

has been applied with ridiculous inconsistency, and while coesite, ilmenite, and sillimanite have been demoted to lower-case status, batisite and occasionally sanidine receive a capital letter. Several mineral names are among the many spelling mistakes in the book.

This is the most comprehensive textbook on crystallography that has been published at this level, and has no serious rival in content. The price is reasonable, considering that the book covers ground that is usually split up between smaller textbooks of more limited scope. A beginning student will find this a difficult book to follow, but the more advanced student will find it an excellent book to which to refer.

A. HALL

ERNST (W.). *Geochemical Facies Analysis*. Amsterdam, London, and New York (Elsevier), 1970. vi+152 pp., 34 figs. Price £3.58.

This short book, eleventh in the series *Methods in Geochemistry and Geophysics*, is intended to demonstrate to what extent sedimentary facies can be interpreted by geochemical criteria. The physicochemical criteria considered to affect the sediments deposited are salinity, temperature, and redox potential, which form subsidiary units of the 'hydrofacies', the special facies term coined for geochemical purposes.

Interpretation of the environment of deposition from the geochemistry of the rock is complicated by theoretical and practical factors. The chemistry of the sediment supplied to a basin is governed by the extent of weathering (a factor of climate and topography in the source area) and provenance. The grain-size distribution and rate of sedimentation determine whether the sediment equilibrates with the depositional environment, and the addition of plant or animal material may affect the sediment. Though the chemistry of the oceans has varied with their evolution it has remained almost constant since the Cambrian. Diagenesis alters the composition of the sediment by the expulsion of pore-water removing soluble material and by the fixing of some elements in authigenic minerals, which may develop under conditions different from the depositional environment. Medium to high grade metamorphism precludes geochemical interpretation of sedimentary environment.

On the practical side interpretation can only be based on a statistically significant number of samples that have been routinely collected, prepared, and analysed. Any conclusions reached require standardization against lithological and biological facies indicators.

Half the book comprises brief but critical reviews of element or isotope variations in sedimentary rocks that have been purported to correlate with variations in the depositional environment. The environmental variables can be defined with varying degrees of certainty: salinity from boron and, perhaps, chlorine in clays and bromine in evaporites, temperature by using oxygen isotopes in unrecrystallized organically precipitated calcite, and neutral to negative redox potentials from vanadium/chromium, ferrous/ferric iron, and iron/manganese ratios and the sulphur content.

Chemical variations with palaeogeography suggest a change from non-marine

through near-shore to off-shore shales. Arsenic, chromium, vanadium, and zinc increase seawards whereas organic carbon, gallium, aluminium, and titanium decrease.

The use of coals to define biofacies is suggested but the trace element evidence is inconclusive. Non-chemical methods of defining facies, for example authigenic minerals and electrolytic properties of pore-waters, are briefly mentioned.

The future of geochemistry in this field seems to lie in the analysis of the clay or organic fractions of the rocks. Its main use is in sub-dividing thick, uniform rock sequences that lack other facies indicators.

The German ancestry of the book is clear. Literal translation of some German sentences combined with very patchy punctuation often obscures the sense. The number of mis-spellings and use of the wrong word is considerable and sometimes humorous. More serious is the lack of clarity of many of the diagrams especially where element variations in a stratigraphic sequence are being illustrated. Some tables have ill-chosen 'examples', which fail to illustrate, or contradict, points made in the text.

The main value of this book lies in the critical reviews of the various geochemical factors thought to indicate depositional environments. In addition, the 15-page bibliography, including many references to continental authors, makes this an invaluable source book.

R. J. L. C.

**BOLLMANN (W.).** *Crystal defects and crystalline interfaces.* Berlin, Heidelberg, and New York (Springer-Verlag), 1970. xi+254 pp., 158 figs. together with a set of moiré models. Price DM98 (\$27).

The title of this book suggests that it is a text on crystal imperfections, in particular the solid-solid boundaries, which are all too often neglected by many authors in this field. The attractive illustration on the dust cover reinforces this impression. However, after a cursory glance through its pages many mineralogists might conclude that this is a text of linear algebra, which somehow has found its way into the wrong dust cover. In fact, the author is presenting his geometrical concept of crystalline interfaces and in this is contained a new and potentially significant technique for the structural analysis of these defects. These analyses are being applied by metallurgists to grain boundary studies. It is too early to assess the real value of the author's concept to this field and therefore draw any definite conclusions as to its mineralogical potential. There are no apparent reasons why it should not be applied by mineralogists to interfaces in mineral systems.

The book can be subdivided into two sections. The first, which occupies chapters 1-10 (approximately half the book), is an elementary and condensed introduction to crystalline lattices and defects. Unfortunately this section has little value as a basic text because of the selective treatment of the subject-matter. The author concentrates upon dislocations and the metallurgically important lattices. Point defects are scarcely mentioned and twinning is entirely neglected. Little emphasis has been placed on derivations in these introductory chapters; however, an appendix is included to assist