1942.