

Microtechniques of Clinical Chemistry, 2nd Ed., S. Natelson, xv + 578 pages, Charles C Thomas, Publisher, 301-327 East Lawrence Ave., Springfield, Illinois. 1961. \$14.75.

Reviewed by Willard R. Faulkner, The Cleveland Clinic Foundation, Cleveland, Ohio

This comprehensive guide to an understanding of clinical microchemistry and its practical application in the laboratory is now in its 2nd edition. It appropriately was written by one who has devoted many years to the subject and who has contributed substantially to its advancement.

The author explains that the primary stimulus for the development of microchemistry was an improved understanding of the significance of the concentration of each of numerous components of blood, which must be determined separately. None of these components can be reliably inferred from a knowledge of the concentration of the others. The alternatives are: either to draw large samples of blood for analysis, or to perform the analyses with microtechniques. For infants and children, the loss of the relatively large volumes of blood required when macrotechniques are used, is potentially harmful. Thus, microtechniques were developed and at this writing, their benefits are being extended to patients of all ages.

The textbook is divided into three major sections—Introduction, Methodology, and Appendix. The inclusion of an author index in addition to the subject index adds to the usefulness of the book. The Introduction, which is liberally illustrated, presents general principles and the instrumentation basic to microchemistry. The related discussion is lucid and logical.

The Methodology section comprises about two thirds of the volume. Microprocedures for 130 substances of clinical importance are given in detail. For each substance, the technique of analysis is presented first, followed by notes on procedure, reagent preparation, and pertinent references. A useful feature of the reference list is the inclusion of papers that describe alternate methods, whenever suitable ones exist. The procedural notes in many instances provide some information in regard to the underlying principles; however, this reviewer hopes that in the third edition, the author will include a concise statement of the chemical and physical bases for each test.

A variety of subjects are in the Appendix: physical properties of urine,

evaluation of data, absorption spectrophotometry, flame photometry, automation, chelate compounds, and clearance tests.

Natelson's *Microchemical Techniques of Clinical Chemistry* is an excellent textbook—one that should be useful to all who must deal with analytical problems involving micro quantities of body fluids.

Ion Exchange. *Frederich Helfferich.* ix + 622 pages. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 1962. \$16.

Reviewed by Robert Kunin, Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.

This book was first published in 1959 by Verlag Chemie in the German language under the title *Ionenaustauscher*. The translation has been made by the author himself and includes a significant amount of new matter. In addition, the material in the English translation is arranged somewhat differently and more effectively than in the German edition.

Although the book is devoted primarily to the fundamental principles of ion exchange and a brief glance might frighten away some chemists not well-grounded in mathematics and theoretical physical chemistry, the author has been skillful in arranging the material in a manner that separates the qualitative and descriptive matter from the quantitative mathematical approach. In addition, the major chapters contain sections covering experimental techniques.

The chapters on the equilibrium, kinetic, and electrochemical aspects of ion exchange represent, by far, the most up-to-date and complete treatments on these topics. Helfferich is to be complimented for this. To some extent, the author may have been too complete and thorough in these presentations thereby overwhelming the uninitiated; however, Helfferich's arrangement and analysis eliminate this problem to some degree.

Although the jacket of the book indicates that the important material in the field of ion exchange is widely scattered throughout the literature and that the author has brought together this valuable information, this is not the situation at the present time. A fair portion of the information in Helfferich's book is available in several excellent reviews and books on the subject. This is particularly true of the chapters covering the first third of the book and dealing with the structure,

properties and synthesis of ion exchange materials.

Helfferich's comprehensive and critical treatment of the principles and theories of columnar operation is excellent and, of course, will be of value, not only to those interested in the field of ion exchange, but also to those working in the general fields of adsorption, catalysis, and chromatography. The pitfalls and helpful hints in applying the various theories of columnar operation will be of considerable value to many workers who are attempting to correlate batch data to columnar performances.

The book contains a good index and the references represent a most valuable collection of well-selected material. The author is to be complimented for his command of the English language which is not his native tongue and his apology in the preface is entirely unnecessary.

The book will be of considerable use to those interested in the theory and fundamentals of ion exchange but will be of limited value to the technologist or engineer primarily interested in the various practical applications in this field. The figures, drawings, and tables in the book are clear and well-reproduced and errors are few and minor.

Introduction to Molecular Spectroscopy. *G. M. Barrow.* xiii + 318 pages. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. 1962. \$10.75.

Reviewed by James R. Scherer, Dow Chemical Co., Midland, Mich.

Molecular spectroscopy has been used as an analytical tool for a number of years, but, for the most part, many people primarily concerned with the analytical applications have had little encounter with the fundamental principles of the subject. This book should serve to fill the theoretical gap for the non-spectroscopist as well as provide a sound introduction for the student beginning a career in spectroscopy.

It is not an easy task to write an introductory book on such a diverse subject. The avenues of research are so many that one might be easily tempted to over-expand the presentation of the subject matter and, in so doing, lose the audience for which it was intended. The author has successfully resisted such temptations and by so doing is to be commended. In a few instances the presentation is somewhat specialized, however, these sections are specifically marked and, as the author

states, may be "omitted without destroying the continuity of the book."

No prior knowledge of quantum mechanics or group theory is necessary; however, the reader should have a familiarity with calculus and elementary matrix algebra. Approximately half of the book is concerned with rotation (microwave) and vibration-rotation (infrared) spectroscopy, one quarter with electronic (visible and ultraviolet) spectroscopy. The remain-

ing quarter is spent acquainting the reader with the necessary quantum theory and group theory for a study of these three fields.

The section on molecular symmetry provides a very nice introduction to the use of group theory in molecular spectroscopy. Examples are given illustrating the reduction of reducible representations and the determination of the symmetry and infrared activity of vibrations. Some difficulty will be

had in reconciling the symmetry operations of the group V_d with the artists conception of the allene molecule in Figure 8-1; however, correction of this figure by the student should prove a useful exercise.

A classical treatment of the rotating linear molecule is used to introduce microwave spectroscopy and wave mechanical results are subsequently used to arrive at the correct quantization of the rotational energy. The spectra are shown to arise naturally from application of selection rules to the rotational transitions. The spectra of symmetric and asymmetric tops are also explained analytically from the point of view of the allowed rotational transitions. Similar methods are used to analyze the vibration-rotation spectra of diatomic, linear, and symmetric top molecules. In keeping with the intended introductory nature of the book, the more sophisticated analyses of the band shapes of asymmetric tops are not given.

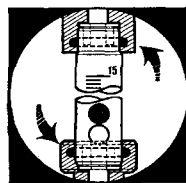
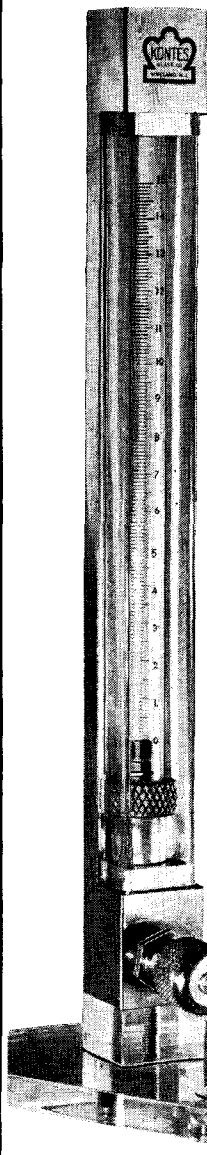
The methods by which vibrational frequencies are calculated for polyatomic molecules are outlined in a special section, and in particular, expressions relating the frequencies to force constants and masses are derived, step by step, for a linear triatomic molecule. Wilsons GF formulation is introduced and the G matrix is shown to be the inverse kinetic energy matrix. Some confusion is introduced in this section by requiring that the rotational and translational velocity of a moving molecule in Cartesian space be zero instead of using the more meaningful statement that there be no coupling between the rotational-translational and vibrational parts of the kinetic energy. This rather fine point does not detract significantly from the clear presentation of the remaining parts of this chapter and in particular the introduction to the use of s vectors.

In view of the importance of Raman spectroscopy to the field of molecular vibrations, it is unfortunate that the author has omitted any introduction to this subject. Some discussion is given regarding the selection rules for Raman bands but without suitable introductory material such terms as "polarizability components" will have little meaning for the novice.

The electronic spectra of diatomic molecules is considered in some detail and analysis of the vibrational and rotational features of electronic transitions is illustrated with the use of actual examples. The sections on the electronic spectra of polyatomic molecules are written in an equally clear manner.

This book is highly recommended.

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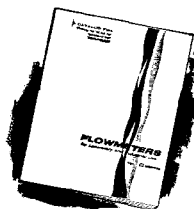
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Analytical Chemistry of Polymers.
Vol. XII. Part II: Molecular Structure and Chemical Groups. xiii + 619 pages. \$17.50. **Part III: Identification Procedures and Chemical Analysis.** xii + 566 pages. \$16.50. Gordon M. Kline, editor. Interscience Division, John Wiley & Sons, Inc., 440 Park Ave., So., New York 16, N. Y. 1962.

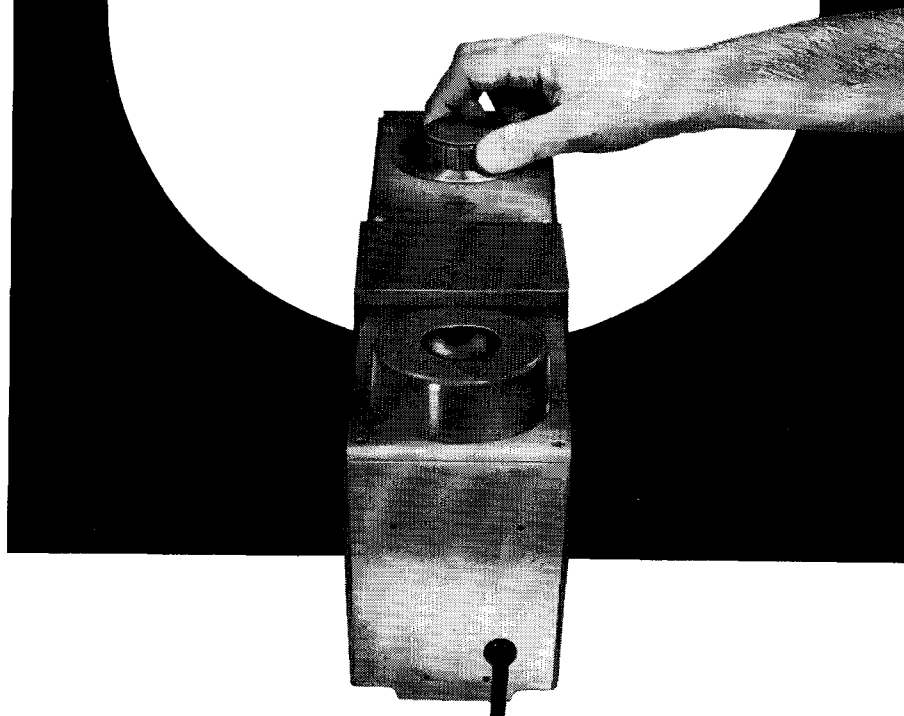
*Reviewed by John Mitchell, Jr.,
 Plastics Department, E. I. du Pont de Nemours & Co., Wilmington, Del.*

This group of three books comprises Volume XII of the High Polymers series. Part I, published in 1959, dealt with routine methods used by industry for the control of purity of monomers and polymers. Parts II and III consist of a series of contributed chapters by scientists from the National Bureau of Standards on techniques for determining chemical and physical structure. Part II contains 12 chapters covering techniques for estimating molecular weights and sizes, x-ray diffraction, optical methods, differential thermal analysis, pyrolysis, mass spectrometry, ultraviolet and infrared spectrophotometry, fluorescence, chromatography, polarography, and magnetic resonance spectroscopy. Part III describes systematic procedures, color tests, microscopy, radiochemical analysis, and end-group analysis. In Part III, 146 pages, over 25% of the total, are devoted to cumulative author and subject indexes for Parts I-III. The latter is useful, but this reviewer doubts if the former will be of much value.

This group of books has a worthwhile objective. The subject matter is well chosen. In general, background information is good and modern techniques are discussed. Unfortunately, this reviewer and his associates felt that in most chapters the author was anxious to complete his assigned task and was reluctant to revise his manuscript to account for new developments. This is reflected in reasonably good literature coverage to 1958 but very spotty thereafter. Several important contributions have been made over the last few years, many of which have affected our understanding of polymer architecture. An effort was made to improve this situation by listing 145 general references to recent publications at the end of Part III. For the most part, these referred to books and reviews, several of which appeared in 1960. In a few cases, extra references were added at the end of a chapter.

The short, 30 pages, chapter on x-ray diffraction presented a fairly good

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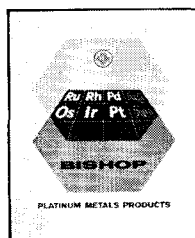
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description of the scope of x-ray studies but was restricted. Of the 57 references, only five are from 1957 or later. Ideas on polymer morphology have changed considerably over the last few years; for example, the folded chain lamellar structure has now displaced the "fringed micelle theory." This is further reflected in the statement that single crystals of polymers have never been isolated. Actually, Till published his paper of single crystals of polyethylene in *J. Polymer Science*, April, 1957. One glaring error is that of Figure 6, described as being a flat plate rotation photograph, which actually is a Laue photograph taken with a stationary crystal and "white" radiation.

The dated approach is illustrated further in chapters on differential thermal analysis and pyrolysis. The discussion is a fine appraisal of status in 1958. Excellent reviews by Ke in *Organic Analysis* in 1960 and Murphy in the 1960 review issue of *ANALYTICAL CHEMISTRY* were omitted. Techniques were not mentioned in which pyrolysis has been combined with gas chromatography, infrared, mass spectrometry, etc. Actually, mention of pyrolysis was made in the chapters on infrared spectrophotometry and mass spectrometry and simple cross-referencing would have sufficed. The section on electron spin resonance was very good.

Limitations appear throughout both volumes, and in several cases unfortunate typographical errors were not picked up; e.g., Table III of the ultraviolet chapter lists the range of 2300-2500A for C-C groups. Inclusion of N-D, C-D, and O-D groups in Table V of the infrared chapter would have been more reasonable if some mention of deuterium exchange techniques had been made in the text. In the same chapter, Figure 8, showing an infrared correlation chart, is too small to be of much use.

The chapter on "Systematic Procedures" in Part III is quite good, particularly tables covering burning characteristics and physical properties. However, this reviewer would have preferred to see more emphasis placed on infrared and other absorption techniques for polymer identification, the oxygen flask method for rapid decomposition of organic polymers, and use of differential thermal analysis for melting and freezing points. This chapter also was sparse in recent contributions; of 174 references, only 27 were in 1959 or later. It is surprising that no mention was made of the use of infrared spectrophotometry for end-group analysis.

In spite of the fact that this group of

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volumes is dated, they will assist the newcomer in the field of polymer characterization. This reviewer appreciates the assistance given him by several of his associates in reviewing these volumes, particularly E. G. Brame, J. Chiu, A. L. Ryland, N. K. J. Symons, and F. C. Wilson.

Planning, Construction and Equipment of Laboratories. B. Dehlgolm, R. Djurtoft, K. E. Nielsen, and P. Niepoort, editors. 555 pages.

The Chemical Section at The Institution of Danish Civil Engineers (Teknisk Forlag), 29 Vester Farimagsgade, Copenhagen V., Denmark. 1961. D. kr. 150.

This book, written in Danish, results from the studies of a group of about 80 Danish chemists, architects, etc. who have been visiting laboratories in Denmark and Sweden. The book contains ten chapters on the following topics: Choice of site, type of building, economics of building; Building materials;

Laboratory furnishings; Supply services; Subsidiary equipment rooms; Service rooms; Chemical laboratories; Isotope laboratories, Biological laboratories, and animal houses; and Pilot plants.

Great efforts have been made to gather the maximum amount of practical information, and to present the material in a concentrated and precise way. A special cross-index has been included so that the book may also be used for reference. Building costs and the distribution of area in six Danish laboratories (planned and built in the period 1954-1962) have been analyzed. The chapter on biological laboratories and animal houses is particularly detailed, and contains much information that has hitherto not been available.

In the first chapters of the book, which deal chiefly with the domains of the architect and the engineer, use of special terms is minimized so that the text can easily be understood by both chemists and laboratory staff. Also, the special laboratory problems, mainly dealt with in the last chapters, are described in such a way that the architect or engineer appointed to the task of planning and building a laboratory will be able to appreciate the requirements of such a place.

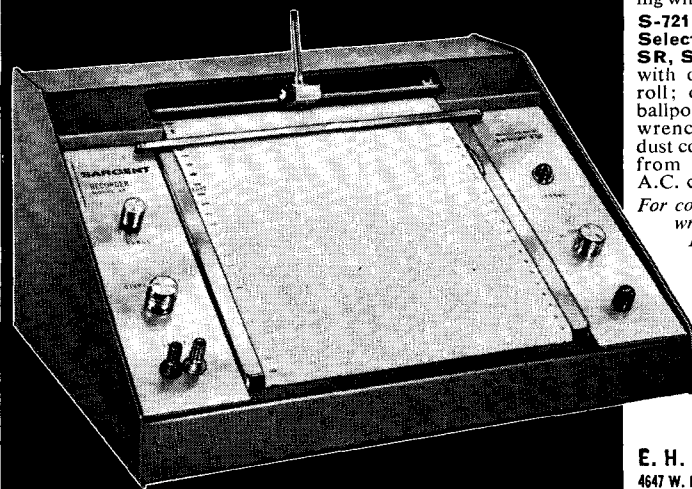
International Directory of Radioisotopes. 2nd ed., revised. xi + 697 pages. International Publications, Inc., 801 Third Ave., New York 22, N. Y. 1962. \$9.

This cloth-bound, single volume, replaces the two-volume, paper-bound edition published in 1959. The revised directory contains information on most radioisotopes and labeled compounds which are sold or distributed by the major suppliers in the world. It has been brought up to date as of June 1962.

Part I contains complete Tables of Radioisotopes, including unprocessed and processed isotope preparations, compounds of isotopes other than those in Part II, and solid radiation-sources for special applications. Isotopes are arranged alphabetically with important current physical information given such as half-lives and radiations.

Part II contains a list of compounds labeled with carbon-14, hydrogen-3, iodine-131, phosphorus-32, and sulfur-35. Compounds of each isotope have been arranged in alphabetical order by their most familiar names; synonyms for these names are in the alphabetical index at the end of the Directory.

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1960 Book of ASTM Methods for Chemical Analysis of Metals. 722 pages. American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pa. \$11.00. ASTM Members \$8.80.

This volume replaces the 1955 edition and represents the work of ASTM Committee E-3 on Chemical Analysis of Metals. There are 61 standards compared to 47 in the previous volume.

The methods have been chosen as suitable for determining compliance with specification requirements with the minimum expenditure of time and effort, consistent with suitable accuracy. While primarily of a referee nature, the methods can be adapted for rapid routine analysis.

The methods are indexed under metal covered and the substance being determined. Also, all methods in certain special classes such as photometric are so listed.

Among the topics covered are: sampling methods; analysis of ferrous metals, nonferrous metal; analysis of metal powders; spectrochemical analysis; and microchemical analysis.

Temperature. Its Measurement and Control in Science and Industry.

Vol. 3. Charles M. Herzfeld, editor-in-chief. Part 2, Applied Methods and Instruments. A. I. Dahl, editor. xiv + 1094 pages. Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 1962. \$29.50.

Volume 3 consists of most of the papers presented at the Fourth Symposium of "Temperature, Its Measurement and Control in Science and Industry," held March 27 to 31, 1961, in Columbus, Ohio. This symposium was sponsored by the American Institute of Physics, the Instrument Society of America, and the National Bureau of Standards. Part 1, Basic Concepts, Standards and Methods, treats basic definitions, principles, standards, and some results in basic science. Part 3, Biology and Medicine, treats in considerable detail problems which arise in those fields.

Part 2 brings together approximately 100 papers under the following section headings: 1. Thermoelectric Thermometry; 2. Resistance Thermometry; 3. Radiation Thermometry; 4. Dynamic Temperature Measurements; 5. Automatic Methods of Temperature Measurement and Control; 6. Miscellaneous Temperature Measurement Methods and Techniques; and 7. Temperature Sources and Thermal Imaging Techniques.

Some duplication will be found among papers which treat a specific type of instrument or technique, but since each author treats the subject matter from a slightly different viewpoint, the reader gets a broad and complete picture of the subjects presented. A few of the papers are essentially compilations of technical data or reviews of basic principles in specific fields. This puts the reader in touch with basic information useful in determining applicability of the technologies to particular temperature measurement problems.

Nuclear Spectrometer Applications.

W. H. Bradley and R. H. Huebner. xii + 218 pages. Paperbound. Nuclear Measurement Corp., Indianapolis, Ind. 1962. \$10.

This application manual on gamma spectrometry contains 100 illustrations of actual gamma, x-ray, and beta spectra. All but three are based upon the Sliding Pulse Spectrometer designed and built by Nuclear Measurement Corp. The book provides some theory of gamma spectrometry and considers the detection of x-rays and beta rays with the gamma spectrometer. Included is a glossary of terms and a bibliography.

U. S. Government Publications

The following publications are available from the Office of Technical Services, Washington 25, D. C.

List of 4,500 Atomic Research Reports.

The Atomic Energy Commission has issued a free list of AEC research and development reports offered for sale by the Office of Technical Services, U. S. Department of Commerce. Request AEC Price List No. 38. Among the fields covered by the reports are biology and medicine, chemistry, controlled thermonuclear processes, engineering and equipment, geology and mineralogy, health and safety, instruments, isotopes, mathematics, computers, metals, ceramics, meteorology, peaceful applications of nuclear explosions, physics, and reactor technology.

Glove Boxes and Containment Enclosures. (TID-16020). *United States Atomic Energy Commission. 1962. Paperbound. 142 pages. \$1.50.*

The report covers glove box con-

struction materials, auxiliary components, safety and fire prevention methods, health physics problems, operational considerations, and brief descriptions of AEC glove box installations. This report was prepared to establish guide lines for the design of efficient, safe, and economical glove boxes.

Detection Device for Hydrogen in Sodium. *K. A. Davis, North American Aviation, Inc., for U. S. Atomic Energy Commission. January 1962. 13 pages. 50 cents.*

A laboratory device that can detect trace amounts of hydrogen in sodium is described. Testing of the device showed sufficient sensitivity to detect 1.4 p.p.m. of hydrogen.

Some Recently Developed Chemical and Physical Analytical Methods.

R. G. Gutmacher and others. University of California for U. S. Atomic Energy Commission. April 1961. 41 pages. \$1.00.

The methods are: the determination of uranium in beryllium oxide-uranium oxide mixtures; determination of milligram amounts of sulfate in beryllium oxide; spectrographic determination of impurities in beryllium oxide powder, high-fired beryllium oxide, and high-fired beryllium oxide-uranium oxide; microdetermination of aromatic nitro compounds, nitrocellulose, and cyclic nitromines; determination of Kel-F and/or Teflon in plastic bonded explosives; preparation of boron trifluoride for isotope ratio determination; and a helium densitometer.

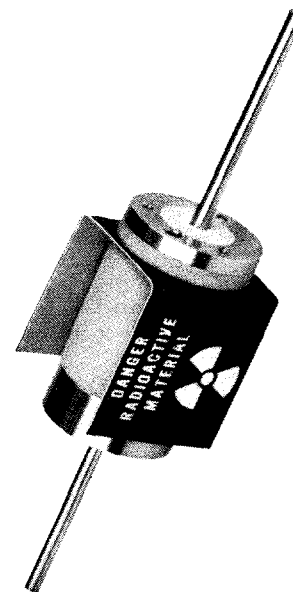
The following can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Experimental Transition Probabilities for Spectral Lines of Seventy Elements.

C. H. Corliss and W. R. Bozman, National Bureau of Standards Monograph 53. July 20, 1962. 562 pages. \$4.25.

Experimental transition probabilities for 25,000 spectral lines of 70 elements have been derived at NBS. This work has increased the number of known transition probabilities for these elements by a factor of 10. The values are derived from the recently published NBS *Tables of Spectral-Line Intensities*

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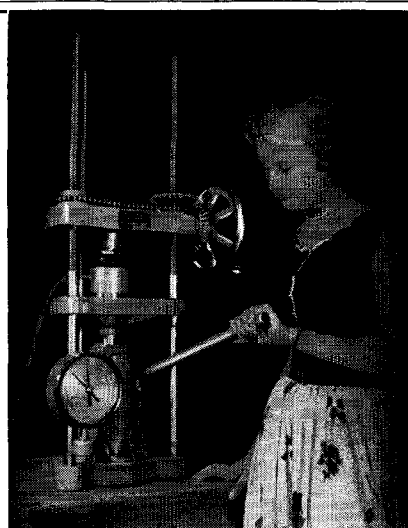
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in which are reported the lines most commonly encountered in arc spectra between 2000 and 9000 Å.

The results are presented in tabular form, with the wavelength in angstroms, energy levels to the nearest kayser, gÅ in the units of 10^8 per second, gf, and log gf given for each line.

Annotated Bibliography on Soft X-Ray Spectroscopy. H. Yakowitz and J. R. Cuthill, *National Bureau of Standards Monograph 52*. 108 pages. 1962. \$1.

Containing some 550 references, this bibliography is reasonably complete for the soft x-ray spectroscopy literature for the decade 1950-1960. The emphasis is on the application of soft x-ray spectroscopy to the study of valence band electronic states in metals and alloys. The spectral region of 25 to 800 Å involving ruled glass grating spectrometers is therefore of principal interest. However, considerable data have been gathered on valence electronic states by means of high energy transitions involving the use of crystal spectrometers; these references are included. Subject, author, x-ray band, material, and other indexes are given.

Tables of Einstein Functions: Vibrational Contributions to the Thermodynamic Functions. Joseph Hilsenrath and G. G. Ziegler. *National Bureau of Standards Monograph 49*. 1962. 258 pages. \$2.75.

This publication is one of a series of NBS publications presenting definitive thermodynamic data of interest in pure and applied science and in technology. The tables of Einstein functions should be useful in estimating the thermodynamic properties of polyatomic gases at high and low temperature, as well as the heat conductivity and electrical conductivity of solids. Tables are presented for the contribution of a harmonic oscillator to the free energy function, enthalpy function, entropy, and heat capacity of gases.

The recent acceptance by physicists and chemists of new values for the fundamental constants and the continued demand for expanded and convenient tables prompted the recomputation and preparation of this volume. An effort was made to incorporate a number of the more desirable features of already published works, particularly with respect to their use in calculations involving: thermodynamic properties of gases; specific heats, electrical and thermal conductivity of solids; and molecular structure and spectroscopy of diatomic and polyatomic molecules.