Mellon has rewritten and expanded the central section of the book, chapters 8 through 10, the latter chapter being a new addition. This has made an important topic, "Secondary and tertiary sources," more accessible to the student, and this chapter will undoubtedly be used for reference itself.

The final text chapter, "Making searches in the chemical literature," has probably been changed the least of any, but in this case lack of change is to be regretted. There has been a great deal of material published on how to make searches, and much of it is pertinent here. Several dozen references are given en bloc to papers on the subject in various numbers of the *Advances in Chemistry* series, but they have not been worked into the text.

The library problems, as before, constitute a thorough coverage of the material given earlier in the text. Most of them include new examples.

The index has grown about one-third but still omits names appearing in footnotes or reference lists.

The following remarks are offered in a helpful spirit and are not meant to detract from an excellent textbook. The *Bulletin analytique* is now *Bulletin signalétique*. I believe the *Ref. Zhur. Khim.* should be included as a searching possibility, despite the lack of subject indexes (page 230). Its name is misspelled on page 105 and in the index. A footnote on page 59 includes a misprint: "No. 4" is given, but "No. 10" is meant. UNESCO has done so much work with language dictionaries that some reference to it could well be included on page 191.

KARL F. HEUMANN
*Chemical Abstracts,*
*Columbus, Ohio*

**Logical Design of Digital Computers.** Montgomery Phister, Jr. Wiley, New York; Chapman & Hall, London, 1958. xvi + 408 pp. Illus. $10.50.

No previous knowledge of computers is assumed by the author of this introductory text, which is well adapted for independent study or for a one- or two-semester course. Its 12 chapters and two appendices cover general methods and techniques, not details of a particular computer with which the author has been associated. Almost every chapter has a collection of exercises and a selection of references quite adequate to lead the student further into the field. There are also many worked-out examples. In general, the book is easy to understand, and though the mathematical discussion may not seem particularly elegant to the mathematician or physicist, it compares very favorably with those generally found in engineering texts.

The first two chapters give a bird's-eye view of digital-computer design, circuit components, and binary numbers. One needs hardly more than the names of circuit components and a brief description of how they behave for logical design for a general understanding of these subjects, so the reader need have no previous knowledge of them. The next two chapters deal with Boolean algebra and the simplification of Boolean functions. The rest of the book cannot be understood without a knowledge of the content of these chapters. Boolean algebra is the algebra of logic and of relay circuits, and while computers can be designed without it, the intricacies of modern computers and the logical properties of circuit elements have now become so complicated that the designer of computers would be like a mathematician without the convenience of algebraic notation if Boolean algebra were not available. Actually, Boolean algebra is inherently simpler than even high-school algebra, and the reader with modest mathematical attainments can master the material, even though the text sometimes will make him sweat.

The next chapter deals with the logical equations characteristic of memory elements [computers are essentially memory elements connected by decision elements (which were discussed along with Boolean algebra), decisions being made between "true" and "false," say] and shows how memory elements are connected to carry out a given operation. Greater generality is reached in the following chapter. The seventh chapter gives a survey of computer memories of large capacity (as distinguished from the one-bit or yes-or-no memories discussed earlier), which can be read or erased or have more information written into them. Input-output equipment, by which information is fed to or taken from the computer, is discussed next.

Chapter 9, on the arithmetic unit, shows how memory and decision elements are designed into circuits capable of carrying out the simple arithmetical operations and the logical operation of comparison. It is the longest chapter in the book and deals with many of the most important and ubiquitous problems of computer logical (not engineering!) design. Much of the technical jargon of the computer art can be learned from this chapter. The next chapter briefly treats error-detecting codes applied to error prevention in computers. Chapter 11 ties all the pieces together by applying the principles earlier expounded to the design of two simple computers, one of general-purpose, the other of special-purpose, design. The last chapter very briefly touches on the ways in which the gaps between the logical equations and actual construction, and between construction and operation, are bridged.

To sum up, the book is a good introduction, can be read fairly easily by engineers, physicists, mathematicians, or logicians with only undergraduate training, gives an adequate guide to the literature for further study, and would equip someone willing to work out the exercises with sufficient facility in logical design to qualify him for work in a logical-design group.

JEROME ROTHSTEIN
*Edgerton, Germeshausen, and Grier,*
*Boston, Massachusetts*

**Surface Active Agents and Detergents.** vol. II. Anthony M. Schwartz, James W. Perry, Julian Berch. Interscience, New York, 1958. xv + 839 pp. Illus. $17.50.

Since the late '30's, the field of surface-active agents has expanded almost explosively. In 1949 Schwartz and Perry published *Surface Active Agents: Their Chemistry and Technology,* which was a notably successful attempt to cover the field up to 1947. The present volume attempts to extend this coverage through 1956. Because of the extremely rapid development of the field (the patent and technological and scientific literature since 1947 far exceeds that available before then), the present book supplements rather than replaces the original and is hence designated volume 2.

The material presented is divided into four major subdivisions: "Processes for synthesizing and manufacturing surfactants," "Special function surfactants and compositions," "The physical and colloidal chemistry of surfactants in theory and practice," and "Practical applications of surfactants." Each of these sections is very well referenced, and this is perhaps the most useful aspect of the book. Because of the mass of material covered, only brief mention is made of each of the many topics in each section of the book. However, the inclusion of a very complete bibliography serves as compensation.

As can be seen from the book's major subdivisions, the authors are concerned primarily with the technology rather than the science of surface-active agents, and hence the book should be most useful for those whose major concern is syntheses of new materials or product development, or both. Nevertheless, the fundamentals are not completely overlooked.

The section on the physical and colloidal chemistry of surfactants rightfully

does not concern itself only with the surface-active agent. A brief section on recent advances in surface physics tends to emphasize the important role played by the substate in phenomena involving surfactants. The bulk properties of surface-active agents, particularly the formation and structure of micelles, are given good coverage.

Because of its encyclopedic coverage and extensive bibliography, volume 2 of *Surface Active Agents and Detergents*, by Schwartz, Perry, and Berch, should be a valuable addition to the library of anyone whose work requires an up-to-date knowledge of this important and active field of technology.

LAWRENCE M. KUSHNER
*Metal Physics Section,*
*National Bureau of Standards*

**Thinking.** An experimental and social study. Frederic Bartlett. Basic Books, New York, 1958, 203 pp. $4.

This highly readable little book represents another example of the characteristically British trait of performing interesting psychological research with relatively simple methods, in contrast to the American trend toward increasing dependence on complex mathematical and electronic techniques. It reports the outcome of 25 years of Bartlett's own thinking about thinking and is intended to be neither an exhaustive survey of the field nor the final report of an organized research program.

Bartlett's approach incorporates several unique features. He conceives of thinking as an advanced form of "bodily skill," to be most fruitfully studied in terms of what is known about the latter. The book is divided into two sections. The first is concerned with thinking within "closed systems," in which a limited number of "items" is involved. Most of Bartlett's experimental work is included here. Chapters on experimental, everyday, and artistic thinking constitute the second section (entitled "Adventurous thinking"), which includes primarily biographical and case material.

Semantic confusion results from Bartlett's definition of thinking as "the extension of evidence in accord with that evidence so as to fill up gaps in the evidence." This brings into the fold much of the work on perception, as well as Bartlett's own classic work, *Remembering*. In contrast with the most common usage, thinking is distinguished from problem-solving in that the latter is said to be concerned only with behavior directly associated with the solution to a problem.

The space devoted to reports of experiments seems uneven; I found myself wishing for more detailed descriptions of procedure and results in some instances and for the omission of lengthy protocols in others. Those researchers on complex mental processes who find straightforward conclusions exceedingly difficult to come by may be somewhat skeptical of the sweeping general statements made with respect to the results of some experiments. Unfortunately almost no effort is made by Bartlett to relate his work to similar work in other laboratories.

*Thinking* will undoubtedly be most useful to those who are active in this line of research, as a stimulant for new ideas, although it is sufficiently nontechnical for the interested layman. It is not appropriate for use as a textbook, nor was it intended for such use, but it may well be valuable to students of research methodology. This is particularly true of the chapter in which Bartlett attempts to reconstruct some of his own scientific thinking.

WILLIAM F. BATTIG
*Psychological Laboratory,*
*University of Virginia*

**The Lipids.** Their chemistry and biochemistry. vol. III, *Biochemistry*. Biosynthesis, oxidation, metabolism, and nutritional value. Harry J. Deuel, Jr. Interscience, New York, 1957. xxxvi + 1065 pp. $25.

The text of this posthumous, third, and final volume of *The Lipids* was completed before the untimely death of Harry Deuel. Some of his colleagues and friends have finished the task of seeing the manuscript through the press. The material was left largely unchanged, except that certain minor corrections of details have been made to include some information that became available after the time of the author's final draft. A brief biographical introduction has been provided by his long-time friend George R. Cowgill.

Chapter 1 provides a recapitulation of what is known about digestion, absorption, transport, and storage of lipids —topics considered at length in volume 2.

Seven chapters deal with the metabolism, including, as possible mechanisms, the biosynthesis and oxidation of fats; fatty acids of various kinds, saturated and unsaturated, with straight and branched chains; hydroxy, keto, di- and tricarboxylic acids; fatty acid amides and aldehydes; phospholipids and their hydrolysis products; cholesterol and related sterols; and hydrocarbons. Other chapters review the role of acetic, formic, and propionic acids in the intermediary metabolism of fats; the question of the conversion of fat to carbohydrate; and the metabolism and nutritional value of the vitamins A, D, E, and K. The carotenoid pigments, the essential fatty acids, and the nutritional value of fats—subjects of long interest to Deuel, as attested by the many references to articles bearing his name—are especially fully treated.

The discussions are noteworthy for the comprehensive and detailed presentation of the historical background and development of the several topics and for the attention given to earlier theories and views, even though experimentally unconfirmed or subsequently discredited. In general, the compilation of knowledge of the various subjects has been based on a very thorough review of the literature, carried well up to date. Rapid advances in certain of the areas and the circumstances surrounding the completion of this volume have, however, precluded the inclusion of some more recent discoveries, such as the biosynthesis of lecithin and the oxidation of propionic acid and certain branched-chain fatty acids.

All who are interested in the chemistry and biochemistry of the lipids are indebted to Deuel for the competence, industry, and tenacity of purpose with which he assembled and completed this three-volume treatise.

RALPH C. CORLEY
*Department of Chemistry,*
*Purdue University*

**The Tissues of the Body.** An introduction to the study of anatomy. W. E. Le Gros Clark. Oxford University Press, New York, ed. 4, 1958. xii + 415 pp. Illus. $9.75.

This unique book first appeared in 1939. Dynamic in point of view and lucid in style, it was and remains entirely modern in presenting anatomy as a living science that can be studied by an experimental approach, rather than as simply a discipline limited to the study of embalmed cadavers and fixed tissues.

Human anatomy has traditionally been taught as two separate courses—gross anatomy and microscopic anatomy. Whether or not this is desirable lies outside the scope of this review. In any event, this arrangement is likely to persist in most medical schools, if only for convenience of presentation. Yet, whatever its virtues, it unfortunately tends to mislead the beginning student into regarding gross anatomy and microscopic anatomy as distinct and even unrelated disciplines. One of the great-