Book Reviews

Wing Theory. A. Robinson and J. A. Laurmann. Cambridge University Press, London, 1956. 569 pp. Illus. $13.50.

So far as I can recall, this is the only textbook or treatise in this important field of fluid mechanics that has appeared in 20 years. It is closer to 30 years, in fact, since Glauert's well-known *Aerofoil and Airscrew Theory* was first published. The present work may be the modern counterpart of Glauert's book—from the same publisher, incidentally—and, if so, the difference in size (a factor of roughly 2.5) probably represents the increase of scope of what we call "wing theory" during these 30 years. For in these days wings are expected to operate not only at low speeds, where compressibility of the air is negligible, but also at high subsonic, transonic, and supersonic speeds as well. This is a book concerned with wings in all of these speed regimes. It is intended as a textbook for advanced courses, and "more generally, for all those . . . who are interested in aerofoil theory for either practical or theoretical reasons."

It begins with a well-written, 80-page, introductory chapter called "Foundations." Here the basic ideas of fluid mechanics are reviewed, and the standard approximations of wing theory are set in their proper relation to the phenomena of real, viscous gas flows: turbulence, boundary layers, and so forth. We then proceed to chapters on two- and three-dimensional wing theory for incompressible steady flow, airfoils in compressible steady flow, and airfoils in unsteady motion. The scope is ambitious; for example, cascades of airfoils are treated, and wind-tunnel wall interference is discussed as well. Hodograph methods, transonic similitude, and reverse-flow theorems are all presented, at least briefly. Shock waves are discussed, and the shock relations are treated in detail. In connection with the matter of profile drag and its experimental determination, even the Karman-Pohlhausen boundary-layer theory is brought in.

Throughout the book, the mathematical treatment is relatively elegant and complete and sometimes a bit formal. Nevertheless, it is always accompanied by clear and sound explanations of the physical situations. There is no attempt, such as is sometimes made, to reduce wing theory to a branch of mathematics. Nevertheless, I do have an impression that at times the elegance and mere length of the mathematical development may obscure the subject, and some of my graduate students who have used the work confirm this. The index seems admirably complete, and the authors' knowledge of the literature of fluid mechanics is truly impressive. References are always included in the text, and in addition there is an extensive appended bibliography.

In summary, I feel secure in recommending this new book as a reference book for many research workers and engineers. The expanding aeronautical industry has recruited many of its research and development personnel from other branches of engineering, physics, and mathematics, and from among young aeronautical engineers who have not progressed very far in modern aerodynamics. These people would do well to study this book. As a textbook for graduate students it may suffer from the elaborate detail of the mathematical presentation. Nevertheless, in some aeronautical programs, wing theory practically replaces fluid mechanics because of time limitations. Where this occurs, the present textbook might well be recommended, since its viewpoint is so broad. It will not, I think, produce "handbook engineers."

W. R. Sears

Cornell University

Actions Chimiques et Biologiques des Radiations. vol. II. M. Haïssinsky, Ed. Masson, Paris, 1956. 221 pp. Illus. Cloth, F. 3400; paper, F. 2800.

The first volume of this series included three papers in radiobiology, by L. H. Gray, M. Lefort, and W. M. Dale, respectively, on "Physical aspects of radiobiology," "Radiation chemistry of aqueous solutions," and "Modern trends in radiation biochemistry."

In volume II some very fundamental subjects, less well known and understood by biologists and medical practitioners, are presented: "Chemical effects produced by ionizing radiations in the gaseous phase," by W. Mund; "Phenomena of luminescence induced by high-energy radiations," by M. Ageno; and "Introduction to radiation dosimetry," by N. Miller.

By some standards, especially that of a teacher, the order of presentation is somewhat peculiar, in that most instructors and writers prefer to progress from physical aspects to physicochemical aspects, to dosimetry, and thence to radiation biology. There is, however, much to be said for an order of progression, when one is writing for students of a specific regimen, such as biologists and physicians, in which one might develop the lectures from better known to lesser known material, thus enlarging and deepening the understanding. This seems to be the approach used in these volumes.

In volume II, as in volume I, the authors have made a real effort to show the evolution of the three fields from observation of the phenomena, to measurement, to utilization of the specific information in practical problems. Considering this, the reader loses the feeling that a somewhat unorthodox presentation has been given in the volume, and the impression is created that a cooperative effort is being made to consolidate knowledge for application in the problem of how high-energy radiations bring about their effect in biological material.

George E. Stapleton

Oak Ridge National Laboratory

The Life of Bacteria. Their growth, metabolism, and relationships. Kenneth V. Thimann. Macmillan, New York, 1955. 775 pp. Illus. $13.50.

Lengthy gestation is frequently associated in folk literature with a remarkable competence on the part of the newly born. Considered, then, against a background of the case histories described by François Rabelais, it is not particularly surprising to learn that Kenneth Thimann's exceedingly competent creature was 15 years *in utero*!

The Life of Bacteria presents, with a rare literary and scientific skill, a superb summary of general microbiology as that burgeoning field exists at mid-century. What emerges from this presentation is not only an outstanding advanced textbook in general microbiology but also an image of the cultured scholar-author, which appears all too infrequently in this age of terse, expository "scientific" writing.

Naturally, in a domain as vast as general microbiology, it is easy to find fault with the particular prejudices and interests of a writer, which are then interpreted as grievous over- or underemphases when scrutinized by the reviewer. In

this sense, then, two of the presently active frontiers of general microbiology—cytology and genetics—are given scantier treatment than seems desirable; on the other hand, while the current frenetic activity in microbial physiology is accurately mirrored, one could wish for fewer details. In a similar vein, a medically oriented colleague has expressed his own dissatisfaction with the somewhat less than a once-over-lightly approach in his special field of infection and immunity. However, there is no point in dismembering a functioning organism because it does not fit a preconceived picture; instead, let us look at the actual presentation.

Thimann's book is "an attempt not only to see bacteriology as a whole—that is, as a branch of biology—but also to see it in its perspective as a development from the past and as an active area of modern investigation." It is a successful attempt, organized in four parts: "Morphology and general physiology"; "Nitrogen cycle"; "Carbohydrate metabolism"; "Growth and synthesis." The text begins with a fascinating history of microbiology. Chapter II outlines the relationship of bacteria to other microorganisms. Internal structure is then considered, followed by a summary of physiology. "Using the term soil in its most general sense, to include also natural waters," Thimann then introduces the roles of microbes in their natural habitat.

Nitrogen metabolism is treated competently in a series of chapters on proteolysis, amino acid catabolism, nitrogen fixation, and nitrification and denitrification.

The section on carbon metabolism includes separate chapters on alcoholic, lactic, propionic, formic, and butyric fermentation, "oxidative fermentations," disaccharide and polysaccharide breakdown, and fermentations involving inorganic hydrogen acceptors. In each case, digressions to related subjects are skillfully made; thus, for example, rumen microbiology is covered in the chapter on polysaccharide breakdown; vinegar manufacture and aromatic catabolism, in the chapter on "oxidative fermentations"; and the significance of Enterobacteriaceae, in the chapter on formic fermentation.

The fourth division begins with growth and protoplasm formation, followed by chapters on assimilation, autotrophy, photosynthesis, and growth inhibition. The final chapter, on evolution, closes the presentation with the significant comment that bacteria "offer an outstanding example of the evolutionary success which attends upon versatility. Perhaps it is because of this versatility that, though they have been so intensively studied, they remain so profoundly unknown."

The text is unstintingly illustrated by photographs, graphs, charts, and drawings and by tables and formulas, both mathematical and chemical. It is admirably indexed, not only by author and subject, but (*mirabile dictu*!) also by microorganisms. Relevant literature is copiously cited, with particular attention given to original papers, which the author (and I concur) feels give "more insight into a subject than the coverage of twenty times as much literature through reviews."

Thimann's work is obviously a labor of love; it illustrates beautifully the beneficial effects of this motivation and the full maturity which is its invariable companion.

MORTIMER P. STARR
University of California, Davis

Changes of State. A mathematical-physical assessment. H. N. V. Temperley. Cleaver-Hume, London; Interscience, New York, 1956. 324 pp. Illus. $7.50.

The subject "changes of state," or phase transitions, is amenable to treatment by two of the exact mathematical branches of physics—thermodynamics and statistical mechanics.

The treatment by thermodynamics is rigorous and leads to a natural classification of the various transition types. It also leads to equations which are numerically applicable to experimental data. The results, however, are meager, and a book dealing only with the thermodynamic equations, unless burdened with many numerical examples, would be but of pamphlet length. This treatment occupies Temperley's first chapter.

Statistical mechanical treatments of phase change have not as yet met simultaneously all three criteria of being realistic, rigorous, and numerically applicable. Some treatments manage to satisfy two of these requirements: at least one is rigorous and treats a realistic model but does not lead to numerically applicable equations; one is rigorous and numerically applicable but deals with a model divorced from that of any real material; others treat a reasonably realistic model nonrigorously and arrive at approximate numerical results; most of the rather voluminous literature cannot even be said to do as well as meet even a pair of these three desiderata. A book presenting these mathematical treatments fully could be faultless but would probably be boring.

However, whereas thermodynamics is noncausal in character, statistical mechanical treatments do give some insight into the causes of transitions. An imaginative scientist studying the literature cannot help but arrive at intuitively based conceptual schemes which correlate, in his mind at least, the causes and effects. Such schemes are difficult to convey adequately. Intuitive concepts demand semantic adjectival phrases which tend to escape rigorous definition. A too pedantic caution in definition of terms robs the description of vigor, but an undefined term can be misunderstood, and the description conveyed to the reader may then be merely false.

Temperley's book is outstanding in its wealth of intuitive descriptions. Most chapters start with a verbal explanation, lacking equations, of the subject matter treated. This frequently occupies as much as, or more than, half of the page space. The more important mathematical methods are then given, or at least outlined, and with continuous reference to the original articles. The references, in general, are adequate and well chosen, although in a few instances I felt that more recent references, which often give treatments superior to the original ones, should not have been omitted.

Most readers will probably like or dislike this book, depending on their reaction to the more verbal and intuitively derived concepts. For the value of these it is difficult to give a just and unbiased appraisal. I found some for which I presumably failed to grasp the intent of the author, and for which the arguments appeared therefore to be *non sequiturs*. In a few cases, even, a reasonable interpretation of the terms used seems to lead to a demonstrably false statement. However, many, or most, of the discussions were stimulating and enlightening. A purely critical reader will probably object to the book. One who also has some tolerance of understanding and imagination can find much of value in it.

JOSEPH E. MAYER
Enrico Fermi Institute for Nuclear Studies, University of Chicago

The Neurohypophysis. Proceedings of the eighth symposium of the Colston Research Society, held in the University of Bristol, 1956. H. Heller, Ed. Academic Press, New York; Butterworths, London, 1957. 275 pp. Illus. $9.50.

An increasing appreciation of the true physiological role of the neurohypophysis, together with the fact that two of its active principles have been analyzed chemically and even synthesized, has resulted in renewed interest in this structure—an interest that is reflected by the fact that the eighth symposium of the Colston Research Society (9–12 Apr. 1956) was devoted to it and that the proceedings were published in book form.