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# BOOK REVIEWS

THE STUDIO HANDBOOK OF MINERALS: A GUIDE TO GEM AND MINERAL COLLECTING. By Hellmuth Boegel. Revised and edited by John Sinkankas. Translated by Eva Fejer and Patricia Walker. The Viking Press, Inc., New York, 1972. 304 pages. $8.95.

This small but informative handbook provides the beginning and intermediate mineral collector with the tools he needs to make many field identifications of minerals. The editor has succeeded in fulfilling his two objectives set forth in the preface, the most important being a treatment of mineral origin and mineral deposits formation. This should be of help to the mineral collector in recognizing other possible minerals which may occur in association with specific minerals of interest.

Over 250 different minerals are described in the text with useful properties and details of origin. A unique feature of the book is the collection of over 150 handsome watercolor illustrations of various minerals. Forty pages of mineral identification tables are included, which are indexed by page number of the text and are quite useful.

The small size (5 in. × 7¾ in.), good quality of paper and printing, and the general mode of presentation make this a worthwhile book for the serious beginning mineral collector.

G. E. Dunning
*General Electric Company*

AN ESSAY ABOUT THE ORIGINE AND VIRTUES OF GEMS. By Robert Boyle. (Facsimile of the 1672 Edition.) Hafner Publishing Company, New York, 1972. *Contributions to the History of Geology, Volume 7.* Edited by George W. White, with an introduction by Arthur F. Hagner. 185 pages. $14.95.

Robert Boyle was one of the principal figures in making the transition from a dying Hermetic tradition to the new mechanical philosophy. One of the ways in which he accomplished this was his "Essay about the origine and virtues of gems" published exactly 300 years ago (1672). A convinced advocate of the new philosophy of Francis Bacon, and a founder of the Royal Society of London whose motto was *"nulla in verbis"*, Boyle developed the new doctrine of matter in "New experiments physico-mechanicall touching of the air . . ." (1660), "The sceptical chymist" (1661), and "The origine of formes and qualities" (1666). He called it 'corpuscularian' and sometimes Pythagorean because material substance and properties were treated as ultimately referrable to fundamental particles, their numbers, texture and configurations. As such the doctrine was opposed to the Peripatetic (Aristotelian) view of the scholastics which, applied to minerals, would have assigned to each a total *form* (being the sum of its attributes and the basis for its classification, inseparable from the mineral itself). Qualities and virtues such as gravity, magnetism, ductility, and especially color were readily understood by the peripatetic point of view, but the scholastics, particularly in considering the medical-magic properties of gems, were overly credulous. Boyle had no intention of dismissing all thought of virtues because,

besides such mysterious effluvia as magnetic force, the physiological effects of minerals were easily demonstrated (laxative, poison, vermifuge, *etc.*), The experimental method alone would not resolve the dispute, but Boyle used it to try to correct the more extravagant ideas of the virtues of gems and to try to arrive at a mechanical explanation for their occurrence and properties. His reasoning, as for example in his use of fluid inclusions as evidence for the fluid origin of gems, is a demonstration of the quality of thought of the 17th century.

We are indebted for this fine facsimile of the original to the editor George White, whose tireless industry and encyclopedic knowledge of the literature of early geology are a force for the development of historical studies unparalled in my experience. There is a first rate introduction by Arthur Hagner and a useful bibliography and glossary (no index unfortunately). This is a book for students at all levels and especially for the mineralogist's personal shelf.

CECIL J. SCHNEER
*University of New Hampshire*

PROFESSOR SEITARO TSUBOI IN PETROLOGY AND ALLIED FIELDS. Mainly in English, partly in Japanese, with a foreword by nine eminent Japanese geologists. Published by the Earthquake Research Institute, University of Tokyo, to commemorate his 77th birthdate. 320 pages.

Professor Tsuboi contributed early to the practical application of crystal optics to minerals, with considerable emphasis on the plagioclase feldspars, before X-ray studies provided the guidance that is now available. Some of his diagrams are as serviceable as others of more recent date, and are used in modern laboratories with minor revisions. He has been an ardent student of minerals and their properties, and he applied his data extensively in his interpretations of petrogenic theory. His efforts have contributed effectively to petrologic development over the years.

The book is a summation of Professor Tsuboi's work and is a fine tribute to an accomplished scientist. The book is in two parts—Part I is a review of his career as a petrologist. Part II is a 300 page selection of excerpts from his publications, most of which are known to those of us who have worked in similar fields of endeavor and have employed his methods. A survey of Professor Tsuboi's work is also a review of a stage in petrologic development that may have been forgotten in the speed of events.

R. C. EMMONS
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ELECTRON PROBE MICROANALYSIS, 2nd ed. By L. S. Birks. Wiley-Interscience, New York, 1971. 190 pages. $14.95.

The decade of the sixties saw a remarkable advance in the technique of electron probe microanalysis to the extent that it is now a virtually indispensible tool in petrologic research. Data collection and reduction processes have progressed to the point that programmed spectrometers and on line data processing permit virtually instantaneous quantitative analyses of selected areas in a sample. Since the development of the technique now appears to

have reached a temporary plateau, it is appropriate that Birks, one of the acknowledged leaders in the field, should revise his popular text on microanalysis. The revised edition follows essentially the same format as the first edition with most chapters updated to include advances in the eight year interval between editions. The book is particularly useful to the neophyte analyst since it emphasizes general principles and standard methods needed for a proper use of the instrument. I have found it a most useful basic text for teaching purposes, but, as a geologist, I would have preferred a more detailed exposition of mineralogical applications and the special problems associated with such applications. Fortunately, however, the literature contains several excellent papers, written with the geologist in mind, which form an excellent supplement.

The first two chapters are essentially unchanged from the first edition while Chapter 3 provides an updated, concise account of the design, operation, aberrations, and alignment of the electron optics system. The basic theory of wavelength dispersion, with much useful information of a practical nature, is discussed in Chapter 4, while Chapter 5 describes conventional detectors with a short discussion of the increasingly popular solid state detectors. Chapter 5 concludes with a brief discussion of energy dispersion techniques which are rapidly replacing the traditional, time–consuming, wavelength scanning methods of semi–quantitative analysis. The chapter on specimen preparation and examination should prove useful to those analysts faced with special problems. The author is careful to title Chapter 7—Introduction to Quantitative Analysis. Much has been written on this controversial subject and the author is content to outline the currently most acceptable methods of data reduction. Most of the tedious calculations are now computerized and the present–day analyst has no fewer than forty computer programs at his disposal. Birks believes that computer methods based on theoretical expressions for the physical processes of X–ray generation are the wave of the future although such methods have not yet found wide acceptance. The final chapter briefly discusses related techniques including ion probe microanalysis and electron spectrometry. Six appendices contain recent compilations of mass attenuation coefficients, fluorescent yields, jump factors, excitation energies, characteristic wavelengths, and *d*–spacings of analyser crystals.

The book is well written, up to date, reasonably priced, and remarkably free of typographical errors. It will be of greatest use to those of us who teach courses in electron probe analysis and to inexperienced analysts who wish to learn the principles of the technique.

I. S. McCallum
*University of Washington*

DIE RESULTATE DER ÄTZMETHODE AN KRISTALLEN DER GLIMMERGRUPPE. By Karl Heinz Brauer. Akademie–Verlag, Berlin, D.D.R., 1971. 116 pages. 20DM.

This booklet is intended particularly for the researcher interested in the field of mica structures and polymorphism/polytypism problems in these minerals. After a short (2 pages) introduction in which the necessity of an accurate knowledge of mica structures is underlined, a historical view (8 pages) of the previous results obtained by the etching techniques on micas is given. A great part of

the text is devoted to the author's own results along this line. He reinstitutes the old etching method, *viz.* studying etch pits obtained by means of the gold flash decoration technique of Bassett. The optimum decoration conditions for micas are mentioned in a brief section. The central part of the book (80 pages) relates results obtained on eleven natural and synthetic species which are either end or intermediate members of joins belonging to di- and tri-octahedral micas. The high resolution of the decoration method allows the observation of etch patterns of elementary layers as well as the stacking sequence of these layers, *i.e.*, the polytypic structure in the neighborhood of the cleaved surface. The study of two dimensional symmetrics of etch pits is used by the author as a tool to investigate symmetrics in octahedral substitutions.

Species, origin, and polytypic structure of all the investigated samples (98) are presented in six tables. More than one hundred light and electron microscope micrographs have been used to illustrate the text in this chapter. Some of these micrographs are redundant (*e.g.*, figs. 88 and 87; figs. 73 and 74). Two of the micrographs (figs. 47 and 63) are not convincing in support of the stacking law as mentioned in legends. Synthesis and pertinent discussion of all observations are done in the last chapter (6 pages) called "final discussion." The book ends with a short summary and numerous (89) references.

The long narrative sentences in the descriptive section of this book will certainly make it difficult for readers with a limited knowledge of German. One would hope that this booklet will soon be available also in English translation. This work is particularly valuable for its contribution toward reestablishing the importance of etching studies as complementary to modern X-ray diffraction methods in the investigation of the structure of lamellar minerals.

A. Baronnet
*University of Provence*

MICROSCOPIC STUDY OF OPAQUE MINERALS. By R. Galopin and N. F. M. Henry. W. Heffer and Sons, Ltd., Cambridge, 1972. 322 pages.

This is a fine book. The chapters present a general survey of methods; a review ("revision") of certain phenomena in transmitted and reflected-light optics, the polarizing reflected-light microscope, and the theory of reflection from polished crystalline surfaces; an account of microscopic observations other than chemical; a summary of chemical procedures; a detailed account of the measurement of reflectance and hardness; a consideration of textures and paragenesis in mineral determination; and a note on determinative procedures with examples. Seven appendices give notes on other techniques, including radiography; list the English, French, German, and Spanish names of some ore minerals; provide a chemical classification of about 120 ore minerals; summarize the preparation of specimens; repeat the quantitative tables of Bowie and Taylor, supplementing these with tables of qualitative properties; provide extensive physical and mathematical notes on optics; and conclude with a note in French by J. Orcel on the historical development of the study of ore minerals, emphasizing microscopy. Name, subject, mineral, and symbol indexes round out the volume. Orcel's 5-page note provides a remarkably concise and virtually complete history of the discipline.

The meat of the book is the treatment of reflected-light optics, and the virtue of the treatment is its clarity and fullness. The authors have taken great care to be intelligible, both in their writing and in their graphical and geometric approach to optics. The result is, I think, the best modern treatment of reflected-light optics in English.

One can find a few aspects of the book that do not suit the fancy. The student will do well to stick to Short (1940) for microchemical tests. Galopin and Henry give much information on reagents but only seven examples of the application of the tests themselves. Paper chromatography, discussed in some detail, requires so much of the ore mineral that it hardly seems suitable for most microscopic studies. Etch reactions are given short shrift. If one has enough material for microchemical testing, chromatography, or systematic etching, the problem of mineral identification can usually be solved more quickly and less ambiguously by Sorem's technique of mounting a minute sample on a gelatin sliver and X-raying it in a powder camera. This is not a purely microscopic approach, but it is a practical one.

The ore minerals listed by properties are too few for the professional to use for identification and too many for the student to study in mastering the principles of observation. For the latter, 20 to 40 would suffice.

Typographic errors, including the printer's residual 000 for cross-referenced pages, are surprisingly frequent in a book that has obviously been put together with a great deal of care.

So much for carping. If the student of ore minerals really wants to understand the optical basis of ore microscopy and thereby take advantage of the tremendous amount of information in Ramdohr (1969), in Uytenbogaardt and Burke (1971), and in the current journals, he will study Galopin and Henry with profit.

In the early summer of 1972, this book was not easily had from dealers in the United States. I got a copy without difficulty from Blackwell's, Broad Street, Oxford, England.

B. F. Leonard
*U.S. Geological Survey*

The following errata have been supplied by the author.

| Page & Column[1] | Line[2] | |
|---|---|---|
| *v* | +7 | For s'appuie read s'appuyent. |
| *x* | +6 | This line should read: aspect by Professor Orcel in the Historical Note, which he has kindly written. |
| 11 R | +15 | For sources light read light sources. |
| 20 L | +6 | For fig. 206 read fig. 20b |
| 22 R | +18 | For 'We have been studying' read 'We shall study (p. 26)' |
| 25 R | +16 | Delete the whole line beginning 'crystals.... (fig. 26)' and replace by 'velocity varies from a value equal to that of the' |

[1] L = Left, R = Right.
[2] + is lines down; − is lines up.

| | | |
|---|---|---|
| 33 R | | In the last line of the legend for fig. 33 for ashed read dashed. |
| 35 R | | In the third line of the caption for fig. 35 for Diax read Diad. |
| 53 | | In Fig. 53 (lower) the left-hand length $f_{coll}$ should be the same as the right-hand one. The right-hand length $f_{cond}$ should be the same as the left-hand one. |
| 56 | | In Fig. 56 the left-hand length $f_{coll}$ should be the same as the right-hand one. |
| 57 L | −6 | For estimztion read estimation. |
| 60 R | +19 | For 6½% read 13% |
| | −20 | Replace the words 'from.... 10%,' by 'by about 6½% up to about 19½%,' |
| 62 L | −1 | For diaphragm read diagram |
| 93 R | −10 | Delete the comma after It also follows that |
| 110 L | −10 | Delete the whole sentence beginning 'With biaxial minerals.... ... values' (This statement is erroneous and was left over from an early faulty draft). |
| | −7 | In the next sentence delete the word 'other' and read 'In biaxial minerals ....' |
| 111 R | +27 | Replace 'to another' by 'to an other one,' |
| 112 L | −1 | For toward read away from |
| 152 L | −12 | For high read low |
| 161 L | | In the 6th line of paragraph No. 4 for cannot read must not |
| 175 R | +2 | For fig. 172 read fig. 174 |
| 176 R | +6 | For consits read consists |
| 191 | | In the legend to the insert the dashed line applies to the natural cleavage and the full line to the mechanically-polished cleavage flake. |
| 198 L | −10 | Replace the comma in occurs, by a full stop. |
| 201 L | | In Example 2 formula for Pentlandite should read $(Fe, Ni)_9S_8$. |
| 211 | | In Example V, No. 4 Cuprite is usually weakly-anisotropic although cubic in symmetry. |
| 224 | | Luzonite and Tetrahedrite have become displaced and should be in the row of Cu–minerals. |
| 233 R | +7 | For (petty) read (petit); these words fo into English as petty, middling, and great. |
| 234 | | In the Bireflectance column opposite Manganite for 2-d read s-d. |
| 241 | | Pyrolusite covers four lines of print. |
| 264 R | −14 | For unit read unity |
| 265 L | | In (vi) the two equations near the foot of the page have become telescoped, and the two seetences beginning with the word 'Where' should read as follows: Where $\mu = +0.2$ and $t = 1$ cm, to find the value of $e^{+0.2} = (y/y_0)$ we write: $0.2 = \log_e(y/y_0)$ or $0.2 \times \log_{10}e = \log_{10}(y/y_0)$, whence $(y/y_0) = 1.221$. Where $\mu = +2.0$ and $t = 1$ cm, to find the value of $e^{+2.0} = (y/y_0)$ we write: $2.0 = \log\text{-}(y/y_0)$ or $2.0 \times \log_{10}e = \log_{10}(y/y_0)$, whence $(y/y_0) = 7.389$. |

| | | |
|---|---|---|
| 295 R | | In the third line of Case 3 of the legend for coss read cross. In the fourth line of the same, for Caser read Case |
| | | Three references have been omitted, so add the following: |
| 306 | | Burns, R. G. & Vaughan, D. J., 1970; 259 Interpretation of the reflectivity of ore minerals. Amer. Miner., *55*, 1576 |
| 306 | | Cameron, E. N., 1963; 182 Optical symmetry from reflectivity measurements. *Amer. Min.*, *48*, 1070. |
| 310 | | Piller, H., 1966; 150 Colour measurements in ore-microscopy. *Mineralium Deposita*, *1*, 175 |
| 317 | | Under Manganite for 243 read 234. |
| 321 R | −13 | Symmetry should have a small letter. |

TABLES FOR MICROSCOPIC IDENTIFICATION OF ORE MINERALS. By W. Uytenbogaardt and E. A. J. Burke. American Elsevier Publishing Co., New York, 1971, *xi* + 430 pages. $18.50.

This new and completely revised edition of W. Uytenbogaardt's "Tables" promises to have a long career as a laboratory manual and reference book. The need for an up-to-date compilation of the microscopic properties of the ore minerals has long been felt, and was underscored by the wide circulation of the 1968 reprinting of the first edition (Hafner Publishing Co.).

The new edition, prepared in co-operation with a research assistant in Professor Uytenbogaardt's department at the Free University of Amsterdam, fully reflects the enormous expansion in the documentation of the properties of opaque minerals which has occurred over the past decade. Since the preparation of the first edition, reflected-light microscopy has "come of age" as a technique, employing reliable and relatively inexpensive apparatus and internationally accepted standards, thereby bringing the quantitative measurement of several diagnostic parameters within reach of most research laboratories. Equally important has been the continued technical development of small ore microscopes and the spread of adequate polishing and grinding techniques, allowing the beginning student to rely almost entirely on the optical properties of minerals for their identification. This increasing sophistication of microscopic procedure has been paralleled by the intensive application of electron microprobe analysis, integrated with X-ray powder and single-crystal studies, to ore minerals, which has, almost weekly, revealed entirely "new" mineral species, some of considerable past or potential economic importance, and has systematically redefined the compositional and structural relationships of known minerals.

The Tables provide an inventory of published data on the properties of the ore minerals, covering most references to the end of 1969, in addition to a considerable body of unpublished Vickers micro-identation hardness and reflectance data determined by Burke. As the authors point out, it is evident that our knowledge of the properties of many important minerals is still scanty, despite the great increase in activity in this field.

The arrangement of the main body of descriptive tables closely follows the scheme of the first edition, with the minerals listed in order of increasing "polishing hardness," although, in several other tables, *VHN* and minimum reflectance in air are used as the basis for presentation. The continued reliance on polishing hardness, intended to reassure inveterate users of the 1951 tables, will certainly become more awkward in future, as that most useful microscopic

feature is suppressed by improved polishing methods (although, at the present time, most laboratories would probably admit to producing sections with some "topography," at least at the routine level). In practice, this format already makes the tracing of minerals rather difficult for students who do not have access to a hardness tester, and a relatively painless changeover to *VHN* as the basis for classification should be urged for the next edition (still further expanded) which will be required in a few years.

Despite these difficulties, the writer has found that the new edition can be used successfully by undergraduate students after only a few weeks of introductory microscopic work, and, despite its rather high price, it will probably find a wide application at all levels in teaching institutions and research laboratories. The tables are most effective when used in conjunction with a micro-indentation hardness/reflectance chart of the type pioneered by S. H. U. Bowie, and most recently exemplified by the inexpensive "Reflectivity and Vickers Microhardness of Ore Minerals," *Geol. Surv. Can. Pap. No.* 68-64 (1969).

The tables are strongly bound and clearly printed, and are remarkably free from serious misprints. As was the case with the first edition, there is plenty of space in the main section of the tables for the insertion of notes on the user's own findings, and on new literature data.

ALAN H. CLARK
*Queen's University*

MODERN METALLOGRAPHIC TECHNIQUES AND THEIR APPLICATIONS. By Victor A. Phillips. Wiley-Interscience, New York, 1971, 538 p. $27.50.

Phillips' book is concerned with the application of metallographic techniques, the equipment with which to apply them, and some of the principles fundamental to both. The nine chapters treat metallographic methods of revealing structure, microindentation hardness testing, optical microscopy, low-energy electron diffraction and Auger electron analysis, conventional electron microscopy, specialized electron microscopy, X-ray microscopy, scanning electron microscopy, and electron microprobe analysis. Thus about two-thirds of the book deals with subjects that few of us students of ore minerals are well acquainted with, though the optical microscope or the electron microscope is a part of them all.

The book can open our eyes to a lot of new techniques and applications, especially through its excellent and abundant photographs, of which there are more than a hundred. A third of these photos illustrate equipment, the rest applications. As to the principles, one must judge cautiously. Reflected- and transmitted-light microscopy, microindentation hardness, and electron microprobe analysis by the use of suitable standards are, I think, treated better in other works.

The mineralogist looking for new approaches, especially through the varied forms of electron microscopy, may find the book stimulating and to that extent useful. The book may not dispel the mistaken notion of some mineralogists that metallography is merely techniques and their application; but we should

recognize that the book is intended for metallographers and metallurgists, not for ore microscopists and mineralogists.

B. F. LEONARD
*U.S. Geological Survey*

HANDBOOK OF ELEMENTAL ABUNDANCES IN METEORITES. Edited by Brian Mason. Gordon and Breach Science Publishers, New York, 1971. 555 pages. $35.00.

Anyone who has ever gone through the often frustrating process of trying to find reliable data on the abundance of a given element in a given class of meteorites will find this book to be a tremendous asset. Whereas previously it was necessary either to search the literature or settle for the rather incomplete and sometimes outdated analyses tabulated in various meteoritic catalogues and books about meteorites, one now has compiled into a single reference large numbers of analyses for every element in most classes of meteorites as well as many separated phases.

The book has 555 pages and is actually a series of chapters by various authors, compiled and edited by Brian Mason. Each chapter concerns either an individual element or a group of chemically similar elements, such as the Lanthanide rare earth, making reference to data for a given element quite convenient.

Since the various chapters were written by different authors, the quality of the writing varies somewhat, but is in general quite good. Many of the authors spend some time discussing the accuracy, precision, and representativeness of the analyses for a given element in the various classes of meteorites. While most of these discussions are somewhat qualitative, they are one of the most helpful features of the book, since they allow the reader, even one who is unfamilar with the various methods of determining a given element, to gain some feeling for the meaningfulness of the data. The book also contains an index of meteorites, so that data for a specific meteorite can be conveniently found. In general, however, emphasis is on concentration ranges for the various classes of meteorites rather than on data for individual meteorites. Each chapter concludes with a list of references, which is very helpful, so that the book can be used as a bibliography as well as a reference in its own right.

The tables and figures are in general fairly clear. Of course, each of the contributing authors presents his data in a slightly different way, so that the variety of figures and tables can be a little bewildering at first, but if the various captions and headings are read carefully there should be little confusion. The data tables do seem a little spread out and diluted by the relatively large amount of text, but most of the text seems worthwhile. Perhaps the data tables could have been condensed in the back of the book for the use of the person who wants a lot of numbers in a short time.

The handbook also contains an introduction to meteoritics, which suffers a little from being too short, particularly in its lack of discussion of achondritic and stoney iron meteorites. Nonetheless, the reader can always refer to one of the standard books about meteorites for more information.

In summary, the shortcomings of this book are relatively minor and its values considerable, so that the reviewer would strongly recommend a copy to everyone interested in the field of meteorites.

JONTHAN FRUCHTER
*University of Oregon*

NATURE OF THE SOLID EARTH. Edited by Eugene C. Robertson. McGraw-Hill, Inc., New York, 1972. 677 p. $13.50.

A symposium held under the auspices of the Upper Mantle Project at Harvard University, 16–18 April, 1970, to honor Professor Francis Bird. Taken together, the 23 invited papers nicely survey the large scale geophysics and geochemistry of the earth. Those on mineralogy of the deep mantle by A. E. Ringwood and on elastic constants of minerals by Orson L. Anderson will be of particular interest to readers of this journal. The volume might well be used for a course, and its price is competitive with textbooks in the field.

WILLIAM T. HOLSER

RESEARCH TECHNIQUES FOR HIGH PRESSURE AND HIGH TEMPERATURE. Edited by GENE C. ULMER. Springer-Verlag, New York Inc., New York, 1971. 368 pages. $10.00.

The book is not as comprehensive as its general title suggests. Many techniques that have been developed for studies in chemistry and physics are not included. It will be of specific value in geochemistry and mineralogy laboratories where experiments are being set up to run at high pressures and temperatures. It is written by experts who provide practical advice derived from personal experience, including necessary notes of caution in operating high pressure and temperature apparatus.

Chapters may be grouped under a few headings. Following an editorial introduction with references to more general sources, three chapters are specifically concerned with the buffering of gaseous fugacities. Chapter 2 (Nafziger, Ulmer, Woermann), reviews the means of buffering gaseous fugacities in high temperature, one atmosphere experiments, while in Chapter 4 W. B. White describes experiments on high temperature phase equilibria using directly controlled high oxygen pressures. Huebner's Chapter 5 has the broad title "Buffering Techniques for Hydrostatic Systems at Elevated Pressures" but is specifically concerned with gas fugacity control (particularly oxygen, hydrogen, and carbon dioxide) by mineral equilibrium buffers in rod–bomb and capsule type experiments. It is not a general coverage of chemical buffers. In Chapter 3 Sato gives a well-balanced presentation of the measurement of oxygen fugacities with solid electrolyte systems, with sufficient theory, and good practical advice on procedures and limitations.

A second group of chapters is concerned with setting up and operating general experimental procedures in mineralogical research. In Chapter 6 Boettcher and Kerrick describe the operation of rod–bombs with minimum temperature errors. Bell and Williams in Chapter 7 review the difficulties and possible errors in pressure calibration in piston–cylinder apparatus, while Holloway in Chapter 8 gives a practical introduction to the construction, operation, and hazards of internally-heated pressure vessels.

The remaining chapters concern more specific techniques. Presnall writes on the problems of accurately measuring gas compressibilities, and Walter on the measurement of silicate vapor pressures. Kullerud, and Barnes, summarise their wide experience with dry sulfide, and hydrothermal sulfide experimental systems, respectively, with the emphasis on techniques used in their own laboratories.

As in many books of edited contributions, the chapters are uneven in style and objective, ranging from major reviews to a specific investigation report. Coverage of background references is variable, but on the average good. There is overlap of material in several chapters which could have been eliminated by editing, but the book has clear print and good diagrams; typographical errors are few and obvious.

In summary, the book is strongly recommended for a place on the shelf in laboratories doing high pressure and temperature mineralogical work. It will be a good starting point when setting up many new procedures, and in introducing new staff to work.

A. J. Ellis
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