

BOOK REVIEWS

INDUSTRIAL GEOLOGY, ed., J.L. Knill, xvi & 344 pp., 73 figs., 24 tables, Oxford University Press, Oxford, 1978, hardback £9.50.

As stated by Professor E.A. Vincent in a foreward, "this book makes no claim to be a comprehensive treatise on industrial geology. Rather it is a series of essays each written by an expert in the field and differing in approach emphasis and treatment." The book evolved from a series of lectures given at Oxford early in 1974, on energy resources, oil, gas, coal, metallogeny, mineral exploration, groundwater and the construction industry. To produce a better balance Professor G.R. Davis replaced his original talk with a discussion of the role of geology in the minerals industry. Other chapters written specifically for this volume include one on coal by Messrs. Williamson and Barefoot, replacing the original lecture by G. Armstrong; chapters on aggregates, sand, gravel and construction stone by Dianne Knill; cement by D.P. Jefferson; geological hazards by M.H. de Freitas; and a chapter on geology in conservation by G.P. Black. The net result is a lively, entertaining collection of essays which succeed in giving a more realistic impression of the role of geology and geologists in industrial geology than any other single volume. Well presented and relatively free from textual errors it suffers from two minor faults, namely that a few of the diagrams as printed are too small for the amount of detail they contain, and those chapters which attempt to review the literature, rather than quote examples, tend to be out of date because of the time lag between preparation and publication. This apart the book is very strongly recommended both for undergraduates and the geologically informed general reader.

In the brief introduction the editor defines industrial geology as embracing "those aspects of the geological sciences which are applied to the direct benefit of Man," and he divides the main industries employing geology into the extractive and construction industries. As is emphasised by several writers industrial geologists need to be versatile and capable of communicating their ideas in easily understandable form to engineers and laymen. Both these attributes are displayed by the authors.

D.C. Ion begins by discussing the role of geologists in the world's energy resource industries, stressing their importance in exploration, production, estimation of reserves, formulating laws and regulations and in protecting the environment. He shows how even within the energy industries reserves are calculated in very different ways sometimes varying by as much as two orders of magnitude depending on the preferred concept. Consequently it is essential that such figures should be interpreted by geologists. The author concludes that "there will be continuing pressure for industrial geologists in the energy resource field to be specialists in one aspect but informed generalists in all."

H.R. Warman's approach is similarly worldwide but is more specifically geological. After emphasising the considerable variations in the chemistry of crude oil and gas he discusses the importance of structure and stratigraphy in localising deposits. Warman comments that in many sectors of the oil industry exploration is separated from appraisal and production, both sections requiring greater versatility from their geologists than is generally imagined. His discussion of Britain's future is particularly illuminating for those who do not yet realise that it is forecast that in the 80's and 90's British oil production will be amongst the 'top 10' comparable to Kuwait, Nigeria and Iraq.

Messrs. Williamson and Barefoot make no attempt to discuss coal on a world wide basis. Nevertheless they show how national and international politics have affected both deep minded (Williamson) and open-cast (Barefoot) coal production in Britain. They show how the constraints imposed by geology combined with the NCB's policy of mechanism resulted in reserves being devoured faster than coal was produced. Probably because of the delay in publication the more recent trends are not discussed and the recent accelerated pace of exploration is only briefly mentioned. Thus East Midland readers will note that Selby is mentioned but N.E. Leicestershire (alias Belvoir) is not. In this reviewer's opinion the chief value of this essay, to aspiring geologists, is the demonstration of the effect of detailed lithology and structure on the exploitation of coal.

Sir Kingsley Dunham's essay on metallogeny is similarly restricted to Britain. It illustrates the sort of distillation from voluminous literature which needs to be made before a minerals exploration strategy is planned. Although not specifically concerned with the role of the geologist in industrial geology it serves as a timely reminder of the importance of a preliminary, thorough and critical literature search combined with a re-interpretation based on modern concepts of ore genesis.

In contrast Professor G.R. Davis emphasises, largely from his experience at Kilembe, the multiple facets of a mining geologist's work in a developing modern mining complex whilst O.W. Nicholl reviews modern techniques of geochemical and geophysical prospecting. These chapters succeed in creating an impression of 'geology as it really is' within the minerals industry and should provide interesting reading for any undergraduates considering joining the industry. Professor Davis comments that "the mine geologist, in common with many other industrial geologists, enjoys the rare satisfaction of knowing that his theories and quantitative predictions are constantly being put to the practical test." This reviewer would add that the geologist must be constantly prepared for his theories to be proved wrong and, as Professor Davis demonstrates, be flexible enough to modify his thinking as new evidence accumulates.

In the minerals industry the relatively scarce mineral deposits are sought wherever they occur. In contrast within the construction industry almost all rocks and soils can and have been used in one form or another. The geologists therefore usually has to seek materials from the nearest available source. He has to be aware of the potential uses of such common materials as clays, sands, gravels, limestones, igneous rocks, etc. Physical properties such as aggregate impact values, chemical resistance, crushing strength, polished stone value and many more are often totally ignored in academic courses but Dr. Diane Knill reminds the reader that these are the properties which concern engineers. In attempting to cover the whole field of geological materials used in the construction industry, Dr. Knill has little opportunity to discuss the role of geologists in seeking such materials but sufficient is written to illustrate that they must be familiar with both the properties and potential uses of the materials they seek.

Similarly geologists in the Portland Cement industry, described by D.P. Jefferson, have to be familiar with the technology of cement manufacture. In contrast to the minerals industry market research usually precedes the geologist and he and the cement chemists may then have to devise means of producing Portland Cement from materials which are far from ideal. Thus, to satisfy market demands, many unusual materials have had to be used such as carbonatites in Nigeria in place of limestones and mixtures of volcanic rocks and imported diatomite in Mexico in place of argillaceous material.

An excellent resume of ground water accumulation, circulation, chemistry and management is given by R.A. Downing. The role of the geologist is not discussed since the author has chosen to concentrate on a lucid description of the elements of hydrogeology.

The role of the geologist in the construction industry is discussed by Professor J.L. Knill and illustrated by reference to the Hartlepool Nuclear Power Station, the Farahnaz Pahlavi buttress dam, Iran and the Kielder tunnels together with other examples discussed in less detail.

In a short review it is impossible to do more than indicate the general flavour of a book which covers such a wide range of subjects. Environmentalists may well object to the lack of an assessment of industrial geology on man's environment and would not necessarily agree with the editor's definition of industrial geology as being "of benefit to Man." The balance is partly corrected by M.H. de Freitas' discussion of geological hazards and G.P. Black's establishment view of conservation. In the space allowed neither can adequately cover all environmental problems. Thus industrial hazards from airborne dust, toxic wastes, natural and artificially produced gases are not meaningfully discussed although they are increasingly the concern of industrial geologists. The suggestions for further reading, additional to references at the end of each chapter, do widen the scope considerably.

Although only partially covering the subject this book will be read with great interest by student, professional and amateur geologists alike. At £9.50 it is reasonably priced by modern standards and is strongly recommended as background reading for the general reader, undergraduates and W.E.A. classes in Economic Geology.

R. J. Firman