

creased agricultural production. In searching for impediments to increased agricultural production, Schultz examines and rejects land and capital shortages, limitations resulting from farm size, and allocative efficiency and omits consideration of structures and infrastructures. He concludes that the major impediment is the low rate of return on investment which provides little or no incentive to acquire credit or increase savings.

Turning to United States aid programs in less-developed countries, Schultz states that such programs should be founded on the knowledge, availability, acceptance, and use of new agricultural inputs with relatively high payoff as inducements to improve agricultural production. He reiterates the role and importance of investment in labor.

Within modern agriculture, particularly in the United States, Schultz emphasizes the need for providing farm

people with the knowledge and means for adjusting themselves and their resources to changing economic conditions emanating from within and outside the agricultural sector. But he finds that the political influence of the Southern Tradition, conflicting views among farm people, confused ideas of their leaders, and vested interests in production-price programs are walls that block progress—but walls which he forecasts will come tumbling down.

The book is provocative and stimulating. However, its reasoning rests heavily on an implicit faith in price-income incentives which alone are not likely to bring the sought-after large increases in agricultural production in less-developed countries. The agricultural problems and their possible solutions at home and abroad are much more complex.

JOHN F. TIMMONS

*Department of Economics,
Iowa State University, Ames*

Monographs in Experimental Botany Series

Introduction to Thermodynamics. D. C. Spanner. Academic Press, New York, 1964. xii + 278 pp. Illus. \$7.50.

The book under review, *Introduction to Thermodynamics*, is the first of a series of monographs in experimental botany. As Spanner states in his preface it is intended as a textbook on thermodynamics for those who are interested in any biological field, even though there is some bias in the book toward botanical problems. Most students in the biological sciences acquire whatever understanding they have of thermodynamics during their study of chemistry. That contact with the subject usually leaves the impression that thermodynamics is a subtle, magical discipline that is invoked to explain phenomena which cannot be described in a more immediate physical context. It is to the alleviation of this unfortunate situation that the author has devoted this book.

I believe that he has in large measure accomplished the task that he set for himself. The book is sound scientifically and didactically and should provide a good basis for classroom teaching; it should also be useful to the mature research worker who wishes to study on his own.

In content the book is divided somewhat naturally into two main parts. The

first part, comprising the first ten chapters, constitutes a rather abbreviated presentation of the basic principles of thermodynamics, a presentation much like that used in the standard undergraduate course in a physical science curriculum. Brevity is the principal characteristic that distinguishes this treatment from others in the textbook literature. The reader whose interest lies principally in the biological application of the subject and whose general background in thermodynamics is adequate might reasonably begin his study with chapter 11, a procedure made practical by the inclusion of a list of symbols and their denotations.

The second part of the book is concerned with the application of thermodynamic reasoning to biological problems. As one might expect, a major portion is devoted to the subjects of membrane equilibria, properties of electrolytes, and water relations. The strength of the author's treatment resides in his insistent use of the chemical potential in an explicit manner. The remainder of the book is concerned with photosynthesis, thermodynamic efficiency, and irreversible processes.

EDWARD W. HART

*General Electric Research Laboratory,
Schenectady, New York*

New Books

Biological and Medical Sciences

Advances in Clinical Chemistry. vol. 7. Harry Sobotka and C. P. Stewart, Eds. Academic Press, New York, 1964. 536 pp. Illus. \$16.50. Six papers: "Principles and applications of atomic absorption spectroscopy" by Alfred Zettner; "Aspects of disorders of the kynurenine pathway of tryptophan metabolism in man" by Luigi Musajo and Carlo A. Benassi; "The clinical biochemistry of the muscular dystrophies" by W. H. S. Thomson; "Mucopolysaccharides in disease" by J. S. Brimacombe and M. Stacey; "Proteins, mucosubstances, and biologically active components of gastric secretion" by George B. Jerzy Glass; and "Fractionation of macromolecular components of human gastric juice by electrophoresis, chromatography, and other physicochemical methods" by George B. Jerzy Glass.

Advances in Ecological Research. vol. 2. J. B. Cragg, Ed. Academic Press, New York, 1964. 276 pp. Illus. \$9.50. Four papers: "Analysis of processes involved in the natural control of insects" by M. E. Solomon; "The use of statistics in phytosociology" by J. M. Lambert and M. B. Dale; "Litter production in forests of the world" by J. Roger Bray and Eville Gorham; and "Forty years of genecology" by J. Heslop-Harrison.

Advances in Genetics. vol. 12. E. W. Caspari and J. M. Thoday, Eds. Academic Press, New York, 1964. 398 pp. Illus. \$14. Four papers: "The biological coding problem" by Frank Lanni; "Differentiation in monolayer tissue culture cells" by Eric H. Davidson; "The biological composition of a taxonomic species in *Gilia*" by Verne Grant; and "Cytoplasmic inheritance in the genus *Streptocarpus*" by Friedrich Oehlkers.

Advances in Gerontological Research. vol. 1. Bernard L. Strehler, Ed. Academic Press, New York, 1964. 422 pp. Illus. \$13.50. Ten papers: "Histophysiology of the aging nervous system" by William Bondareff; "Proteins in development and senescence" by Simion Oeriu; "Changes in the nucleus with advancing age of the organism" by Warren Andrew; "Similarities and contrasts between radiation and time pathology" by George W. Casarett; "Cross-linkage and aging" by F. Marott Sinex; "The nucleic acids in development and aging" by Zh. A. Medvedev; "Genetic factors associated with aging" by Arnold M. Clark; "Isolated lipofuscin granules—a survey of a new field" by Sören Björkerud; "Autoimmunity in aging" by Herman T. Blumenthal and Aline W. Berns; and "On the histochemistry and ultrastructure of age pigment" by Bernard L. Strehler.

Advances in Immunology. vol. 4. F. J. Dixon, Jr., and J. H. Humphrey, Eds. Academic Press, New York, 1964. 488 pp. Illus. \$15. Seven papers: "Ontogeny and phylogeny of adaptive immunity" by Robert A. Good and Ben W. Papermaster; "Cellular reactions in infection" by Emanuel Suter and Hansruedy Ramseier; "Ultrastructure of immunologic processes" by Joseph D. Feldman; "Cell wall antigens" (Continued on page 1140)