BOOK REVIEWS

PETROCHEMISCHE BERECHNUNGS METHODEN AUF ÄQUIVALENTER GRUNDLAGE, by CONRAD BURRI. 334 pages, 66 figures. Birkhäuser Verlag, Basel and Stuttgart, 1959. Price not indicated.

This book is the work of two men, one the author, Professor Conrad Burri, Professor of the Eidgenössischen Technischen Hochschule and the University of Zurich, and the other, the late Professor Paul Niggli, who devised the techniques of petrochemical presentation that are described in the book.

The book has five parts: A) Introduction, B) Petrochemical calculation methods on equivalent basis, as devised by Paul Niggli, C) The proposals of Barth and Eskola toward considerations of the anions in petrochemical calculations and their relationships to the equivalent norm of Niggli, D) Appendix, E) References. This is a book which has long been necessary and for which there should also be an English equivalent. One of the few articles in English readily available to American petrologists which describes Niggli's calculations is that by C. S. Bacon, Jr., published in the *American Mineralogist*, **32,** 257–295, 1947. There is also information on the so-called Niggli values in Parker's English version of Volume 1 of Niggli's projected three-volume work, "Rocks and Mineral Deposits" (*Am. Mineral.*, **34,** 128–129, 1949; **40,** 131–132, 1955). The major part of the book, approximately 210 pages, is devoted to part B, which itself is split into two sections, 1) the Niggli values si, al, fm, c, alk, k, mg, ti, p, etc., and their application, and 2) the equivalent norm. The presentation is everywhere clear, and numerous examples are given to illustrate the calculations.

Part C, dealing with Barth's and Eskola's extensions of the method, includes not only the calculation of rock analyses with reference to the additional anions, but also describes Barth's standard cell. References in English to this procedure are in Barth's book, "Theoretical Petrology," pp. 82–85, which also contains a discussion of the Niggli values, their calculation and application (*Am. Mineral.* **37,** 1067–1068, 1952).

The Appendix contains three tables: 1) an alphabetical list of the base and equivalent normative compounds, 2) a listing of the important equations of reactions between base and equivalent normative compounds, and 3) tables for calculating molecular and atomic equivalent numbers for the most important rock-forming oxides. The book concludes with a list of the significant literature, and author and subject indexes.

It is unfortunate that this method of presentation has received relatively little detailed attention by American petrologists. Doubtless this has been due in part to the fact that most of the significant literature has been in German, much of it under Niggli's authorship. Geology students beginning their study of German have generally shied away from Niggli's works owing to the abstruse nature of his grammatical presentations. It is to be hoped that this general summary by Burri will greatly expand the interest of English-speaking students in this important petrochemical technique.

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IGNEOUS AND METAMORPHIC PETROLOGY, Second Edition by FRANCIS J. TURNER AND JOHN VERHOOGEN. 694 pages. McGraw-Hill Book Company, Inc., New York, N. Y. $12.00.

The First Edition of "Igneous and Metamorphic Petrology" by Turner and Verhoogen was reviewed in the *American Mineralogist*, Vol. 37, pp. 702–703, 1952. As was anticipated at that time, the book has met with a highly favorable reception from American students

of petrology; indeed, without doubt it has become the foremost modern summary of principles, problems, and theories in igneous and metamorphic petrogenesis.

Much of the Second Edition has been largely rewritten in order to include many of the more recent results in experimental petrology and geochemistry. The book is approximately 90 pages longer than the First Edition. The chief expansion has taken place in Chapter 5, entitled "Crystallization of Igneous Minerals from Silicate Melts." One new chapter has been added (Chapter 13) on nepheline syenites, ijolites, and carbonatites; and pegmatites, Chapter 14, have been placed in a separate chapter.

The presentation of material in the second half of the book, on metamorphism, has been completely rearranged, and Chapters 18–24 of this part have been revised, largely based on Memoir 73 of the Geological Society of America—"Metamorphic Reactions and Metamorphic Facies" by W. F. Fyfe, F. J. Turner, and J. Verhoogen, 1958. Thus this edition contains two more chapters than the first.

All of these changes contribute significantly to the improvement of the book and assure its continuing popularity. As evidence of its general acceptance, the book has now been placed by the publishers in their International Series in the Earth Sciences.

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GENERAL CRYSTALLOGRAPHY, a Brief Compendium, by W. F. deJong with the collaboration of J. Bouman. W. H. Freeman and Company, San Francisco, California, 1959. 281 pages, 231 figures, 41 tables. Price $6.00.

This book is not intended for a textbook but is an excellent summary of crytallography, clearly written and well illustrated. Part I, Geometrical crystallography (92 pages), covers crystal description, calculation and drawing. Part II, Structural crystallography (42 pages) includes experimental methods, Fourier analysis and Patterson diagrams. Part III, Chemical crystallography (53 pages) discusses crystal bonds and structure types. Part IV, Physical crystallography (85 pages) covers homogeneous deformation, stress, the crystal as a dielectric, thermal and electronic conduction, pyro- and piezoelectricity, elasticity, imperfections, gliding, and crystal growth. There are numerous references, and both a subject and author index. This is a slightly enlarged version of deJong's Kompendium der Kristallkunde, published by Springer-Verlag, Vienna, in 1959.

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CRYSTALS AND CRYSTAL GROWING, by Alan Holden and Phylis Singer. Science Study Series—Anchor Books, Doubleday and Co., Inc., Garden City, N. Y., 1960. 320 pages, 137 figures, 42 plates, 4 color inserts. Price $1.45 ($1.65 in Canada).

This is a good answer to the question "What book about crystals can I give to a high school student?" It should even be interesting to an adult. It contains a surprising amount of information concerning crystals, clearly written in simple language. It discusses such subjects as solutions, crystal growth, symmetry, habit, cleavage, arrangement of atoms in solids, and methods for growing crystals. There are numerous examples and illustrations. Questions concerning crystals and suggested simple research problems are included.

There are some minor points, especially of emphasis, which might be questioned, but the reviewer is more inclined to praise the authors for presenting a difficult subject in such an interesting and intelligible manner.

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PROCEEDINGS OF THE SECOND UNITED NATIONS INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY—VOLUME III, SURVEY OF RAW MATERIAL RESOURCES, UNITED NATIONS PUBLICATION, 1958, 845 pages, International Documents Service, Columbia University Press, New York. $18.50.

The first book (Volume 6) on geology of uranium and thorium issued following the first general conference on peaceful uses of atomic energy (1955) consisted of the reports of two sessions, 6B and 7B. Most of the articles (Session 6B) dealt with geology and mineralogy of uranium and thorium deposits. Thirty-one reports described deposits outside of the United States and 69 gave information on areas and deposits in the United States. The 27 papers in session 7B dealt with prospecting methods for radioactive ores in various parts of the world.

The new volume of the complete series of 33 on the Proceedings of the second International Conference on the Peaceful Uses of Atomic Energy (1958) contains the results of three sessions—E-5, E-7, and E-9 under the title "Survey of Raw Materials Resources." In the three years since the appearance of the geology-mineralogy volume of the first congress, many new discoveries and techniques in the search for uranium have been made and developed. More emphasis has been placed on other types of nuclear raw materials, namely beryllium, zirconium, and thorium. There also have been satellite studies in uranium geochemistry and a detailed study of uranium mineralogy. This volume also is noteworthy for the increase in participating investigators from countries outside of the United States.

The book is subdivided into Raw Materials Supply (E-5, 118 pages) consisting of 17 papers; Geochemistry (E-7, 153 pages), with subdivision (A) Geochemical Prospecting comprising 15 articles, and (B) Isotopic Composition and Age Determination consisting of 9 articles. This is followed by the greatest number of papers in Session E-9 (563 pages). This last session, entitled Mineralogy and Geology and Prospecting is subdivided into (A) Mineralogy and Genesis of Deposits (21 articles), (B) Geology of Deposits (30 articles), and (C) Prospecting (10 articles).

Opening topics on Resources of Nuclear Fuel for Atomic Power, Geologic Distribution of Nuclear Raw Materials and Geologic Appraisal of Uranium Resources of the United States are followed by articles on zirconium and beryllium resources. Next come discussions on uranium, thorium, and other reactor materials in Canada, France, Union of South Africa, Egypt, India, and Japan.

Session E-7, Geochemistry, includes information on new techniques in uranium exploration such as geochemical methods, chemical prospecting, a study of uranium in groundwater, springs, humus, petroliferous rocks, and the use of such tools as electron microscope and paper chromatography. This section is followed by papers on isotopic lead studies, age measurements, radioactive disequilibrium and beryllium geochemistry. A concluding paper deals with isotopic studies on meteorites and the Earth's crust.

Session E-9 begins with a summary of recent progress in the mineralogy of uranium, followed by new data on uranium minerals of the USSR. Subsequent miscellaneous articles discuss uranium migration, ore genesis, and origin of certain deposits. Particularly noteworthy is an article by Liebenberg on the controversial Witwatersrand ores. Other topics are the occurrence of uranium in coals, shales, hydrothermal ores, and the paragenesis of USSR deposits. Under geology of the deposits are descriptions of Canadian ores bodies, a few articles on various deposits of the United States, Argentina, Greenland, France and French Union, Portugal, Belgium Congo, India, and Japan. Lastly, there are discussions of prospecting methods and various radioactive measurements.

In general the illustrations are clear, but reduction of some maps has produced some illegible results, which was also the case in the earlier volume.

To the reviewer the increase in the number of articles from investigators outside of the United States greatly enhances the value of the book, particularly as these present new ideas that may be applied to problems on the geology and mineralogy of domestic deposits. However, it is disappointing to note that all of the articles submitted by the USSR geologist leave out locality names—a unfortunate omission. The book is well worth adding to geology libraries, but its high cost (considerably higher than the 1955 volume) limits its acquisition by individual geologists.

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STRUCTURE REPORTS FOR 1952. Vol. 16. General Editor, A. J. C. WILSON, Asst. Editor, DUBRAVKA HAVRANEK. Section Editors: N. C. BAENZIGER, Metals; J. WYART, Inorganic Compounds; J. MONTEATH ROBERTSON, Organic Compounds. Published for the International Union of Crystallography by N. V. A. Oosthoek's Uitgevers Mij, Utrecht, Netherlands. Price $32.00; £11.6.0.

The excellent quality of abstracts and the same type of arrangement found in previous volumes are continued in this volume covering the crystal structure literature of 1952.

STRUCTURE REPORTS, Vol. 14. Supplementary volume, and cumulative index for 1940–1950. General Editor, A. J. C. WILSON, Asst. Editor, O. EISNER. Section Editors: N. C. BAENZIGER and C. S. BARRETT, Metals; J. M. BIJVOET and J. WYART, Inorganic Compounds; J. MONTEATH ROBERTSON, Organic Compounds. Published for the International Union of Crystallography by N. V. A. Oosthoek's Uitgevers Mij, Utrecht, Netherlands. Price $9.50; £3.80.

Previously unreported abstracts, together with cumulative subject and author indices, and cumulative corrigenda are included.