critical discussion of the intriguing process of Pinocytosis by H. Holter of Copenhagen. More specialized papers on structure–function relationships in the mammary gland (Haguenau and Hollmann) and the pancreas (Hirsch) are followed by a series of papers on various aspects of protein synthesis. Hultin, *et al.*, describe experiments on amino acid incorporation by liver microsomes and ribonucleoprotein particles which appear to demonstrate that gross effects of various agents on protein metabolism in the whole animal are retained in the microsome function. A study of RNA and protein association in the ribonucleoprotein particle was presented by P. Siekevitz, particularly his work on the effect of spermine on this particle. Among other reports, including one by Chantrenne on the effect of 8-azaguanine on the specificity of protein synthesis in *B. cereus*, is an excellent paper by V. G. Allfrey on protein synthesis in isolated cell nuclei. It appears that this cell fraction contains the necessary amino acid-activating enzymes and RNA, and that amino acid uptake is accelerated by DNA and inhibited by histones.

The last short section of the volume deals with polysaccharides in three papers. The synthesis of cellulose by bacteria (S. Hestrin) and mucopolysaccharides in connective tissue (Dorfman and Schiller) pose a number of interesting problems, including that of the extracellular production of polysaccharide.

The volume is a mixture of fairly specific research reports and brief but critical reviews, which is inevitable in a symposium. There are sufficient reviews of lasting value in the volume to recommend it for a place on library and personal book-shelves.

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**Quantum Mechanics.** By EUGEN MERZBACHER, University of North Carolina. John Wiley and Sons, Inc., 440 Park Avenue South, New York 16, N. Y. 1961. xii + 544 pp. 15.5 × 23.5 cm. Price, $12.00.

This book is an introductory text to non-relativistic quantum mechanics, covering the standard topics, with perhaps more emphasis on methods than the historical applications. Topics treated especially thoroughly, in comparison to comparable textbooks, are one-dimensional wave mechanics, spin matrices, linear vector spaces and rotations. The book also has a section on the formal theory of scattering, and shows also in many other places a modern viewpoint. There are many good problems which should lead the student to deeper insight.

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**Metabolic Pathways (Second Edition of Chemical Pathways of Metabolism). Volume II.** Edited by DAVID M. GREENBERG, Department of Biochemistry, School of Medicine. University of California, San Francisco, California. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1961. xiii + 814 pp. 16.5 × 23.5 cm. Price, $24.00.

The enormous growth and development of the field of intermediary metabolism necessitated a new edition of the book, "Chemical Pathways of Metabolism." To achieve this end the editor has brought together a group of experts who deal thoroughly but concisely and critically with their respective fields.

This second edition constitutes not only an impressive extension and revision of the first edition's eight chapters in intermediary metabolism, namely, Nitrogen Metabolism of Amino Acids, Carbon Catabolism of Amino Acids, Biosynthesis of Amino Acids and Related Compounds, Metabolism of Sulphur Containing Compounds, The Synthesis of Proteins, Purines and Pyrimidines, Nucleotides and Nucleosides, and The Metabolism of Chlorophyll, but also presents four new and authoritative chapters: Thiamine, Metabolic Pathways Involving Niacin and Its Derivatives, The Biosynthesis of Flavine Derivatives, and The Biogenesis and Catabolism of Folic Acid and Vitamin $B_{12}$.

This second edition contains not only a valuable highly annotated survey of fields of intermediary metabolism but in many instances presents a stimulating critique of some more controversial areas. An outstanding example of this is found in the chapter on protein synthesis.

Although any text on metabolic pathways is subject to more or less rapid obsolescence, this book meets a well defined need for special and authoritative surveys in metabolism and should receive the eager and welcoming approval of graduate students, research workers and academicians.

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**Elektrochemische Kinetik.** By Dr. KLAUS J. VETTER, Fritz-Haber-Institut der Max-Planck-Gesellschaft, Berlin-Dahlem, Apl. Professor für Physikalische Chemie an der Freien Universität Berlin. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1961. xv + 698 pp. 17 × 23.5 cm. Price, DM. 156.

For many years following the initial work of Tafel, Butler, Frumkin, and others in the field of electrode kinetics, research centered primarily around the hydrogen evolution reaction. To those who have followed developments in electrochemical theory, the sudden shift of emphasis from hydrogen evolution kinetics to the general area of electrochemical kinetics is quite striking, as are the rapid developments during the last 15 years. With the publication of "Electrochemische Kinetik," the subject has now moved from a chapter or two in electrochemistry textbooks to a comprehensive treatment in a single book devoted exclusively to this subject.

The treatment by Vetter is unusually thorough. Since nearly all of the theoretical aspects of electrochemistry have a general direct bearing on electrode kinetics, they must be brought into the discussion in some manner. The author has done a good job in seeing that the discussion of these points is directed toward the role they play in the kinetics, and thus avoids wandering off into extended irrelevancy. The only criticism which might be raised in this regard is the length of the thermodynamic treatment, which is given adequately in most electrochemistry texts, and need not be treated so extensively in connection with kinetics.

The bulk of the book is devoted to a detailed account of the many different forms of polarization and overvoltage phenomena, methods by which electrochemical reaction mechanisms may be determined, and a description of the experimental information available on redox, metal ion and gas electrodes. It is doubtful that any significant research on electrochemical kinetics has been omitted from the contents.

The book is not a text. However, since there are few, if any, courses devoted exclusively to electrochemical kinetics, there is no need for a text in this area. As reference material for persons engaged in electrochemical research, the book is a valuable addition to the working literature.

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**Abundance of Chemical Elements.** By V. V. CHERDYNTSEV. Translated by WALTER NICHIPORUK. The University of Chicago Press, 5750 Ellis Avenue, Chicago 37, Ill. 1961. x + 304 pp. 16 × 24 cm. Price, $10.00.

**Interscience Monographs and Texts in Physics and Astronomy. Volume VII. The Abundance of the Elements.** By LAWRENCE H. ALLER, The Observatory of the University of Michigan, Ann Arbor, Michigan. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. xi + 283 pp. 15.5 × 23.5 cm. Price, $10.00.

The composition of the universe has interested man since ancient times, and is still one of the fundamental questions of science. There are two main sources of information: samples of terrestrial and meteoritic material which can be analyzed chemically, and light received from extra-terrestrial bodies. The first source has been exploited mainly by chemists and geologists, and the second by astronomers. Important assistance has been provided by, respectively,

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.

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**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.