

by his friends. Most of the papers deal with areas in the states of Arizona, California, Montana, Nevada or New Mexico, a region in which late Mesozoic and Cainozoic volcanism was on an enormous scale.

One of Williams's best known works was his 1941 memoir, still much referred to, on "Calderas and their Origin". The present volume has a significant contribution to the subject, by Smith and Bailey, on "Resurgent Cauldrons". These are defined as cauldrons in which the sunken block, following initial subsidence (usually along a ring fracture), has been uplifted (usually as a structural dome). The Valles caldera is taken as type example.

The biggest volcanic outburst of this century was that of Katmai in 1912. In the absence of close eyewitnesses, its nature must be deduced from the erupted products. The first scientists on the scene made a competent study, but some of their interpretations have since become inadequate, and the long-awaited restudy by Curtis in this volume is therefore very welcome. It includes carefully determined estimates of the quantity of ash erupted.

Only one paper is of an area outside the United States. It is by McBirney and Aoki on the "Petrology of the Island of Tahiti", coming 40 years after the pioneer work by Williams. It is supported by forty-one new analyses of rocks and their mafic minerals, and the rocks of Tahiti are claimed as constituting "probably the most complete suite of strongly alkaline rocks in the Pacific". In a paper on another island group, Macdonald gives a very useful review of the petrology of Hawaii, adding seventy-six new analyses of rocks to the four hundred already available. Elsewhere, Hay and Iijima conclude that palagonitization of basic ash deposits on Oahu was mostly by reaction of glass with cold percolating groundwaters. They study the chemical changes with the aid of forty-three analyses.

From Nevada, Coats describes a complex of extrusive rhyolites believed to have the form of a filled basin with a nearly flat upper surface, and proposes the useful term *lekolith* (from Gr. *lekos* = basin or dish) for such a structure. G. D. Robinson *et al.* show that the emplacement of granite plutons, folding, and thrust faulting in Upper Cretaceous times were essentially synchronous in the area of the Boulder Batholith (Montana). Cook describes from Nevada ignimbrites associated with texturally similar plugs and dykes, and the laharic origin of much of the Tuscan Formation in California is reviewed by Lydon. Geophysical studies include the correlation of palaeomagnetic stratigraphy and radiometric dating by Hoare *et al.* for volcanic formations on Nunivak Island (Alaska), and by Doell *et al.* for the Valles caldera (New Mexico).

With 135 text-figures and 50 plates, the volume is well illustrated, and the bibliographies are comprehensive. Disappointingly, for a volcanology volume, only one of the seventeen papers is concerned with recent volcanic activity: this is really a book on volcanic geology and petrology. Moreover, some of the papers are more of local than general interest. In spite of this, the book is a fitting tribute to a great volcanologist and must find a place on the shelves of all university geology libraries.

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TEXTURAL INTERPRETATION

Metamorphic Textures

By Alan Spry. (The Commonwealth and International Library of Science, Technology, Engineering and Liberal Studies, Geology Division.) Pp. viii + 350. (Pergamon Press: Oxford, London and New York, July 1969.) 60s (\$10) boards; 50s (\$8) paper.

DURING the past twenty years, research on metamorphic rocks has centred largely on chemical phase-equilibrium studies on the one hand, and on mesoscopic and macro-

scopic structural analysis on the other. Workers in neither field, however, with a few notable exceptions, have concerned themselves very much with the theoretical and experimental studies on the physical aspects of crystal growth which have been taking place in metallurgical and ceramic science. To be sure, the one- and two-phase systems with which these fields are primarily concerned are much more readily susceptible to theoretical analysis than the multi-phase systems familiar to the metamorphic petrologist; nevertheless, solid-state experience which they provide can go a good way towards replacing the combination of instinct and folk-lore which often seems to have guided textural interpretation in the past.

For these reasons, any book which concerns itself with the small scale physical processes operating in metamorphic rocks and which emphasizes the important bearing on these of metallurgical and ceramic studies, is to be welcomed. To the best of my knowledge, this is the first modern book in English to attempt to do this.

In his preface, the author states that his purpose is "first to provide definitions, descriptions and illustrations of metamorphic textures for the senior undergraduate student, and second to discuss the fundamental processes involved in textural development at a level appropriate to the graduate student and practising petrologist".

He approaches these objectives by means of eleven chapters with such headings as "Metamorphic Minerals and the Solid State", "Grain Boundaries", "Mineral Transformations" and "Textures of Polymetamorphism". These are illustrated by sixty-five line drawings and thirty-one plates. There is a good subject index, an author index and a very comprehensive bibliography.

In spite of all these virtues and its timeliness, this volume is something of a disappointment. The author's writing is too often neither lucid nor precise. Although it should be possible for those already familiar with the subject matter to follow his reasoning, the presentation will in a number of places present a considerable obstacle to the student reader.

The author's description of textures is generally useful, but the reader is not afforded many new insights into textural interpretation. The book also possibly attempts to be too comprehensive in its coverage, with the result that some sections are rather superficial and would have been better either omitted or expanded; for example, it is difficult to imagine any of Spry's categories of reader needing the three-quarters of a page devoted to "Slate".

In spite of these shortcomings and a number of typographical errors, this book should be on the shelves of every geology department library. There is nothing else in this field and it is certainly a useful source book.

E. R. OXBURGH

GEOCHEMICAL INFORMATION

Handbook of Geochemistry

Executive editor: K. H. Wedepohl. Editorial board: C. W. Correns, D. M. Shaw, K. K. Turekian and J. Zemann. Vol. 1: Pp. xv + 442. Vol. 2/1: Pp. x + 586. (Springer-Verlag: Berlin, Heidelberg and New York, 1969.) Vol. 1: Cloth; Vol. 2/1: Loose-leaf binder. DM 224; \$56 the two volumes.

THIS handbook is an encyclopaedic contribution, in two volumes, to the field of geochemistry by some seventy authors acting under the direction of a five-man editorial board.

If there is a general criticism of the first volume, which is intended to act as a background of geochemical, geophysical and cosmochemical fundamentals to the extensive data collected in volume two, it is that the contents seem unbalanced. Perhaps predictably, the composition and abundances of the main types of igneous, sedi-