

BOOK REVIEWS

GEOCHEMICAL EXPLORATION METHODS FOR MINERAL DEPOSITS. By A. A. Beus and S. V. Grigorian (technical editor A. A. Levinson, translated by R. Teteruk-Schneider). Applied Publishing Ltd., Wilmette, Illinois, 1977. x + 287 pages. \$32.00.

This book is divided into eleven chapters, the first of which includes interesting tabulations of geochemical abundances in various rock types, and criteria for determining anomalous values. Surprisingly, no mention is made of earlier work by Clarke, Rankama and Sahama, Goldschmidt, Adler, *etc.*, and the book retains a provincial flavor throughout.

Following an all-too-brief discussion of elemental migration is a treatment of "geochemical specialization", *i.e.* how to plan geochemical prospecting. The absolute necessity of preliminary spectrographic analysis is rightly stressed, and the much greater value of interelement correlation is treated well. Two approaches are considered: finding primary geochemical aureoles (halos), and identifying intrusive rocks likely to produce metallization. Russian techniques are well advanced in the latter area. The need for close comparison of geochemical and petrographic results is mentioned, a fact that warms this reviewer's heart.

A lengthy discussion of primary halos related to various ore types and geometries contains numerous interesting examples and the need to understand sought-for ore mineralogy to plan analysis is repeatedly demonstrated.

The chapter on secondary halos and dispersion trains in broad-scale prospecting offers few clues likely to prove useful. Test cases should always be made, and discussion of some is called for. Also lacking is a discussion of supergene behavior shown by various elements. Brief chapters on water analysis, plants, and atmospheric methods follow.

A chapter on application of geochemical methods is fascinating, and the book ends with a discussion of statistical treatment of results.

One wonders, after reading this book, how applicable thorough geochemical study is in highly competitive prospecting in the western world. The thorough studies done in the Soviet Union might be too time-consuming here. On the other hand, the book is bound to enrich the reader, and should provoke those who always analyze for the same three or four elements to give more thought to their work. I recommend this book to my colleagues in industry especially.

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SEA WATER: CYCLES OF THE MAJOR ELEMENTS. Edited by James I. Drever. Dowden, Hutchinson and Ross, Inc., New York, 1977. 345 pages. \$28.00.

Sea Water: Cycles of the Major Elements is a collection of 19 reprints, deftly knit together by the Editor's comments, and published as Volume 45 of the *Benchmark Papers in Geology*. Professor Drever has chosen to follow a historical approach. The history of the subject unfolds quite naturally from its 18th century beginnings, through the Sillen period, into the last decade with its

accumulation of data, the retreat from certainty, and the development of what may turn out to be a reasonable view of the mechanisms by which the major elements are removed from sea water.

The volume therefore serves as a valuable introduction not only to an important area of geochemical inquiry, but also to an unfinished chapter in the history of science. Only the price of the volume is bothersome. Most scientists in the field of marine geochemistry either have reprints of these important papers or have ready access to them. Students should be a prime market for this book, but at a price of \$28.00 the volume is largely out of their reach. I hope that the publishers can be convinced to issue a paperback edition at a price which is at least competitive with that of an equivalent collection of xerox copies.

HEINRICH D. HOLLAND
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SEDIMENTARY PETROLOGY Part III. THE ORIGIN OF SEDIMENTS AND SEDIMENTARY ROCKS. By W. von Engelhardt (translated by W. D. Johns). E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, Germany, 1977. 359 pages. DM98 (about \$44.00).

This book is the third in a series of references that attempt to cover the field of sedimentary petrology. Preceding texts, authored by mineralogists and sedimentologists of renown, focus on methodology (Part I) and descriptive mineralogy, texture, and diagenesis (Part II). The present effort, a slightly revised translation of the 1973 German edition, assumes familiarity with the material covered in these earlier volumes. Here, the emphasis is on processes, both physical and chemical, involved in the accumulation of sedimentary deposits, and the subject is treated in five categories: parent materials, weathering, transport and deposition of clastic constituents by water and wind, formation of chemical sediments, and diagenesis. These aspects are presented in a clear and concise manner for use by advanced students and those with experience in the area of sedimentary petrology.

The author is to be commended for having synthesized a considerable wealth of information in a compact compendium, and his coverage of such a broad subject is generally successful. The book provides a list of key references, a good subject index, a summary of data listed in 57 tables and 134 illustrations, most of them graphs. The quality of the translation is generally good and only rarely does the stilted Anglo-Germanic style detract from the presentation.

The geochemical aspects are somewhat more comprehensively treated than those pertaining to physical processes and mechanics of transport (about one third of the volume). This, to some extent, reflects the background and basic interests of the author. There is an effort to quantify wherever possible. Although beginning- to intermediate-level university students might well be directed to other texts on sediment transport, they nevertheless would benefit from the sections on solution processes, formation of new minerals, pore space and homogenous flow processes, composition of formation waters, and problems of diagenesis.

This book and the series to which it belongs are a welcome addition, and signal a swing from largely field-oriented and envi-

ronmental sediment studies that have dominated the subject during the past two decades toward a renewed emphasis on the petrologic aspects of sediments and sedimentary rocks. The book is overpriced, thus limiting its potential distribution, at least on this side of the Atlantic, primarily to libraries. This is unfortunate since the volume clearly belongs in the laboratory close to the scientist who is likely to use it.

DANIEL JEAN STANLEY
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Suppe, J., and R. L. Armstrong: Potassium-Argon Dating of Franciscan Metamorphic Rocks

Suppe, J.: Interrelationships of High-Pressure Metamorphism, Deformation and Sedimentation in Franciscan Tectonics, U.S.A.

V. *The Western Alps*

Wenk, E.: Zur Regionalmetamorphose und Ultrametamorphose im Lepontin

Niggli, E.: Alpine Metamorphose und Alpine Gebirgsbildung

Hunziker, J. C.: Polymetamorphism in the Monte Rosa, Western Alps

Martini, J.: Le métamorphisme dans les chaînes alpines externes et ses implications dans l'orogénèse

Dal Piaz, G. V., J. C. Hunziker, and G. Martinotti: La zona Sesia-Lanzo e l'evoluzione tettonico-metamorfica delle Alpi nordoccidentali interne

Ernst, W. G.: Interpretative Synthesis of Metamorphism in the Alps

The bulk of the text (80%) is in English. The rest is in German, French, and Italian. Editorial comment on the long Italian paper is brief, if not wanting. One wonders why a translation was not included, since in the Preface one reads "Where original works are in foreign languages, we have endeavored to locate or commission translations."

Not surprisingly, the selection of papers bears the clear stamp of the editor. His own papers and his comments on all eighteen comprise 16% of the text. As W. G. Ernst is a leading authority in this field, he is well prepared to do the job.

The book is a companion to Volume 17 of the series, *Metamorphism and Plate Tectonic Regimes* (1975) also edited by W. G. Ernst. Between them the books provide an excellent panoramic background to tectonic problems associated with belts of low-temperature metamorphic rocks, principally in the blue-schist facies, and associated ultrabasic rocks and eclogites. A book such as this emphasizes the closely related processes resulting in the world-wide association of these structures and rocks and for that reason is instructional. To a specialist, the convenience of having these papers bound together may be outweighed by the high price. It is a book that many will insist their institutional libraries acquire.

I. Y. BORG

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SUBDUCTION ZONE METAMORPHISM. Edited by W. G.

Ernst. Dowden, Hutchinson and Ross, Inc., Stroudsburg, Penn.; distributed by Halsted Press, a division of John Wiley & Sons, Inc., New York, 1975. 445 pages, \$30.00

The Benchmark Series of books, of which this is Volume 19, is intended to assemble papers from the literature that are fundamental to the understanding and study of some geologic field. An editor chooses, compiles, orders, and comments on contributions to the subject that otherwise would be widely dispersed in the literature. Presumably some preference is shown to important papers in journals that do not have wide circulation. In this volume papers from such publications as *Medd. Dansk Geol. Foren.* and *Eclogae Geol. Helv.* are reprinted, together with papers from more familiar sources. The papers span the years 1958 to 1973, and thus include some that predate the recognition of subductive processes. The reprinted papers describe five areas. The titles and authors are as follows:

I. *New Zealand*

Coombs, D. S.: Lower Grade Mineral Facies in New Zealand

Landis, C. A. and D. G. Bishop: Plate Tectonics and Regional Stratigraphic-Metamorphic Relations in the Southern Part of the New Zealand Geosyncline

Blake, M. C. Jr., and C. A. Landis: The Dun Mountain Ultramafic Belt-Permian Oceanic Crust and Upper Mantle in New Zealand

II. *New Caledonia*

Brothers, R. N.: Lawsonite-Albite Schists from Northernmost New Caledonia

Brothers, R. N. and M. C. Blake, Jr.: Tertiary Plate Tectonics and High-Pressure Metamorphism in New Caledonia

III. *Japan*

Seki, Y.: Glauconitic Regional Metamorphism in the Kanto Mountains, Central Japan

Ernst, W. G., and Y. Seki: Petrologic Comparison of the Franciscan and Sanbagawa Metamorphic Terranes

Miyashiro, A.: Orogeny, Regional Metamorphism, and Magmatism in the Japanese Islands

IV. *California*

Coleman, R. G., and D. E. Lee: Glauconite-Bearing Metamorphic Rock Types of the Cazadero Area, California

Bailey, E. H., W. P. Irwin, and D. L. Jones: Franciscan and Related Rocks, and their Significance in the Geology of Western California

Blake, M. C., Jr., W. P. Irwin, and R. G. Coleman: Upside-Down Metamorphic Zonation, Blueschist Facies, Along a Regional Thrust in California and Oregon

INTO PRINT: A PRACTICAL GUIDE TO WRITING, ILLUSTRATING, AND PUBLISHING. By Mary Hill and Wendell Cochran. William Kaufmann, Inc., Los Altos, Calif., 1977. 175 pages. \$6.95 (soft cover), \$12.00 (hard cover).

This book, by two geological editors, is an expanded version of *Geowriting: A Guide to Writing, Editing, and Printing in Earth Science* (American Geological Institute, 1974), edited by the same authors together with Peter Fenner. While it is intended for engineers and scientists of all kinds, many of the examples given are geological in nature, and the book is thus particularly suited for writers in the geological sciences. In the preface they state "With this book we hope to prepare you for the ordeal and triumph of publishing. It is a guidebook on how to write what you have to say and how to get it into print." Speaking as an editor myself, I think they have achieved their purpose admirably. If authors would

study and then adhere to the recommendations in this book, the path to publication would be smoothed for all concerned.

BRIAN MASON
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CHEMICAL PETROLOGY: WITH APPLICATION TO THE TERRESTRIAL PLANETS AND METEORITES. By R. F. Mueller and S. K. Saxena. Springer-Verlag, New York, 1977. 394 pages. \$29.80.

As its title suggests, this book is an overview of the application of chemical principles to an unusually broad range of petrologic problems. It begins with three chapters briefly outlining the chemical basis for the petrologic discussion which follows, using both equilibrium thermodynamics and kinetic theory; the material on kinetics is especially good. After a somewhat unnecessary chapter on rock classification, there are three chapters dealing with chemical and petrologic processes in space, in meteorites, and on the terrestrial planets. For those of us whose petrology has remained earthbound, these chapters provide an interesting review of recent developments elsewhere. Next come four chapters dealing with metamorphism. The first is a stimulating discussion of metamorphic processes, especially the development of microstructures. The other three present a more or less conventional review of metamorphic equilibria and facies, culminating in an endless series of diagrams and reactions. These chapters could have been much improved by the addition of more critical discussion of conflicting experimental data, and especially by an attempt to relate the reactions discussed to some concrete field examples. The book concludes with four chapters on magmas, plutonic rocks, and volcanism, which constitute an admirable and largely successful attempt to integrate theory, experimental data, and field observations. To my mind, this is the most successful section in the book.

Because of the breadth of topics covered, this is a difficult book to categorize. The coverage accorded most topics is too shallow for use as a text in a conventional course in igneous or metamorphic petrology. At the same time, there is insufficient discussion of basic thermodynamics, standard state conventions, and the like to make the book fully suitable for use as a text in a course on phase equilibria, or as a vehicle for self-education by a classically-oriented petrologist wishing to learn how to apply chemical principles to his own problems. Nevertheless, the book does effectively review much modern petrologic work, and many petrologists who have confined their interests to some narrow aspect of the science will find this a welcome overview of the less familiar ramifications of their discipline. But perhaps the most important contributions of this book are contained in the scattered sections dealing with the mechanisms and kinetics of petrologic processes. These sections provide few pat answers. Instead, they highlight potential approaches to the understanding of processes, and provide stimulating insights into what will surely become one of the most exciting fields of petrologic research during the next decade. For those whose background in petrology is limited to equilibrium concepts the book provides a succinct introduction to much kinetic theory application on petrologic systems.

The book is attractively put together and well illustrated, but the number of typographical errors, incorrectly-cited references, and incorrect references to equations is disturbing in a book costing nearly \$30.00 from so distinguished a publisher.

GEORGE W. FISHER
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AN INTRODUCTION TO CLAY COLLOID CHEMISTRY, 2ND EDITION. By H. Van Olphen. John Wiley and Sons, New York, 1977. xviii + 318 pages. \$21.50.

This second edition retains the sequence and balance of treatment of the first edition (1963), with some reordering of material into chapters. The text is largely the same. New material has been compressed into some additional paragraphs, and citations of the recent literature have been added.

The first four chapters give a modern account of colloidal systems, in particular of hydrophobic sols and their stability. Chapter 5 gives clear structural description of the montmorillonites, illites, kaolinites, and chlorites, with brief paragraphs on the palygorskites and the mixed-layer clays. The vermiculites are mentioned only in passing. This structural information is then used in discussions of particle size and shape, surface area, and density of charge (chap. 6), and of the electrical double-layer structure and stability of clay suspensions (chap. 7). The reader is thus prepared for more detailed treatment of the peptization of clay suspensions (chap. 8) and of technological applications of stability control, sedimentation, filtration, and flow behaviour (chap. 9). Chapter 10 deals with interlamellar and osmotic swelling and its applications. Chapter 11 presents a fairly detailed account of the interactions of clays with organic compounds. The last chapter of the main text (chap. 12) contains a rather brief treatment of electrokinetic and electrochemical properties of clay-water systems.

This is followed by a 27-page synopsis and then by a series of five appendices:

- I. Note on the preparation of clay suspension
- II. Miscellaneous computed data for montmorillonites
- III. Electric double-layer computations (modified and amplified as compared with the first edition)
- IV. Van der Waals attraction energy between two layers
- V. Clay literature

This is an attractive introduction to the colloid chemistry of clay-water systems. This reviewer believes that the author has consistently overemphasized positive charge characteristics at the edges of clay particles, with the consequence that edge-plate interaction is also overlaid as compared with edge-edge interaction. Researches since 1965 have tended to bring the edge-edge case strongly into the picture, but this is not apparent in the new edition.

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FELDSPAR MINERALS VOLUME II: CHEMICAL AND TEXTURAL PROPERTIES. By Joseph V. Smith. Springer-Verlag, New York, 1974. xiii + 690 pages. \$44.00.

Over the last seventeen years there have been three international conferences devoted to the feldspar minerals (at Copenhagen in 1960; at Oslo in 1962; and at Manchester in 1972), resulting in three conference proceedings [*Cursillos y Conferencias Inst. 'Lucas Mallada'*, Fasc. VIII, 1961; *Norsk Geologisk Tidsskrift*, v. 42, No. 2 (Feldspar Volume), 1962; *The Feldspars*, Eds. W. S. MacKenzie and J. Zussman, Manchester University Press, 1974]. In addition, two general reference books on feldspars have been published [A. S. Marfunin (1966) *The Feldspars—Phase Relations, Optical Properties, and Geologic Distributions*; Engl. Trans., Israel Prog. Sci. Trans. Jerusalem; T. F. W. Barth (1969) *Feldspars*, Wiley-

Interscience, New York], and a bibliography of the feldspar literature appeared in 1969 [D. R. Waldbaum (1969) *A Bibliography of the Feldspars*, University Microfilms, Ann Arbor, Michigan]. Most recently, the Mineralogical Society of America sponsored a short course on the feldspar minerals held in conjunction with the 1975 annual meeting of the Geological Society of America in Salt Lake City, Utah (*Mineral. Soc. Am. Short Course Notes*, v. 2).

The five feldspar volumes cited above published prior to 1975 sample only part of the voluminous and often confusing feldspar literature published in mineralogical and geological journals and offer little in the way of critical guidance. J. V. Smith's *Feldspar Minerals Volumes I and II* critically review and organize in an easily accessible fashion the extensive feldspar literature (1785–1973) on crystal structures and physical properties (*Volume I*) and chemical and textural properties (*Volume II*). When companion *Volume III* on phase equilibria and natural occurrence appears, mineralogists will have available a three-volume set containing "everything you always wanted to know about (feldspars) but were afraid to ask."

Volume II presents encyclopedic coverage of chemical and textural properties of the feldspars in eight chapters, numbered 13 through 20, devoted to analytical techniques (13), chemical properties (14), general review of growth, diffusion, and intergrowth (15), diffusion (16), crystal growth and defects (17), twins and related structures (18), intimate feldspar intergrowths (19), and intergrowths of feldspars with other minerals (20). A reference list follows each chapter, and subject, name, locality, and rock type indexes appear at the end of the book. There are a total of 66 tables and 211 well-done line drawings and photomicrographs.

Each section of *Volume II* begins with a brief historical account and a statement concerning organization of the section, followed by an objective summary of observations, experiments, and theories from the literature. Perhaps the most appealing feature of the book is the manner in which Smith has clearly separated the observations, experimental data, and ideas of others from his evaluation of observations, experimental results, and past and present theories. The student of feldspars may not always agree with Smith's opinions, but he/she will find them clearly stated. In addition, Smith points out many of the unsolved feldspar problems and defines a number of new ones for future research.

Turning next to flaws, Chapter 15 presents a disappointing review of growth and diffusion processes and defects. Furthermore, the general theoretical discussions of these processes in Chapter 16 (Diffusion) and 17 (Growth and Defects) are inadequate. A brief synthesis of relevant theory from the extensive materials-science and metallurgical literature on these subjects would have given the reader useful background information for evaluating past and future work on growth, diffusion, and defects.

Volume II is a major and significant contribution to mineralogy, as is *Volume I*. Smith's command of the vast feldspar literature is truly impressive, as is his ability to synthesize and objectively criticize past work. Springer-Verlag is to be congratulated for publishing these volumes and for maintaining their high standards in typesetting, figure reproduction, and layout design. Every serious student of mineralogy should purchase both volumes or put them on a Christmas list.

GORDON E. BROWN
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LIST OF BOOKS RECEIVED

- THE MAN WHO CAPTURED SUNSHINE. By Katherine Ainsworth. ETC Publications, Palm Springs, California, 1978. xiv + 274 pages. \$12.95.
- MINERALOGY OF CLAYEY SOILS IN RELATION TO SOIL CLASSIFICATION. By B. W. Avery and P. Bullock, Soil Survey Technical Monograph No. 10. Harpenden, England, 1977. viii + 64 pages. Price 80p. Obtainable from Soil Survey of England and Wales, Rothamsted Experimental Station, Harpenden, Herts., AL5 2JQ, England.
- INTRODUCTION TO ENVIRONMENTAL REMOTE SENSING. By E. C. Barrett and L. F. Curtis. Halsted Press, New York, 1977. ix + 336 pages. \$27.50.
- BEDFORD INSTITUTE OF OCEANOGRAPHY BIENNIAL REVIEW 1975/1976. Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, 1977. 221 pages. Price not given.
- MORPHOGENETICS OF KARST REGIONS: VARIANTS OF KARST EVOLUTION. By Laszlo Jakucs. Halsted Press, New York, 1977. 284 pages. \$40.00.
- OIL IN THE SEVENTIES: ESSAYS ON ENERGY POLICY. By Ernst Berndt, Edward Erickson, Basil Kalymon, James McKie, Walter Mead, David Quirin, Russell Uhler, Michael Walker, Campbell Watkins, Herbert Winokur Jr. The Fraser Institute, 626 Bute Street, Vancouver, B. C., Canada, 1977. xxvii + 283 pages, 17 charts, 25 tables. Can\$3.95 softcover, Can\$14.95 hardcover.
- RASTER-ELEKTRONENMIKROSKOPIE. By L. Reimer and G. Pfefferkorn. Springer-Verlag, Berlin, 1977. xi + 282 pages. \$34.40.