

be produced. It is indicative of the comprehensive nature of the work in the geochemical and mineralogical aspects of the evaporite field that it is still worth publishing now. The team of translators and consultants have done their work well.

The English title of the book is unfortunate as it gives the impression of a broad treatment of the subject, whereas there is little discussion of petrology, stratigraphy, or palaeogeography. The mineralogy and geochemistry are however very fully explored.

In place of chapters the book is divided into seven sections. Section A contains an introduction, a brief history of the evolution of sea-water, and a very comprehensive list of the major and accessory minerals found in salt deposits.

Section B examines very fully the stability relationships and the application of Gibbs Phase Rule to seven important mineral assemblages.

The third section deals with the physicochemical conditions of precipitation and metamorphism of salt deposits. When dealing with salt genesis it is clear that the author was ahead of his time and aware that the conditions of salt formation are highly varied. He says 'This does not reduce the value of models, rather the comparison of different models with natural salt series is the only way of approaching the actual composition of the solutions and the conditions under which they existed.'

Section D compares the theoretical models of section C with the major and minor mineralogical and chemical components of natural evaporite deposits. One can but regret that Braitsch died (1966) before the results of the last decade of work on Recent evaporites became available.

The clay minerals found associated with evaporites and the geochemistry of iron and boron in salt deposits are discussed in section E.

Sections F and G give us the conclusions of the author together with his suggestions for future work and the philosophy by which to pursue that work.

This is an important book for all those interested in the chemistry and mineralogy of evaporite deposits.

P. R. BUSH

PHILLIPS (W. R.). *Mineral Optics: principles and techniques*. San Francisco (W. H. Freeman & Co.), 1971. ix+249 pp., 113 figs., 14 colour pls. Price U.S. \$12.50 (£5.30).

Students beginning a University course in geology frequently experience difficulty in grasping the principles of optical mineralogy and in the reviewer's opinion most of them do not really understand this subject until they have to: namely when they try to teach others. This may be the reason why there are so many textbooks on this topic and this is the latest one available.

The production on high quality paper with coloured illustrations, clearly drawn diagrams, and large margins to the pages make a very good impression. The coloured Michel-Lévy chart reproduced from one made by Carl Zeiss is excellent but the coloured diagrams of interference figures drawn with crayons showing the methods of determining optic sign are somewhat unnecessary since the student can produce equally good diagrams of his own with coloured crayons or he can even colour the

black and white ones found in most textbooks. If the author had wished to reproduce colour photographs those showing the relationship between the various types of dispersion and the symmetry in monoclinic crystals would have been useful since crystals cut in the most suitable orientation for showing dispersion are not always readily available. Colour printing could have been used to better advantage in three-dimensional diagrams showing ordinary and extraordinary waves passing through a mineral, because however well these are drawn they can be confusing to anyone but the draughtsman.

The ray-velocity surface is introduced for uniaxial materials and then the Fletcher indicatrix but the derivation of the indicatrix from the ray velocity surface is omitted. For biaxial minerals the Fletcher indicatrix is used straight away and the ray-velocity surface only briefly mentioned.

A greater proportion of this book is devoted to the description and use of the Universal stage (59 pages) than in any previous book of its kind and while this is highly commendable it is perhaps ten years too late. The main use of the Universal stage has been for the determination of the variation in composition of zoned crystals and to a large extent this technique has been replaced by use of the microprobe analyser.

The present reviewer has frequently been critical of the high prices charged for students' textbooks and one wonders how much the price of this book has been affected by the inclusion of colour plates. It is certainly a little more expensive than its British rivals but nevertheless it will be included on the author's list of recommended textbooks for first year geology students because the price is not excessive and the standard is adequate for geology students who do require a highly theoretical treatment of the subject.

WM. SCOTT MACKENZIE

ULMER (G. C.), Editor. *Research Techniques for High Pressure and High Temperature*. Berlin, Heidelberg, and New York (Springer-Verlag), 1971. xli+367 pp., 68 figs. Price U.S. \$10 (DM 33.00).

This book consists of a series of articles written by a number of experts in the field of high-pressure-high-temperature experimentation as applied to the earth sciences. The topics covered are oxidation equilibria at high temperature; oxygen equilibria at high temperature and pressure; pressure and temperature control and measurement using hydrothermal techniques in externally heated pressure vessels; pressure calibration in piston cylinder equipment; internally heated pressure vessels; liquid-vapour equilibria; and high-temperature-high-pressure techniques for sulphide studies.

These topics cover most of the fields in which the graduate student, for whom the book is designed, is likely to be involved and thus it provides a useful source of information for someone entering this field of research. The editor warns his readers that the book should be used as a guide and not as a 'blue-print to build a bomb'.

A few minor criticisms follow—repetition of the same information in different contributions, for example three contributors have produced drawings and descriptions