mass and light spectroscopists. Nuclear physics has provided theoretical explanations for many of the observations, and has demanded additional information for checking and extending the theories. The problem is truly "interdisciplinary," and a monograph or treatise with balanced coverage of the whole would be quite desirable. Such a book would have to be written by at least two collaborators, one active with each of the major sources of information.

The next best thing happened in 1961: the two books listed above appeared almost simultaneously. The Cherdyntsev-Nichiporuk book represents the geochemical viewpoint and the Aller book that of the astronomer. There is, of course, considerable overlap, since each book strives for completeness, but neither handles the specialty of the other as well as it does its own. Together they provide good coverage of the subject through about 1960.

Cherdyntsev's book was first published in 1956 in Russian. The translation contains not only many revisions and additions supplied by the author, but many footnotes added by Nichiporuk bringing the observational data up-to-date as of 1960. The first and longest of the three "Chapters" is a survey of the observational facts on "The Abundance of Chemical Elements in the Earth's Crust and Cosmic Systems." The emphasis is on the earth, with consideration of both chemical and nuclear processes leading to the observed distribution of elements and isotopes. Meteorites are discussed less thoroughly, and the astrophysical data only superficially. It is especially good with respect to the geochemistry of inert gases and the natural radioelements, areas in which the author has made extensive contributions. This is probably the most useful Chapter, partly because practically all of the translator's comments are in it. Chapter II, on "The Elementary Theory of Stability of Atomic Nuclei," summarizes much pertinent information on nuclear structure and transformations, but is fairly elementary from the nuclear theoretical viewpoint. Chapter III, "Regularities in the Abundance of Isotopes and the Problem of Formation of Atomic Nuclei," contains a good summary of the systematics of abundances of isotopes and elements, then a discussion of various ages of matter, and finally a discussion of astrophysical processes leading to the present abundances. The treatments of the latter two topics are considerably out-of-date.

Aller's book contains single chapters on the earth and planets, meteorites, and cosmic rays. Variations within the earth's crust are hardly mentioned. The astronomical data, to which Aller has contributed extensively, are treated in considerable detail, with separate chapters on gaseous nebulae, normal stellar atmospheres (including the sun's) and groups of stars showing definite differences in composition. The methods of analyzing spectra to yield elementary abundances are described in some detail. A valuable feature of the chapter on "General Abundance Compilations" is a new tabulation based primarily on astrophysical data. The final chapter, on "Theories of the Origin of the Elements," is a quite up-to-date summary of nucleosynthetic processes in stellar interiors and atmospheres.

The Cherdyntsev–Nichiporuk book not only contains the substantive contributions of two authors (the translator merits that designation), but provides good coverage of two literatures. The extent to which the scientific literatures of the "east" and the "west" are unfamiliar in their opposite territories is illustrated by the fact that Cherdyntsev refers to Aller's work only two or three times, and Aller mentions Cherdyntsev not at all. The American edition of the Soviet author's book should thus substantially further his desire to "strengthen friendly connections between the scientists of the Soviet Union and those of the United States." However, the mode of revision by footnotes causes some roughness of style, and it is disconcerting at times to find footnotes actually contradicting the text. The Aller book is much smoother reading.

The hope of being able to find a set of "universal" or "cosmic" abundances of nuclides and elements has vanished. Both the sources and the present repositories exhibit wide variations. The problem is extremely complex and needs much more work on all fronts. Either of these books will provide starting points for the novice, guidance for the already active investigator, and valuable reference material for the scientist in contiguous fields.

CARNEGIE UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY TRUMAN P. KOHMAN
PITTSBURGH 13, PENNSYLVANIA

Advances in Spectroscopy. Volume II. Edited by H. W. THOMPSON, C.B.E., F.R.S., St. John's College, Oxford. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N.Y. 1961. xi + 483 pp. 16 × 23.5 cm. Price, $13.00.

This is the second annual volume of a series intended to allow spectroscopic workers who, like nearly all present day scientists, are compelled by the enormous extent of their general field to restrict their activities to a limited part, to become aware of advances in other branches of spectroscopy than their own. Included are reviews of spectroscopic applications to chemical analysis, to the vibrational behavior of crystals, to biological and biochemical studies, to chemical constitution as revealed by nuclear magnetic resonance, as well as discussions of aspects of the fundamental theory of molecular energy levels and of the refraction of gases in the infrared. The authors are leaders in their fields and some are pioneers in the modern development of their subjects. The reviews are therefore authoritative; fundamental theory necessary to the specific application in the different chapters is carefully developed, and the treatments will constitute excellent introductions to younger workers interested in entering the various fields, as well as interestingly readable surveys for the general spectroscopic reader on the lookout for possible feed-back on his own specialty.

A. Walsh gives a succinct account of the application of atomic absorption spectra to chemical analysis. More than a century has elapsed since Kirchoff began to analyze the solar atmosphere by atomic absorption spectroscopy, but, in spite of such astrophysical successes as Lockyer's discovery of helium, it is only within the last few years that the potentialities of the method in terrestrial chemical analysis have begun to be realized. Many of the difficulties of quantitative analysis by atomic absorption spectroscopy have been solved by using as source the emission of the element under test excited under conditions, for example in a hollow cathode tube, which ensure the production of very sharp lines. In certain circumstances the absorption method excels the conventional emission method in sensitivity and in freedom from interference by other constituents of the sample.

The chapter on flame spectra by A. G. Gaydon, partly an amplification of the author's well-known monographs, is nevertheless a self-sustained review of the subject. Flames are interesting sources of molecular spectra, and several band systems, such as those of IO, IF and CHO, were first discovered in flames. Temperature measurements by flame spectra and the chemical processes in flames are illuminatingly discussed.

H. Friedman contributes an excellent account of the practical aspects of X-ray fluorescence spectroscopy, which owes its modern popularity to the convenience of high powered sealed-off X-ray tubes, electronic stabilization of current and voltage and electronic rather than photographic photometry. Applications to trace analysis are described as well as the examination of minute regions of inhomogeneous specimens by the electron microprobe.

Nuclear magnetic resonance is described by R. E. Richards in a well-balanced review of the theory and uses of this method in chemistry and chemical physics, while the infrared spectra of crystals are discussed by W. Vedder and D. F. Hornig. The account of the behavior of electromagnetic waves in crystals will be found useful by students of crystal spectra in the visible and ultraviolet regions as well as in the infrared.

A specialized topic is the refraction of gases in the infrared, reviewed by J. H. Jaffe, one of the few practitioners of this subject. The main general interest of such measurements lies in their use in determining the strengths of absorption lines, and it appears that the values determined from refraction are at least as good as those previously determined by absorption measurements, and probably better. To those with some experience in the measurement of the rotation–vibration spectrum of HCl in absorption, it must give peculiar pleasure to see the curves in this chapter illustrating the course of the refraction curve, with its suggestion of the "resonance catastrophe," as it passes through each individual line of the spectrum, including those originating in the two chlorine isotopes.

Biological and biochemical applications of spectroscopy are reviewed in two chapters, one by K. P. Norris on the infrared spectra of micro-organisms, the other by G. H.

Beaven on the ultraviolet spectra of proteins and related compounds. Infrared spectra allow the differentiation of closely related strains of organisms, and can be of great value as a routine analytical tool in the study of cell metabolism. Beaven's chapter is a comprehensive review, and includes several topics of quite general interest to physical chemists, such as the evaluation of the "microscopic" ionization constants required to describe completely the ionization of the individual groups in a complex molecule, and the consequent deduction of molecular sizes and shapes. The account of fluorescence, phosphorescence and energy transfer in proteins, based on the studies of Weber and others, is also of very general interest.

The volume closes in a flurry of formulas in an exposition at an advanced level by H. C. Longuet-Higgins of the electronic vibrational coupling in degenerate electronic states associated with the Renner and Jahn–Teller effects.

This work can be recommended for the library of any laboratory concerned with the theory or practice of spectroscopy.

RESEARCH LABORATORIES
EASTMAN KODAK COMPANY W. WEST
ROCHESTER 4, N. Y.

BOOKS RECEIVED

July 10, 1962—August 10, 1962

NORMAN APPLEZWEIG. "Steroid Drugs." McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1962. 742 pp. $7.50.

G. M. BADGER. "The Chemical Basis of Carcinogenic Activity." Charles C Thomas, Publisher, 301–327 East Lawrence Avenue, Springfield, Illinois. 1962. 72 pp. $5.00.

D. R. BATES, Edited by. "Pure and Applied Physics." Volume 13. "Atomic and Molecular Processes." Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. 904 pp. $19.50.

RICHARD BRUNNER AND GUIDO MACHEK, Edited by. "Die Antibiotica." Band I. "Die Grossen Antibiotica." 1. Teil. "Allgemeiner Teil. Penicillin." 2. Teil. "Streptomycin. Chloramphenicol. Tetracycline." Verlag Hans Carl, Abholfach, Nürnberg 2, Germany. 1962. 1316 pp. DM. 149.—.

RAYMOND DAUDEL. "Traité de Physique Théorique et de Physique Mathématique." XIV. "Structure Electronique des Molécules. Molécules Diatomiques, Petites Molécules, Hydrocarbures Saturés, Molécules Conjuguées, Molécules D'Intérêt Biochimique." Gauthier-Villars et Cie., 55, quai des Grands-Augustins, Paris VI, France. 1962. 283 pp. 48 NF. ($10.00).

MARCEL FLORKIN AND ELMER H. STOTZ, Edited by. "Comprehensive Biochemistry." Volume 2. "Organic and Physical Chemistry." American Elsevier Publishing Company, Inc., 52 Vanderbilt Avenue, New York 17, N. Y. 1962. 328 pp. $14.50.

DOTT. LUCIANA GRIGGIO. "Bibliografia Polarografica (1922–1960)." Parte I. "Elenco Dei Lavori e Indice Degli Autori." Supplemento N. 13. Centro di Polarografia, Via Loredan 4, Padova, Italy. 1961. 94 pp. $2.00.

H. G. KUHN. "Atomic Spectra." Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1962. 436 pp. $13.00.

KARL LINTNER AND ERICH SCHMID. "Werkstoffe des Reaktorbaues mit besonderer Berücksichtigung der Metalle." Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1962. 592 pp. DM. 78.—.

KATHLEEN LONSDALE, General Editor. CAROLINE H. MacGILLAVRY AND GERARD D. RIECK, Editors. "International Tables for X-Ray Crystallography." Volume III. "Physical and Chemical Tables." The Kynoch Press, Witton, Birmingham 6, England. 1962. 362 pp. £5. 15. 0.

CHARLES C. PRICE AND SHIGERU OAE. "Sulfur Bonding." The Ronald Press Company, 15 East 26th Street, New York 10, N. Y. 1962. 208 pp. $8.00.

MARK A. STAHMANN, Edited by. "Polyamino Acids, Polypeptides and Proteins. Proceedings of an International Symposium held at the University of Wisconsin, 1961." The University of Wisconsin Press, 430 Sterling Court, Madison 6, Wisconsin. 1962. 394 pp. $8.00.

B. C. L. WEEDON, Scientific Editor. "Pure and Applied Chemistry." Volume 4. Nos. 2–4. "Physical Chemistry Section." Commission on Macromolecules. Special Lectures presented at the International Symposium on Macromolecular Chemistry, held in Montreal, Canada, 27th July to 1st August, 1961. Butterworths, 4–5, Bell Yard, Temple Bar, London, W. C. 2, England. 1962. 540 pp. $18.00 (per volume).