Book Reviews

Science and the Common Understanding. J. Robert Oppenheimer. Simon and Schuster, New York, 1954. 120 pp. $2.75.

This volume represents the substance of the Reith Lectures delivered over the home service of the British Broadcasting Corporation from London in Nov. and Dec. 1953 by the director of the Institute for Advanced Study in Princeton. The theme of the book is the author's expression of confidence that new scientific discoveries, particularly in atomic physics, can supply valuable analogies to human problems not normally thought to be susceptible of scientific treatment.

The book opens with a historical sketch of 17th and 18th century science and its influence on human thought exemplified, among other things, by the great growth of scientific societies seeking to extend the boundaries of precise knowledge and expressing assurance that this knowledge could be applied to human betterment. But scientific ideas are not restricted to immediate application: more significantly, they lead on to newer and more general concepts. This is well brought out by the author in his story of Rutherford's use of the alpha particle as a tool in the building of a more convincing theory of atomic structure. The tale, set forth by and large in clear, simple, and elegant prose, is brought down to present-day nuclear physics with its plethora of "elementary" particles.

Not so successful, unfortunately, are the third and fourth chapters in which an attempt is made to convey to a lay audience the development of modern atomic physics based on the quantum theory and to do it, moreover, in a mere 30 pages of text. This business, and in particular the problem of the dual description in terms of waves and particles, seems so far to defy nontechnical presentation in nonmisleading fashion.

In the last two chapters, Oppenheimer comes to grips in vigorous fashion with his fundamental thesis, using as the peg on which to hang it the famous complementarity principle of Bohr. In rhythmic prose of attractive literary quality and with impressive sententiousness in his philosophical "asides," he stresses the possible application of the complementary and mutually exclusive modes of description inherent in the presently accepted version of quantum mechanics to numerous problems in other sciences and in human affairs generally. The grand antinomy of the individual and the community, in some ways the crux of all human problems, comes in for considerable attention. As far as science is concerned, one gathers that the author has the firm conviction that knowledge is good for its own sake and that this transcends the human difficulties involved in its so-called "practical" application. He expresses his faith, to use his own words, in "the open society, the unrestricted access to knowledge, the unplanned and uninhibited association of men for its furtherance." It is likely that scientists generally will echo this sentiment.

Although the general argument impressed me, I cannot refrain from voicing a doubt about the appropriateness of seeking such weighty conclusions from the complementarity principle. It is an ingenious idea and basic to the currently prevailing interpretation of quantum mechanics, but there is no assurance that it will continue to maintain its scientific status. Several prominent theorists have raised objections to the probability and indeterministic interpretation of quantum theory on which it rests, and if in the future this interpretation should be altered—by no means an unheard-of type of occurrence in the history of physics—the principle of complementarity might well lose its cogency. This would not necessarily invalidate Oppenheimer's conclusions, but it would spoil a clever argument. One cannot help feeling that reasoning by analogy in science and philosophy, although tempting and often helpful, is nevertheless a somewhat tricky business. It has in this instance, at any rate, provided an entertaining and provocative exposition.

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Pathology. W. A. D. Anderson, Ed. Mosby, St. Louis, ed. 2, 1953. 1393 pp. Illus. + color plates. $16.

With minor modifications, this new edition is similar to the first edition. There has been a change from single-column to double-column page; illustrations have been increased and, as in the first edition, are of good quality. The total length of the book has been shortened by about 50 pages. Unfortunately, a large amount of type has been reduced in size, making reading a bit more difficult. Aside from the foregoing, there is no extensive general revision. However, additions have been made where necessary, particularly in the section on diseases of the nervous system where previous deficiencies have been largely corrected.

In general, the second edition maintains the same standard and inclusive excellence as the previous volume. However, this second edition is even more of a book for the pathologist than for the medical student. The editor seems to indicate this in the preface where he proposes that the teacher supply the deficiencies, these being chiefly the lack of explanation of and attention to fundamentals. The volume continues to cover a wide variety of conditions, although devoting only a few words to a moderately inclusive text on each condition. For the beginning medical student, a volume with less attention to comprehensiveness and with more attention to basic pathological processes would probably be more helpful. However, this reviewer agrees with the editor that if the teacher of pathology devotes the time and care in his lectures to the explanation of basic processes, then the book provides a valuable adjunct in a pathology course.

It is not necessary to assume that a textbook of pathology must be written in a single volume. There

are many places in this compendium that appear to have suffered severely because of lack of space—subjects that should be expanded into a second or third volume. This book therefore is at the crossroads. If it is expanded, it will become a two-volume edition. If further revisions are made downward, it will lose its inclusive nature and would then revert to a traditional textbook for medical students. It is felt that the authors should amplify their statements and expand into a second volume, perhaps dividing the book in the middle, with the first volume being devoted largely to principles and the second volume to the expansion of detail on unusual or rare subjects. The book is highly recommended for use by practicing physicians, pathologists, and medical students.

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Progress in Biophysics and Biophysical Chemistry, vol. III. J. A. V. Butler and J. T. Randall, Eds. Academic Press, New York, 1953. 386 pp. Illus. + plates. $9.50.

The new volume in this admirable series maintains, with few lapses, the high standards set by its predecessors. Several of the articles are of the nature of decennial reviews. Considering the chapters in order:

Doniach, Howard, and Pelc briefly, but authoritatively, summarize the physical principles, techniques, and principal accomplishments of the autoradiographic method. A set of excellent photographs clearly indicates the scope and power of the modern techniques.

Seeds provides a valuable summary of the rather limited data available upon the dichroism of the ultraviolet and visible absorption bands of oriented biological substances, with reference to the utility of such data in the determination of structure. With the development of microspectrographic methods, the potential range of application of this technique has been greatly expanded.

Fraser is concerned with the infrared spectra of biologically important molecules, particularly proteins, nucleic acids, and polysaccharides, and the assignments that have been made of the various bands. While the uncertainties of interpretation are indicated, the treatment is too brief to serve as much more than a guide to the literature.

Markham contributes a critical and authoritative review of several topics pertaining to viruses, including the use of centrifugal methods for virus purification and molecular weight determination, the study of the structure of virus crystals by electron microscopy and x-ray diffraction, and the investigation of the form of tobacco mosaic virus in solution by viscosimetric, birefringence, and light-scattering techniques. Markham's discussion clearly points out the inadequacies of some of the early work in this field and indicates some still unresolved discrepancies.

"Mechanism of biological action of ultraviolet and visible radiations" by Errera is a wide-ranging and quite complete review that is somewhat marred by an uncritical attitude and an awkward organization of material.

Booth gives a brief, but lucid, summary of the developments in the theory of the ionic double layer during the past decade and of the advances in the applications of this theory to a variety of specific problems, including among others, the stability of colloids, coacervation, and electrophoresis.

Davies and Walker provide a well-balanced and thorough review of the practices, potentialities, and difficulties (intrinsic and technical) of microspectrophotometry. The carefully reasoned discussion of the major contributions in this field is especially noteworthy.

Sadron's chapter is a critical review of the hydrodynamic and optical methods for determination of the size and shape of rigid macromolecules in solution. Particular attention is paid to the assumptions underlying the various methods, the internal consistency of the methods, and the necessity for consideration of the rigidity and degree of polydispersity of the particles. Experimental results upon TMV, serum albumin, and DNA are discussed as examples.

Teorell succinctly summarizes the theory of ionic transport across electrically charged (ionic) membranes. The applications of this theory to the development of membrane potentials, to the electric conductivity and reactance of such membranes, and to the establishment of transient and steady-state ionic distributions are discussed, with special reference to possible biological implications.

A disturbing number of typographical errors and faulty equation references must be noted.

The wide scope of topics in this volume forms an interesting contrast in conception of the nature of biophysics to that of the corresponding American series.

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Simuliidae of the Ethiopian Region. Paul Freeman and Botha de Meillon. British Museum (Natural History), London, 1953. vii + 224 pp. Illus. £2 10s.

The black flies constitute one of the most important families of bloodsucking Diptera, transmitting human onchocerciasis in Africa and Central America. A great annoyance wherever they occur, they often produce fatal toxemia by their mass attacks. The tropical African fauna has been studied in considerable detail, but this is the first revisionary work since the junior author's treatment of 23 species in 1930. This present work reduces the more than 100 described species to 69. This is the result of some complete synonymizing and some reduction of species based on pupal differences only to the status of forms. The authors discuss the species problem in some detail and suggest that these forms may actually be reproductively isolated, sibling species, a theory that seems