already enriched the resources of the analyst, but usually many years elapsed between the original conception of a physical method and its introduction into the analytical laboratory. How rapidly nowadays physical methods find application by the analyst is shown by a glimpse at the contents of this volume, which contains all methods dealing with the interaction of radiation with matter.

Three chapters deal with x-rays: "Absorption Phenomena of X-rays and γ-rays," by G. L. Clark; "X-ray Diffraction Methods as Applied to Powders and Metals," by W. L. Davidson; and "X-ray Diffraction as Applied to Fibres," by J. A. Howsmon. These are followed by an article by L. O. Brockway on electron diffraction. "Spectrophotometry and Colorimetry" are presented by W. R. Brode. Three sections are concerned with spectroscopic topics: "Emission Spectrography," J. Sherman; "Infrared Spectroscopy," H. H. Nielsen and R. A. Oetjen; and "Raman Spectra," J. H. Hibben. Polarimetric methods are discussed by C. D. West and "Refractive Index Measurements" by L. W. Tilton and J. K. Taylor. The treatment of "Electron Microscopy" by R. D. Heidenreich emphasizes application to metals. The last article in the volume, written by H. W. Washburn, deals with mass spectroscopy.

All these are excellent monographs about physical methods which are already acknowledged as indispensable means in quantitative analytical work, or will undoubtedly become of steadily increasing importance. Each paper covers the fundamental principles of each field, detailed treatments of methods, clear descriptions of instruments, critical discussions of the various fields of application, and includes a list of references to specialized texts and original research papers. Since all contributors are experts in their special fields, one finds many valuable discussions of a practical nature that could originate only from continuous laboratory experience. There is no doubt that every analyst will greatly appreciate these valuable contributions and will profit from them.

Credit is due to the publishers for the excellent production of this volume.

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The Autobiography of Robert A. Millikan. New York: Prentice-Hall, 1950. 311 pp. $4.50.

Every physicist who has come into contact with Professor Millikan—and who is there of us who has not?—to say nothing of all the countless others in so many fields of practical affairs, will want to read this book in order to discover, if he can, what it is that makes this extraordinary man go. And I believe that he will succeed in finding the answer to a much greater extent than he has a right to expect. It is seldom that a man is so successful in getting his personality into his own writing about himself; here the man we have known speaks to us from every page. Here will be found, for example, an answer to the question which so puzzled or even dismayed the physicists of a generation ago: how was it possible that a man comparatively unheard-of and with no recognized achievement in research should suddenly blossom out at the age of 45 into a physicist of the first magnitude? Although the book does not supply the complete answer, it shows that it was at least no accident. The exuberant energy, and the vision that knew how to concentrate on the essential and the significant, were there all the time, waiting only the inevitable eventual removal of the inhibiting effect of irrelevant and unusual circumstances in his early career.

The book is much more than a record of the life of one man, however; it is a history of the physics of his time, and as such will find its place among the other histories of the most memorable decades that physics has yet experienced.

Not the least interesting part of the book to one who passed through some of the same experiences is the detailed account of Millikan's activities during the first world war. Surely none of the tales of the fabulous activities of physicists during the second war can surpass this tale of its forerunner. But the younger generation should read these war experiences for another reason—as an antidote to the cynicism which became so fashionable in the years immediately after the war. Most of the unselfish men who threw their lives into that war, as did Professor Millikan, were actuated by a sense of high idealism, as were also a large part of the other decent people in this country. This has too easily been forgotten.

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Heterocyclic Compounds: Three-, Four-, Five-, and Six-Membered Monocyclic Compounds Containing One O, N, and S Atom, Vol. 1. Robert C. Elderfield, Ed. New York: Wiley; London: Chapman & Hall, 1950. 703 pp. $11.00.

The Chemistry of Heterocyclic Compounds: The Heterocyclic Derivatives of Phosphorus, Arsenic, Antimony, Bismuth, and Silicon. Frederick George Mann. New York-London: Interscience, 1950. 180 pp. $5.25.

This introductory volume on heterocyclic chemistry proclaims that the series is to be "a general treatment with primary emphasis on the principles involved." This treatise is long overdue, and if the subsequent volumes live up to the high promise of the first volume a long-felt need will be fulfilled. There have been numerous books on heterocyclic chemistry, but the subject is too complex and diverse for one author or one volume. The compendia which tabulate in great detail all available literature on a subject lack critical evaluation of the chemical principles disclosed. The present effort gives promise of fulfilling the need for a chemistry of heterocyclic compounds.

The first volume covers ethylene oxides, trimethylene oxides, ethylenimines, azetes, furans, thiophenes, pyrroles and derivatives, pyrans, pyrones, thiapyrans, thiapyrones, pyridines, partially hydrogenated pyridines, and piperi-

dines. The contributing authors are all well acquainted with their respective fields. If the quality of the sections is not uniform, the variation is due more to available subject matter than to presentation. The more-than-200-page section on pyridines by H. S. Mosher deserves particular comment, since the results in this most prolific field have been amply covered. If any criticism is to be voiced, it is that there is no chapter in which the comparisons of similar ring systems are collected. It may be that later volumes will contain such comments.

Although the type appears to be smaller than average, the typography is good, with adequate leading between the lines. Because of the amount to be compressed into one volume, the reader may experience some eye-strain not encountered in less meaty volumes. The format is excellent, and considering the size, the subject, and the times, the price seems very reasonable.

Arnold Weissberger, as consulting editor, has projected the publication of a 28-volume series covering the field of heterocyclic chemistry, of which this is the first. If the remainder come up to the high standards set by this volume, the series will be a welcome adjunct to any library.

The field of phosphorus, arsenic, antimony, bismuth, and silicon heterocycles is discussed most thoroughly. Attempts are made to correlate the findings from element to element in Group V, with the greatest burden falling on the arsenicals as the best-known of the group. In some instances too much emphasis has been placed on the results obtained by analogy, but in general the presentation is excellent. Some question can be raised as to the use of double bonds in postulating structures with heavier elements, but, since the electronic structure of no compounds of these elements is known with certainty, the question is academic. The electronic interpretations on the whole are good, although frequently they need translation to the American idiom of Pauling, Price, *et al.* to be completely understood. Dr. Mann is at his best in those instances wherein he has had personal experience, and the contrast in other sections is often striking. Although this results in an unevenness in presentation, it is to be preferred to the uncritical approach of many who review a field of chemistry without knowledge of its particulars. The decision to limit the term "heterocycle" to rings containing at least one carbon is to be regretted, since some of the chemistry thus omitted is admirably suited for inclusion.

In the introduction some of the nomenclature difficulties are discussed. Although the British and *Chemical Abstracts* systems differ, as discussed by Dr. Mann, the discrepancies are even deeper if one examines the German system, or lack thereof. The author wisely selected the *Chemical Abstracts* system as being the more consistent but fails to mention the pitfalls and inconsistencies in this. The nomenclature problem becomes more complex when heterocyclic names are considered. Dr. Mann has done well in following the *Chemical Abstracts* system, which is foreign to him, and only on rare occasion does a British system name occur. German names slip in more frequently, and the *Ring Index* system is never entirely mastered. The use of the substitutive *arsa* is abused by making it replace $=CH-$ on occasion and $-CH_2-$ on others. Without prior knowledge of the compounds, some of the ring names would be confusing. Fortunately, structural formulas are used liberally.

References are plentiful, although they are by no means complete. Sufficient source references are given, however, to enable the reader to consult a large portion of the original literature. Typography is excellent and the format good. The addition of biological references makes the book an excellent reference work for those who would acquire a working knowledge of the subject matter. It is to be hoped that the price established on this volume is not indicative of the rest of the series. If so, the more extensive subjects will be beyond all reasonable cost.

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Natural Regions of the U.S.S.R. L. S. Berg. Olga Adler Titelbaum, Translator. New York: Macmillan, 1950. 436 pp. $10.00.

The American Council of Learned Societies has made available in English one of the best books ever written on the natural geography of the U.S.S.R. by encouraging Miss Titelbaum to translate L. S. Berg's *Priroda S.S.S.R.* Although Lev Semenovich Berg's greatest interest was in the field of ichthyology, he published more than 480 books and articles on geology, geobotany, zoogeography, and related subjects. In over 50 years of field work he traveled and did field research in almost every part of the Soviet Union.

Geography has been a well-established discipline in Russia from Czarist days, and Berg's publications and interest in the field made him a leader in the Russian Geographical Society and recipient of many honors and medals. He made a contribution to geographical methodology and theory by his scientific approach to the problem of natural areas. Repeating patterns of the natural phenomena meticulously observed, catalogued, and analyzed finally establish for the U.S.S.R. seven landscape zones for the great lowlands. Berg also establishes twelve mountain landscapes, with varying degrees of vertical zonality.

After the zonal boundaries have been confirmed Berg approaches the areas systematically by a discussion of climate, relief, soils, vegetation, and fauna. Morrison, Nikiforoff, and Miss Titelbaum have carefully checked and supplied both the English and Latin names for the plants and animals. This procedure has enabled the translators to check the Russian and English equivalents with Berg's use of the Latin. About half of the book is devoted to a very clear discussion of the vertical zonations of climates, soils, and vegetation in the mountains in separate parts of the Soviet Union.

We are particularly indebted to Berg for the climatic statistics in both the latitudinal and vertical zones and the discussion of the temperature and precipitation controls on the spread of the various plant associations. One