Book Reviews

Analytical Cytology. Methods for studying cellular form and function. Robert C. Mellors, Ed. Blakiston Div., McGraw-Hill, New York–London, 1955. xi + 511 pp. Illus. $15.

Acquaintance with most of the nine topics covered in this textbook is essential to an appreciation of modern cytological research. Subtitled "Newer methods for studying cellular form and function," the subjects under the heading "Optical spectral region" are "Cytophotometry" by A. W. Pollister and L. Ornstein, 67 pages, 127 references; "Histochemical staining" by A. B. Novikoff, 48 pages, 354 references; "Phase-contrast, interference-contrast and polarizing microscopy" by R. Barer, 87 pages, 171 references; "Ultraviolet microspectroscopy" by J. I. Nurnberger, 37 pages, 158 references; and "Fluorescence microscopy" by O. W. Richards, 28 pages, 208 references. Under methods using other forms of radiation are "Electron microscopy" by C. C. Selby, 67 pages, 190 references; "Radioautography" by P. J. Fitzgerald, 43 pages, 89 references; "Historadiography" by A. Engström, 26 pages, 51 references; and "X-ray diffraction" by G. Oster, 20 pages, 46 references.

Written for biologists, these presentations of principles and methods have a minimum of physical and mathematical formulation. The topics closest to classical cytology (and with the greatest current numbers of publications) are presented in greatest detail, with the treatment of x-ray diffraction reduced to elementary principles. Originally covering developments through 1952, the manuscripts have been revised immediately prior to publication to include outstanding work into 1955.

A particularly lucid account of the theory and practice of phase and interference microscopy is presented by Barer with the aid of simple geometry. Microspectrophotometry is dealt with in two sections with emphasis (for the visual) on practical details by Pollister and Ornstein, and (for the ultraviolet) with an objective critical evaluation of principles by Nurnberger. After a brief statement on methods in electron microscopy, Selby gives a valuable summary of the major morphological findings on tissue cells. Most of the remaining subjects have been presented earlier in monograph or review form; but, in addition to the convenience of their collection in one volume, the work of the editor can be admired for scaling the length of individual presentations and their technical level to meet the interests and capacities of a wide biological audience.

WILLIAM L. DOYLE
Department of Anatomy, University of Chicago

Studies of Biosynthesis of Escherichia coli. Publication 607. Richard B. Roberts, Dean B. Cowie, Philip H. Abelson, Ellis T. Bolton, and Roy J. Britten. Carnegie Institution of Washington, Washington, D.C., 1955. xiv + 521 pp. Illus. Paper, $2.50; cloth, $3.

This is a rather unique book. It reports the studies of one laboratory on primarily one strain of bacteria, *E. coli* B. There are occasional studies for comparative purposes on yeasts, *Neurospora,* and sometimes *Chlorella.* About 10 percent of the book is devoted to the general methods, particularly to those involving radioactive tracers. This is followed by a section on permeability of the cell wall, first to inorganic ions, then to organic substances.

From the distribution of the isotopes, it is concluded that not only inorganic ions are easily diffusible but every organic compound used, including glucose-1-phosphate and fructose-1,6-diphosphate. This conclusion that the cell wall is unable to exclude small molecules leads to the supposition that the cell wall is a mere morphological boundary and that the protoplasm is in direct contact with the environment. This is curious, since a variety of other studies would have led one to suppose differently. *E. coli* is shown to be capable of incorporating CO_2 into the aspartic-glutamic system, arginine, purines, and pyrimidines; acetate into lipids, leucine, and the Krebs cycle. Similarly paths are traced for glucose, amino acids, formate, formaldehyde, and so forth. This material occupies possibly half of the book, some of it scattered throughout.

The authors then attempt, with a good degree of success, to integrate this information. There are discussions of variations in metabolism caused by adaptation to different energy sources, and there is a study of extracellular products of metabolism. There are detailed discussions of the role of the Krebs cycle, the synthesis of the glutamic-aspartic families of amino acids (in which proline, arginine, lysine, homoserine, threonine, methionine, and isoleucine are included), the syntheses of other amino acids, complete with charming family pictures (the aromatics, the pyruvic family, and the serine family). There is a long and fascinating section on nucleic acid synthesis and perhaps too long a section on sulfur metabolism. This is followed by a chapter on the mechanism of isotopic competition, and then by a masterly summary, particularly from the kinetic viewpoint. There is an extensive, pertinent bibliography attached.

Aside from detailed and intricate metabolic pathways, it appears that in attempting to explain why compounds supplied externally do not behave identically with those formed by the cell, the important conclusion is reached that the endogenous compounds are not indeed identical with the external material (the acetyl coA and acetate system being a model) and that this applies to virtually all the materials studied. Although this is not an exactly new concept, it is here clearly formulated, experimentally supported, and extended to include substances not usually considered in this light. This is a stimulating and valuable book, a careful and detailed experimental consideration of a limited area *E. coli* B, which may indeed prove large enough at that.

WAYNE W. UMBREIT
Department of Enzyme Chemistry, Merck Institute for Therapeutic Research

Mechanisms of Microbial Pathogenicity. Fifth symposium of the Society for General Microbiology. J. W. Howie and A. J. O'Hea, Eds. Cambridge Univ. Press, New York, 1955. x + 333 pp. $5.

The 16 papers by British and American authors in this fifth symposium of the Society for General Microbiology constitute an impressive compilation of ideas on the disease-producing capacities of selected bacteria, protozoans, and fungi that infect man, animals and plants. The breadth of the area covered is great, but bringing together data and ideas from fields that are related but commonly held at arms length (for example, bacteriology and protozoology)

is stimulating and should provoke new investigations. The first paper by A. A. Miles on "The meaning of pathogenicity," as its title implies, is preoccupied with definitions. The remaining authors do not always conform to his suggestions on the use of the terms *pathogenic* and *virulent,* but little confusion results. The ideas expressed in Theobald Smith's philosophic classic *Parasitism and Disease* are alluded to repeatedly. It is, however, by no means clear that these ideas have had an important impact in the field—at least so far as the contributions to the present volume are concerned.

As might be expected, understanding of the mechanisms of action of specific toxins, whether in plants or animals, is better understood than the invasive manifestations of microorganisms, and excellent progress is being made from this approach. This is exemplified in the chapter by Smith and Keppie on pathogenesis of anthrax and in the chapters by Wood and by Brian on the role of toxins, whether enzymes or small molecular substances, in certain plant diseases. The discussion of the relative importance of lycomarasmin and pectic enzymes in tomato wilt is particularly instructive.

Somewhat questionable statements occur in a few places. For example, on page 34 it is stated that the somatic antigen of *Sh. shigae* is protective against the disease, and on page 187 the immunological response to infection is described in terms so mechanistic that they can hardly be accepted as constituting a valid generalization.

This book is strongly recommended to those interested in the pathogenic properties of microorganisms.

COLIN M. MACLEOD
Department of Microbiology,
New York University
College of Medicine

Philosophy and Analysis. A selection of articles published in *Analysis,* 1933–40 and 1947–53. Margaret Macdonald, Ed. Philosophical Library, New York, 1954. viii + 296 pp. $7.50.

Philosophy and Analysis consists of 37 articles, all except two of which had been previously published in *Analysis* between 1933 and 1940 and between 1947 and 1953. *Analysis* has played a unique role in publishing short articles on precisely defined philosophical questions and in offering an exchange of views among like-minded philosophers. Unfortunately, its limited circulation made reference difficult; hence, the present collection fills an important gap, not only for technical workers in this field, but also for educated laymen, who are here provided with more variety and continuity than is available in any single issue of such a highly specialized journal. This cultivation of small-scale, rather than large-scale, philosophies has been quite fruitful. As a result there has been a tendency for philosophers to concentrate on separate problems in contrast to their previous procedure of issuing pronouncements about the whole universe.

A very helpful introduction is provided by Margaret Macdonald, editor of *Analysis.* She undertakes to clarify the special outlook or attitude represented by this journal, which is concerned primarily with philosophical analysis and the application of the method of logical analysis to philosophic problems. She points out that this concept was introduced by Moore and Russell and later extended by Wittgenstein.

In general, the idea is "that philosophical problems might be solved by a better understanding of the meaning of language." In other words, "To find out what a sentence means or a proposition asserts one must deduce those other propositions upon which its truth depends." This is related to Russell's *Principle of Acquaintance*—namely, "Every proposition which we can understand must be composed wholly of constituents with which we are acquainted." All this is in line with Moore's *Defence of Common Sense,* "That we understand and know for certain the truth of many statements of ordinary life, though we do not know their analysis." Moore's position may be stated, "To be understood, a philosophical statement, or problem, must be explained in ordinary, that is, known philosophically technical language. When so explained, one will find that the problem concerned can be solved, or shown to be soluble, which is a kind of solution, only by careful examination of the uses of certain words in oridnary contexts."

In this connection there has been considerable influence by Wittgenstein and members of the Vienna group through their principle of verifiability—namely, "A proposition is significant if it is logically possible that it should be verified by one reporting an experience. . . . If not so verifiable, a proposition is either analytic tautologist or nonsensical, which includes metaphysical." Usually one "does not so much try to answer philosophical questions or solve philosophical problems as ask in what sense of 'question' and 'problem' they are questions and problems and what sort of answer would satisfy those whom they puzzle." It is significant that analytic philosophy has concentrated on certain problems while completely ignoring others. Thus the present collection is concerned with questions in logic and epistemology—that is, problems such as meaning, knowing, truth, and probability.

There is included an article on "The relationship between philosophy and psychology" and also one on "Ethics." Probably most interesting to the general reader are some papers that appeared in 1939 dealing with dialectic materialism as presented by speakers from both sides.

Although recognizing the value of linguistics per se and of semantics in general, the average scientist may well look askance at this kind of approach, which, however, may be justified as an attempt to present a unified and coherent word description of experiential ideas.

RAYMOND J. SEEGER
National Science Foundation

Linearized Theory of Steady High-Speed Flow. Cambridge monogr. on mechanics and applied mathematics. G. N. Ward. Cambridge Univ. Press, New York, 1955. xv + 243 pp. Illus. $6.

This book is a systematic and coherent account of the basis of linearized theory of steady flow. It is written in a careful and scholarly style. The approach to the subject matter is formal in the sense that general methods are studied first and the special cases extracted and in that formal mathematics is used to deduce all the theorems and representation formulas.

The book is divided into three parts: "General theory," "Special methods," "Slender body theory." Chapter 1 presents the assumptions (perfect gas, inviscid fluid), exact equations under those assumptions, and derivation of linearized equations. Chapters 2 and 3 give general solutions for subsonic (Laplace equation) and supersonic (wave equation) flows in terms of the basic elements, sources, vortices, and so forth, and integral formulas, domains of dependence, and so on. Chapter 4, an especially interesting chapter, discusses usually troublesome points of the theory, such as boundary conditions, formulas for over-all forces, including the effect of singularities at edges, nonuniformities of approximation at infinity, and also flow reversal theorems.

Chapter 5 presents a brief account of the application of the methods of Chapter 2 to subsonic wing theory. In Chapter 6 the methods of Chapter 3 are applied to supersonic wing theory. The lifting problem is treated in detail by the method of Evard and Krasilshchikova, using characteristic coordinates and the source representation. In Chapters 5 and 6 no specific examples are worked out.

Chapter 7 presents the theory of linearized supersonic conical fields following Goldstein and Ward and applies it to flat wings. Chapter 8 covers those applications of operational methods to