Book Reviews

Information Theory in Biology. Henry Quastler, Ed. Univ. of Illinois Press, Urbana, 1953. 273 pp. Illus. Paper, $4.

One of the oldest dichotomies in biology is represented by the opposition of mechanists to teleologists. As Temkin has shown there is a deep philosophical difference between the classical German mechanistic physiology and the "vitalistic materialism" of the French school. It now seems possible that a mechanistic approach to the problems of adaptive behavior can come from information theory, and bridge the gap once and for all. The publication of *Information Theory in Biology* may very well represent a landmark for that reason alone.

The book is also welcome because it makes available in one place a number of attempts to apply information theory to, for example, protein structure, protein synthesis, genes, immunochemistry, the information content of zygotes and bacterial cells, and the control of the blood sugar level. In spite of a section on the definition and measurement of information, this work does not present an elementary introduction to information theory for the uninitiate, but is rather a series of short research papers. Outside of this lack of a systematic simplified introduction to information theory as such (if that is possible!) the book is extremely valuable. As a physiologist, I hope sometime to see a similar work largely devoted to an analysis of complex homeostatic mechanisms.

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Nobel Prize Winners in Medicine and Physiology: 1901–1950. Lloyd G. Stevenson. Schuman, New York, 1953. ix + 291 pp. Plates. $6.50.

This is one of three volumes covering the several fields of scientific work in which Nobel prizes are awarded. Over the half-century awards were made in 41 years, to 59 laureates. Brief biographical sketches are followed by descriptions of the prize-winning work, in the form of quotations, usually excerpts from the Nobel lectures delivered in Stockholm at the time of the presentation of the prizes. The author then comments upon the significance of the discoveries in theory and practice. The book offers an interesting and useful summary of outstanding work in medicine and physiology over these years.

It would be folly indeed to attempt to discuss or appraise the notable contributions made by the prize-winners. They have received the highest honor that our society can give for distinguished work and require no further commendation. It may, however, be of some interest to note certain trends in the making of the awards. In 12 years they were made in the fields of bacteriology and parasitology (Von Behring, Ross, Finsen, Koch, Laveran, Metchnicoff, Ehrlich, Bordet, Fibiger, Nicolle, Domagk, Fleming, Chain, Florey, Müller). Ten times they were made to investigators of the nervous system, central or peripheral (Pavlov, Golgi, Cajal, Gullstrand, Bárány, Wagner-Jauregg, Sherrington, Adrian, Dale, Loewi, Heymans, Erlanger, Gasser, Hess, Moniz). Fundamental discoveries in biophysics and biochemistry were honored in five years (Kossel, Hill, Meyerhof, Einthoven, Warburg, and Cori and Cori). The biochemical emphasis was extended by four awards to students of endocrinology (Kocher, Banting, Macleod, Houssay, Kendall, Hench, Reichstein) and by four others in the field of vitamins and dietary deficiencies (Eijkman, Hopkins, Whipple, Minot, Murphy, Szent-Györgyi, Dam, Doisy). In embryology and genetics appear three names (Spemann, Morgan, Muller). Four others worked on the blood or blood-vascular system (Richet, Carrel, Krogh, Landsteiner).

In the earlier years a strong clinical interest appeared to dominate the awards. In later years the basic sciences came very much into their own, with clinical applications shortly developing from nearly all the discoveries. It is somewhat notable that, in a half century during which cancer was being studied in many laboratories, only one worker in the field was honored, namely Fibiger, recognized for his discovery of the *Spiroptera* carcinoma. Surgical procedures have not often been honored, including only the thyroidectomy of Kocher, the transplantation of blood vessels and organs of Carrel, and the prefrontal leucotomy of Moniz, although the success of Pavlov rested very largely upon his expert surgery. Extensive fields in medicine and physiology have attracted no awards as yet. Manifold opportunities are still open to the present scientific generation to make new discoveries which will receive the high recognition of the Nobel prize.

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Rutherford, by Those Who Knew Him. Being the collection of the first five Rutherford lectures of the Physical Society. Physical Society, London, 1954. 69 pp. Illus. + plates. Paper, 8s.6d.

The Rutherford lectures were initiated by the Physical Society in 1942 and are held every second year. The lectures in this book were given by H. R. Robinson, J. D. Cockcroft, M. L. Oliphant, E. Marsden, and A. S. Russell. All were close collaborators of Rutherford and thus are in an excellent position to contribute many personal impressions that shed light on Rutherford's life and on the way he worked and compelled others to work.

The life of the man who first proposed a mechanical

model for the atom has been recorded in several biographies. He was born in New Zealand in 1871. As a student at Nelson College in New Zealand, Rutherford demonstrated his outstanding qualifications and won a scholarship to Canterbury College, from which he graduated with a double "first" in mathematics and physics. He next had the good fortune to work with the eminent J. J. Thomson (later Lord Kelvin) at the Cavendish Laboratory in Cambridge. It was there that he started his main life work on radioactivity.

After several years as research professor at McGill University, Montreal, he returned to England. He soon established himself (at Manchester and later at Cambridge) as the spiritual leader of a group of scientists and students who evolved theories that were to influence and change not only the field of physics but (by showing the possibility of splitting the atom) the destiny of the entire world.

These five lectures comprise a host of additional personal facts and anecdotes. We get a good inside view of the way Rutherford attacked a problem; how he could drive his collaborators and students to search and probe until a question had been answered; how he infused the people around him with the idea that only by working together harmoniously can good results be achieved; and how he taught that, for a real scientist, the victorious feeling of having wrung one more secret from nature should be the ultimate goal, not the financial reward. Another lesson from his life is the importance of the collaboration of scientists from many countries.

These lectures represent an important addition to the biographies already published. Although the lectures do deal with scientific problems and their solutions, they make fascinating reading for the layman, because they reveal the way in which Rutherford lived and worked. A number of photographs and facsimiles, unfortunately not too well reproduced, are enclosed. This publication will serve as a memento to a great scientist and a great man.

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Modern Chemical Processes, vol. III. A series of articles describing chemical manufacturing plants. Editors of Industrial and Engineering Chemistry, Reinhold, New York, 1954. v + 276 pp. Illus. $5.

The 23 papers that make up this new volume comprise an interesting selection of new chemical processes. From an educational standpoint, the three volumes in this series offer the student of chemistry or of chemical engineering a wonderful opportunity to gain a broad understanding of the economic factors that govern industry to a large extent, such as raw materials, plant location, transportation, power, labor, and markets.

The clear-cut photographs and flow-sheets of the various manufacturing plants provide an insight into their operation and design which should be obtained before student inspection trips are made to such plants. In fact, the knowledge students gain from reading these volumes might well take the place of an expensive inspection trip in some instances.

Last but not least, the student will acquire an ability to express himself more clearly in writing, as a result of observing the good grammar and rhetoric contained in these papers.

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Biochemistry. Abraham Cantarow and Bernard Schepartz. Saunders, Philadelphia–London, 1954. xxv + 848 pp. Illus. $11.

In this book, Cantarow and Schepartz, who are, respectively, professor and assistant professor of biochemistry at Jefferson Medical College, have placed their main emphasis on the dynamic aspects of mammalian biochemistry and have devoted relatively little space to structural, organic, and physical chemistry. Although the book does not pretend to serve as a textbook on the clinical or pathological aspects of biochemistry, certain abnormalities such as diabetes mellitus and disturbances in "acid-base" balance are discussed fully. Moreover, the important role of microorganisms in the over-all picture of the metabolism of higher animals has not been neglected.

The volume starts with a series of relatively short chapters dealing with the chemistry of carbohydrates, lipids, proteins, nucleic acids, and porphyrin-containing compounds. This is followed by a lengthy chapter on the vitamins, which includes a description of their chemistry, occurrence and biosynthesis, nutritional function, and biological action. As an introduction to the general subject of metabolism, there are chapters dealing with the mechanism of action and classification of enzymes, the activity of the digestive enzymes, and the mechanism of "detoxication." Then respiration, water balance, "acid-base" balance, and energy metabolism are discussed. A brief but very helpful survey of the methods used to investigate intermediary metabolism precedes the section on biological oxidation and the mammalian metabolism of carbohydrates, lipids, proteins, nucleic acids, porphyrins, and inorganic compounds. This section also includes a noteworthy discussion of metabolic antagonism. The chemistry and physiology of the hormones is covered in one chapter. The last section deals with various aspects of the chemical composition of animal tissues and fluids.

The book obviously was prepared with a view to making it a readily useful reference. The table of contents is detailed, there are many cross references, and the index (67 pages) is excellent. In the belief that a first-year medical student would be confused rather than benefited by numerous references to the experimental literature, the bibliography for each chapter lists mainly the more recent review articles and monographs. However, these were chosen carefully and in-