book shows its age mainly by the almost apologetic attitude to the role of the geologist in industry. It is doubtful if geologists in the 1970s will feel the need to justify their existence so strenuously.

This is a suitable text for final-year undergraduates, presenting a great deal of geological data with a firmly economic slant. It brings together much scattered information in a form it would be difficult to find elsewhere; the section on industrial perlite for example. In covering such a wide field the author has had to deal somewhat superficially with some problems, but he presents a large number of specific areas, which read as 'case-histories' and are very illuminating. It is understandable that he has chosen most of his examples from North America, which the U.K. student might find off-putting. It is odd, for instance, to see the South African asbestos production discussed in a paragraph after ten pages devoted largely to that of Quebec.

A more serious deficiency for the non-American student is that the A.S.T.M. standards for industrial rocks are used throughout, and the undergraduate using this text alone might be left unaware of the wide range of standards used elsewhere in the world.

The author has adopted a classification of rocks and minerals corresponding to geological origin rather than industrial use; this is surely right in an undergraduate course. He is inconsistent, however, in superimposing on this a division into Rocks on the one hand and Minerals on the other, especially as the definition of these terms is based on bulk and value. Thus nepheline syenite and pegmatite appear as Minerals, whilst kaolinite is counted as a rock. But these are minor criticisms of a work that supplies the student with a comprehensive text in a much-neglected field.

J. E. PRENTICE

CLOUD (P.) and a Committee of the National Academy of Sciences—National Research Council. *Resources and Man.* San Francisco (W. H. Freeman). 1970. 259 pp., 54 figs. Price $2.95 (24*s.*).

Those concerned with the supply of useful minerals (and rocks) for man's use are becoming increasingly preoccupied with the exponential rise in demand resulting from the population explosion. In general terms, in each 36-year period, consumption is equivalent to the estimated total consumption in the whole of previous history; the process is obviously one that cannot continue indefinitely. This volume asks the question: can man approach a kind of dynamic equilibrium with his environment so as to avert destructive imbalances? Even though it tries to look well beyond the year 2000, it also keeps the shorter term in view; but in both cases the answers are not altogether reassuring.

The topics dealt with (and their authors) are: the human ecosystem (Marston Bates); interaction between man and his resources (John I. Chapman); United States and world populations (Nathan Kenfitz); food from the land (Sterling B. Hendricks), food from the sea (William E. Ricker); of immediate interest to the mineralogist are the discussions of mineral resources from the land (Thomson S. Lovering), mineral resources from the sea (Preston Cloud), and energy resources (M. King Hubbard).

Lovering considers the large, low-grade metalliferous deposit in relation to the Lasky concept, that as grade decreases arithmetically, tonnage of ore increases in geometrical ratio. While he shows that the concept is not valid for high-grade deposits or indeed for any deposit with a sharp wall-rock cut-off, it has a wide area of validity for deposits such as the 'porphyry' coppers and it may extend downwards to grades that are within an order of magnitude of the Clarke. Thus for copper, nickel, cobalt (and, I would be tempted to add, for gold in some instances), larger and larger tonnages can be brought in as technology improves. There is, however, an important class of elements, including tin, mercury, tantalum, silver to which this certainly does not apply, and the position of metals such as lead and zinc is ambiguous. The implication is that the notion that, as the highly concentrated ore deposits become exhausted, man will turn to the 'natural' crustal rocks for his supplies has only a very limited validity. Nor is the sea and sea-bed, now supplying about 5 % of his 'mineral' raw material needs, likely to offer a long-term solution. In the energy field, King Hubbard sees little more than a century of life for world petroleum, and no more than three or four centuries for coal. In the long-term, the breeder reactor is the hope, if the difficult problem of waste disposal can be solved.

Among its recommendations, the Committee calls for a large increase in the effort directed towards a comprehensive geochemical census of the crustal rocks and a new and more vigorous monitorizing system for radioactive waste. It further proposes that the reuse of materials that can be re-cycled be encouraged, especially for mineral products in short supply; that the time-lag between the recognition of mineral-resource shortages and investigation intended to alleviate it be reduced; and that geological exploration of continental shelves be accelerated.

For the mineralogist who sees his work as part of the human struggle for survival, this book deserves attention. K. C. DUNHAM

DEGENS (EGON T.) and ROSS (DAVID A.), editors. *Hot Brines and Recent Heavy Metal Deposits in the Red Sea.* Berlin (Springer-Verlag), 1969. xii+600 pp., 220 figs. (8 in colour). Price DM 128.

The first indication of anomalously high temperatures near the bottom of the Red Sea were recorded by the Swedish research vessel *Albatross* in 1948. During the period 1963–5 the combination of stratified high-temperature and high-saline waters were reported by Charnock and Swallow (R.V. *Discovery*), Dietrich and Krause (R.V. *Meteor*), and by Miller (R.V. *Atlantis II*). The latter cruise was also the first to core the sediments and discover their high metal content. The observations and sample collecting by R.V. *Chain* during 1966 (sponsored by N.S.F. and N.A.S.A.) serves as the main source of material in this book. There are over 70 contributors and the subject matter is assembled under seven main headings:

Introduction, 21 pp. (mainly the history of exploration in the Red Sea up to, and including, U.S.C. and G.S.S. vessel *Oceanographer* in 1967); Geological and geophysical setting, pp. 25–128 (general structure, thermal, magnetic, gravity, and seismic profiles); Water, pp. 131–260 (circulation, temperature, and chemical composition); Organisms,