

Book Reviews

Minerals and Men: An Exploration of the World of Minerals

James F. McDivitt and Gerald Manners
*The Johns Hopkins University Press,
Baltimore and London, 175 p., 1974.
\$8.25 cloth cover; \$3.50 paperback*

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This delightful little book, as the preface states, seeks to "blend some geological information with monetary requirements, some technological concepts with environmental problems and foreign trade implications". To reach this end, the book is divided into three parts. Part One discusses the place of minerals in society and examines some of the unique characteristics of minerals. This includes a brief, but excellent, discussion of the "resource base" or "total stock" concept of commodities. The authors regard the earth as the starting point for resource discussion and, from this, gradually lead up to the concept of enriched zones in the earth, commonly referred to as orebodies. This leads naturally to a short discourse on the groupings of commodities and, from thence, to the geography of supply as dictated by the "fixed" nature of mineral deposits. One topic which is beautifully handled is the explanation of why current reserves of most commodities tend to be basically a 15 to 20 year working inventory of a mineral resource rather than a complete statement of the mineral wealth in the ground.

Part Two examines selected commodities to illustrate various aspects and issues of mineral supply

and development. For example, iron ore (and steel) is used to illustrate the complexity of the mineral industry with regard to materials which must be acquired and assembled, their sources, and changes in patterns of supply. Molybdenum and vanadium are presented as examples to emphasize the importance of by-product recovery. The concept of resources, as illustrated by copper, is particularly well treated. Besides defining, in easily-digestible terminology, the differences between reserves, resources and resource base, the authors manage to convey some idea of the degree of flexibility with which man is able to influence what constitutes a mineral resource. The importance of scrap as a raw mineral is also discussed, using lead as the example.

In general, this reviewer found the choice of commodities well-founded, and the concepts extremely well-presented in non-specialist's terminology. The only commodity with which the reviewer might take exception is the choice of iron to illustrate the complexity of the mineral industry. Apparently, iron was chosen because it is the giant of the metal industries (over 90% of the metal produced each year is steel) and, coincidentally, the junior author (Manners) is an authority on the marketing of iron ore. However, to this reviewer, the very fact that iron is the supergiant among metals automatically sets it apart from the others. Copper, for example, might be considered more typical in that its deposits are more uniformly distributed in the world, it enjoys uses in a bewildering variety of ways similar to that of iron, and in addition, it is a major industrial metal.

The relationship between government and base metal mining is discussed from the point of view of self-sufficiency, subsidy to mines, stockpiling, and import quotas. Although brief and wide-ranging, this section of the book reaches no

conclusions other than to state that "there is no one answer to what a nation's import policy should be in order to satisfy all the parties involved". To this reviewer however, the discussion suffers from the fact that only the experience of the United States in dealing with the complexities between government and base metal mining is considered. The problem is very real in other countries of the world and they have met the challenge in different ways but these other examples are not considered in this section which stands out as the most parochial part of a book with an otherwise reasonably "international" flavour.

Part Three is devoted to summing up and to recognizing some continuing uncertainties. Among the latter, two which are discussed in some detail are the environmental impact of modern mining techniques and the question of energy supplies.

Despite its general title, however, the book does not deal with the relationship between minerals and all men. The treatise is based entirely from the viewpoint of the United States, an extremely highly industrialized nation which many experts feel is in the "advanced middle age" stage of exhaustion of a significant portion of its resources. Foreign ownership, for example, a topic of concern to Canadians, is not even mentioned. The "world of minerals", it seems, is confined to the United States.

The book is not written for the scientist who is looking for facts and figures to back up the many generalizations contained within it. The authors recognize this in their preface but there is a potential danger in that the chronic lack of data and specific examples will lead the non-informed reader to conclude that this is almost entirely an academic exercise. It is therefore unfortunate that some of the few hard

facts which *are* presented are actually wrong. For example (p. 24), Labrador is *not* overseas relative to the Mesabi Range in northern United States (as are Venezuela and Africa, the other two examples cited). Also, on p. 13, the value of US mineral production in 1970 was \$29 *billion*, not 29 million as stated in Table 1.

With these caveats in mind, however, this reviewer, as an economic geologist who has grappled with the problems of describing to non-specialists, some of the complexities of the relationships between the mineral industry, geology and resource base, found that *Minerals and Men* treated the topic in a remarkably terse but nonetheless clear and easy-to-read fashion. The manner of presentation and organization is excellent and the terminology used was chosen with the non-specialist in mind. The result is a thoroughly enjoyable exploration of (part of the) world of minerals as it relates to (some) men.

MS received January 13, 1977

Short Course in Microbeam Techniques

Edited by D. G. W. Smith
Mineralogical Association of Canada,
186 pages, 1976.
Soft cover, \$7.50

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Prior to the regular 1976 Mineralogical Association of Canada meeting in Edmonton, the Executive Committee determined to produce a short course on the microanalysis of minerals. After entrusting organization of the course to D. G. W. Smith, the MAC has now published in this small volume the lecture notes of the six participating instructors, as edited by Smith

The first paper, by J. C. Ruckledge, deals with instrumentation - the designs, concepts behind the designs and necessitated compromises made. It includes a good review of the evolution of the electron microscope, but no more than two paragraphs on the instrument which has lately aroused the interest of

analysts - the ion microprobe. The choice of illustration throughout the paper is excellent.

G. Springer presents in section two the basic formulae built into various computer programmes relating standards to unknowns by atomic number, absorption and fluorescence effects caused by differences in composition. It is obviously the most technical paper presented and aimed at a rather limited audience. Several errata detract from an otherwise clear presentation of a difficult topic.

Section three, by D. G. W. Smith, is easily the most readable contribution in this publication. Smith deals clearly and concisely with quantitative energy dispersive microanalysis from first principles to complex refinements. Instrumentation is fully described in a progressive sequence from detector to output. The parameters limiting each step are outlined and illustrated, together with comparisons to wavelength dispersive techniques where applicable. The paper is certainly recommended reading for any analyst contemplating modifying an old or establishing a new microanalysis lab.

The last three papers are concerned with practical applications of microbeam technology, but concentrate almost exclusively on the electron microprobe. A. G. Plant writes specifically about mineralogy applications, D. B. Clarke about petrological studies and D. C. Harris of economic geology applications. With such a separation of topics, some overlap of detail must be expected, but it is not severe. Although these three papers together constitute an excellent summary of a wide range of electron microprobe studies, I feel they could be somewhat condensed. Once the principles and restrictions of analysis have been stated, applications are as varied as the researcher's interests. In that regard, the listed references with each paper are as valuable as the text. In the examples given by Plant on ion probe analyses, the difficulties in seeing through the numerous molecular ion interferences to be expected from silicates and oxides are well brought out.

Finally, an appendix listing such items as suggested symbols for analytical parameters, mass absorption coefficient formulae for various spectral regions and a list of suggested standards round out this book. I had hoped that by this

time it would be possible to add two sections to the appendix: firstly, a summary list of data reduction programmes the instrumentation to which they are best suited and the addresses from which copies may be obtained; and secondly, a list of silicate, oxide and sulfide standards available from specific labs.

Some duplication of references might have been avoided had there been only one listing rather than six; however, in any form the references are a major asset of this volume. Another strength, which alone makes the book a worthwhile addition to a library, is the comparison of quantitative data acquisition by automated electron microprobe and by scanning electron microscope fitted with energy dispersive facilities.

As this is the first MAC publication in the short course category, it may be premature to compare it with the more established publications sponsored by the American Geological Institute and by the Mineralogical Society of America. A comparison is further made difficult by the difference in topic emphasis; AGI and MSA concentrated on mineral group studies while this book has dealt purely with a technique of examination. The MAC volume certainly lacks some of the style and polish of the other publications, but it is a worthy contribution which, hopefully, will be followed by others, similarly explaining the mysteries of "black box" techniques.

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