

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.

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Short Course in Microbeam Techniques

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

Reviewed by N. D. MacRae
Department of Geology
The University of Western Ontario
London, Ontario N6A 5B7

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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