Copper. The science and technology of the metal, its alloys and compounds. Allison Butts, Ed. ACS Monograph Series, No. 122, William A. Hamor, Ed. Reinhold, New York, 1954. xii + 936 pp. Illus. $20.

This volume is one of the monograph series of the American Chemical Society. It contains 46 chapters, each written by one or more of the leading international authorities, on all the various phases of the technology of copper. The volume is encyclopedian in its scope.

The stated purpose of this composite monograph is "to provide a reference work on all the important phases of the subject of copper both as a chemical element and as an industrial metal." This objective has been carried out admirably, and the resulting volume, containing nearly 1000 pages, should occupy a space on the reference shelf of every engineer, metallurgist, chemist, and technical or scientific worker whose operations bring him in contact with the element copper in any of its forms and applications.

The metallurgical phases of copper are, in general, particularly well covered and, in most cases, with adequate detail, but some aspects might have been more expanded. For instance, the chapter on "Electrolytic refining" occupies 57 pages with 23 references. The subject is exploited in the fullest detail and with perhaps more detail than its relative importance would seem to demand. On the other hand, "Secondary copper and copper alloys" (Chapter 16) is covered in only 8 pages with no references. Considering the very great importance of this subject in our present-day economy, more space should have been assigned to it. The methods of refining secondary material are described only in such general terms that the inclusion of this chapter, as written, seems scarcely worthwhile.

In Chapter 7, the thermodynamics of copper smelting occupies 16 pages with 18 references. The introductory material of this chapter, especially in regard to free-energy changes, could have been treated in more detail. Unless the reader has a good, up-to-date, and working knowledge of modern physical chemistry, he is not likely to be able to apply the equations appearing on pages 152 and 153, even though it is stated:

> If the activity values are known, the free-energy changes accompanying reaction with reactants and products at any other than standard states can readily be obtained by combining the Δ °F values from the graphs with equation (2).

The reader is told that "A" equals the activity of a constituent. When he turns to his physics textbook he finds that "activity" is defined as the ratio of the fugacity of the substance in the state in which it happens to be to the fugacity in the standard state. When he seeks a concise definition of "fugacity," he jumps into really deep water.

Again, in the treatment of "Analytical chemistry of copper" (Chapter 46), slightly more detail could have been given. Even though it is stated that "the analytical chemistry of copper is reviewed rather briefly" and that "Due to space limitations no attempt is made to give the details of the laboratory procedures," nevertheless, the commonly used and accurate electrolytic method receives a thorough treatment (3½ pages and about 50 references). Although the gravimetric, iodiometric, and other methods, including the colorimetric method, are discussed and amply referenced, it might have been advantageous to include some details of one of each of these methods. This chapter contains 106 references.

Most of the chapters cover their subjects in an adequate and excellent manner, and the book covers the whole subject of copper in practically all its ramifications in a most commendable fashion, including 1289 references to the literature from about 1933 to as late as 1952. Unfortunately, however, six chapters have no references at all. This fact, together with the poor reproduction of at least two diagrams (pages 105 and 157) in which some of the numerals are completely blocked up and undecipherable, is about the only valid criticism that can be made. Only one typographical error was found (page 536), and this was a minor one.

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Optical Workshop Principles. Translation of *Le Travail des Verres d'Optique de Précision.* Charles Dévé. Trans. by Thomas L. Tippell. Hilger & Watts, London, and Jarrell-Ash, Newtonville, Mass., Engl. ed. 2, 1954. xxiv + 436 pp. Illus. + plates. 42s.

The first English edition of this work was prepared by Hilger to provide a manual for the training of the many optical workers needed in World War II. The present edition was translated from the third French edition, most of which was written in 1945 and published in 1949. The apparent age of the French original does not detract from the value of the book as a guide to the rationale of optical shop practice.

The author pointed out that the manual was written for apprentices, teachers, shop managers, and others who already know something of the practice of optical surfacing. Some elementary subjects, such as the design and mechanics of grinding machinery, are not discussed. Thus the book is in the nature of a monograph on selected topics of optical work, but the treatment of these is so thorough and practical that it is useful to workers in any stage of training.

The first part of the book, "Elementary," is devoted to glasses, their faults and aberrations; choice of materials; abrasives, glues, cements, tools, polishers; surfacing; and spectacle lenses. The second part, "For the use of works managers and senior workmen," takes up the mechanical theory of working optical surfaces; optical tests in the workshop; polarization of light; crystal working; the construction of several types of polarizing prisms; centering, edging and cementing lenses; reticules, micrometers, graticules; the metallization of mirrors. There are three appendixes; the most significant is on the surfacing of aspherical lenses. There are author and subject indexes. Only a

few typographical errors were found. In the formula for silvering mirrors, on page 343, caustic soda may be meant instead of "soda."

Altogether, the book is excellent and should be of value, not only to the professional optical shop workmen and apprentices for whom it was prepared, but also to scientists and amateurs who have any interest in the grinding and polishing of glass and crystals. It should be in every optical workshop.

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Matthews' Textile Fibers. Their physical, microscopic, and chemical properties. Herbert R. Mauersberger, Ed. Wiley, New York, and Chapman & Hall, London, ed. 6. 1954. x + 1283 pp. Illus. $16.50.

This sixth edition of an important reference work originated by J. Merritt Matthews 50 years ago has become a multiauthored compilation of which Mauersberger serves as a coauthor and editor. The great advance of the textile industry in production of synthetic fibers such as nylon, Dacron, Orlon, Acrylon, and Dynel, has required extensive additions to a text designed to cover the properties of these materials and the procedures for identifying them, either alone or mixed with other fibers. The book has been revised throughout with incorporation of new illustrations, new technical data, and extensive additions, not only in synthetic organic fibers, but also in the discussion of inorganic (glass) fibers, and identification and quantitative analysis.

In the discussion of each of the principal types of textile fibers, consideration is given to history and use, statistical information, microscopic characteristics, physical and optical properties, and chemical properties. The latter include effects of solvents, acids, alkalis, and the general dyeing properties of the fiber. The book is limited to the fibers and spun threads, and does not include characterization of woven fabrics produced from these fibers.

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Experimental Inorganic Chemistry. W. G. Palmer. Cambridge Univ. Press, New York, 1954. 578 pp. Illus. $9.

The author has written a book that combines the theory and practice of inorganic chemistry in a usable, useful, practical, and interesting fashion. It is recommended to all teachers of inorganic chemistry (not to be confused with general chemistry) as a pedagogically stimulating textbook. Emphasis is placed on the laboratory approach. Directions are given, not only for the synthesis of large numbers of typical and representative compounds but also, in many instances, for the analysis of the resulting products. "In analyzing the compounds they [the students] have themselves prepared they find no drudgery."

Some readers will argue that the organization of subject matter on the basis of the Mendelyeev classification of the elements is not modern, but this is a minor point since the theoretical material is most certainly up to date. Commendable is the emphasis on structural inorganic chemistry that constitutes an important part of both the introductory summary and the theoretical material preceding the experimental operations in each chapter. Specialists may also criticize choice of theoretical matter, but the teacher will find this book to be the best, if not the only "teachable," textbook covering the practice of inorganic chemistry. It emphasizes the necessity for analysis as an *important* adjunct to synthesis. Theory is employed to furnish the background for experimental operations. Such an approach is in itself both refreshing and novel, since so many chemists seem to forget, in their Aristotelian quest for knowledge, that chemistry deals with matter. It is a well-balanced textbook and should find wide and favorable acceptance.

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The Determination of Crystal Structures. H. Lipson and W. Cochran. vol. III of *The Crystalline State,* Lawrence Bragg, Ed. G. Bell, London; Macmillan, New York, 1953. ix + 345 pp. Illus. + plates. $8.

Lipson and Cochran's volume is the third of a series under the general title *The Crystalline State,* edited by Sir Lawrence Bragg. Two decades have passed since the appearance of the first volume, *A General Survey,* written by the editor himself, and the very great advances that have been made in x-ray analysis since Bragg's volume appeared are partly evidenced by a comparison of it with the present work. Volume II, *The Optical Principles of the Diffraction of X-Rays,* by R. W. James (1950), is chiefly devoted to the physics of x-ray scattering.

Lipson and Cochran have concerned themselves with the problems of structure determination "from the stage at which a set of structure amplitudes has been obtained to the final accurate positioning of the atoms." The treatment is practical throughout; matters that are not immediately applicable—for example, the full development of space-group theory—are omitted. The series of volumes does not provide a discussion of modern experimental methods; perhaps a review of these is contemplated in a future volume.

Here is a work of tremendous practical value to crystal-structure analysts; and at the outset, I express my personal admiration for the amount of material and experience that have been assembled and the splendid way in which the material is presented.

The work opens with a review of x-ray optics. A discussion of the results of space-group theory follows. The third and fourth chapters are concerned with techniques for computation of structure factors and Fourier series, respectively. The following four chap-