

late W. E. Tröger. It is a useful, well-produced, resiliently bound compendium of mineralogical information that will be welcomed by English-language readers.

Although the book emphasizes optical properties with the familiar crystal representations with schematic optical directions and graphs relating composition to optical variations, there is also a wealth of summarized information about density, crystal form, chemical reactions, petrological occurrences, principal *d*-spacings, etc. A magnificently produced colour chart shows accurately the birefringence colours up to 0.20.

A number of criticisms must be made. In the tables the translators state that 'some "old" crystallographic settings have been retained for internal consistency with previous editions'—hardly a justifiable reason in a new edition. The confused problem of identifying Fe-free and ferrian zoisite is for example exacerbated by use of the old crystallographic setting. Many graphs relating solid solutions to composition have not been revised for so many years, despite much available new information, that the graphs have little value, e.g. melilites 1950 and 1951, vesuvianite 1950, tourmaline 1951, nepheline 1941, beryl 1927. The chart relating 2*V* to composition in the orthopyroxenes repeats the error of distinguishing volcanic and plutonic samples despite this error being pointed out 11 years ago.

Perhaps the best correlation graphs are those for the plagioclases which are based on Burri, Parker, and Wenk's comprehensive 1967 survey, but the olivine and K-feldspar graphs are also modern. Correlations in the complex mica and amphibole groups are almost unusable because of overlapping optical properties in minerals of quite different chemistry.

The question that increasingly looms before mineralogists and petrologists is the extent to which books of this type are now used other than to assist in the identification of minerals as distinct from determining their compositions. More and more the microprobe is used to give precise compositions with respect to all major elements instead of the crude approximations of composition at the best obtainable by optical determinations. The labour of refractive index determination and precise Universal stage work necessary to estimate compositions from optical properties is now rarely justified.

The translators are to be commended for producing an accurate translation in good English of a book that will be a useful laboratory manual. Whether students will choose to purchase this book at £12.50 when there are so many other available mineralogical textbooks, many containing in addi-

tion systematic treatments of petrological and crystallochemical aspects, remains doubtful.

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Roberts (B.). *The Geology of Snowdonia and Llŷn: an outline and field guide*. Bristol (Adam Hilger Ltd.), 1979. x + 183 pp., 30 figs., 31 geol. sketch-maps, 1 geol. map (1:70,000). Price £15.00.

As the title suggests, this guide is divided into two sections. The first section (44 pp.) briefly but clearly outlines the stratigraphy and structural history; the area consisting of Cambrian and Ordovician sediments and igneous rocks on a late Precambrian metamorphic basement. The igneous rocks include layered mafic intrusions, mafic intrusions, microgranites, dolerites, tuffs, lavas, and ignimbrites. The metamorphic basement is related to the Mona Complex of Anglesey and shows a progression in metamorphic grade (and texture). Throughout the area all the abovementioned rocks are deformed (often intensely), thus this is an excellent centre for structural geology.

In the second section (124 pp.), thirty-one different field excursions, each with an accompanying geological map and a different emphasis, are described in detail. To complete all thirty-one itineraries would take about two months but the author suggests a shortened programme of about one week's duration which is suitable for an undergraduate field course. To the visiting geologist, the outline should assist him in choosing itineraries of particular interest. This book is unlikely to be of use to the undergraduate student; the outline would serve as a summary of the geology but the field itineraries contain too much information of the type that a student would be expected to record at the outcrop. Conversely this wealth of information, together with the details of access, tides, type of walking encountered, and estimated time for each excursion, will make this guide valuable to the geologist leading a field party into this area.

This guide is prepared in sideways A4 format with a flexible waterproof(?) cover so that although of large size (to accommodate the large scale maps) it can be rolled up and carried in a rucksack. It is to be hoped that the quality of the paper and binding are such that they will withstand the bad weather often encountered in this part of Wales.

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