

Physics and Chemistry in Space, 3. Geochemical Exploration of the Moon and Planets. I. Adler and J.I. Trombka. Springer, Berlin, 1970, 243 pp., 129 figs., cloth, DM 58,00.

Evidently, the principal interest of the authors of this book is in geochemical techniques and data analyses, which are presented in considerable detail for the Moon but are of more general application. Fringe subjects, such as ALSEP geophysics, hardly enter the discussion so, clearly, the book is highly specialised and will appeal mainly to the specialist in lunar and planetary science and engineering.

Emphasis is put on a discussion of the composition of the Moon through in situ, soft landed, instruments and remote sensing devices. The instruments themselves are discussed in chapter 2, where specific and detailed reference is made to the Surveyor programme and further reference to the orbital measurements made from Ranger 3 and Luna 10. Here is the place to look for a reasoned explanation of the Surveyor back-scatter experiment; and a full description of the results drawn from Surveyors 5, 6 and 7.

References to work being done on instruments under development for lunar and planetary studies are explored in chapter 3.

The principal results of the Apollo 11 and 12 surface missions can hardly fail to stimulate the imagination; along with a circuit of the Lunar Receiving Laboratory, the reader is briefed, chapter 4, about the results drawn from a preliminary examination of the Apollo 11 samples.

In chapter 5 the theme is data processing and analysis. The authors present analytical methods of interpreting complex digital spectra – such as γ -ray spectra – in terms of soil composition. The reader should be familiar with least square methods of fitting curves.

The last chapter is entitled "Orbital and Surface Exploration Systems After Early Apollo" and, again, deals principally with the Moon in reporting suggestions for future programmes.

There are numerous minor misprints and, on page 6, "in the neighbourhood of Mare Cognitum" should read "in a part of Mare Nubium later re-named Mare Cognitum". The book is generally well presented and illustrated, however, and is compact. There is a Subject Index.

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Lead Isotopes, B.R. Doe. Springer, Berlin, 1970, 137 pp., 24 figs., 26 tables, DM 36,00.

The study of variations in the isotopic composition of lead in rocks and minerals is at the same time historically the earliest geophysical application of radioactivity and that which is in most turmoil at the present time. As mentioned by Doe, the coupled decay of the two isotopes of uranium to two of lead permits internal treatment of the data which is not possible with any other known dating method, and permits application in principle to several fundamental problems in the earth sciences. However, the interpretation of lead isotope data is still often the cause of controversy and is on occasion not as clearly understood as it should be even by some of those working in this field.

The time is therefore ripe for a monograph which would examine and present clearly the unifying basic assumptions which underlie the interpretation of lead isotope variations in such superficially diverse situations

as the dating of zircons, of lead ores such as galena, and for trace lead in rocks and minerals. Unfortunately, the monograph under review does not supply that want. No real attempt at all is made to examine critically how the formalism customarily used to interpret lead isotope data is based on multi-stage episodic models, or to review in adequate depth the deviations from such a model which have been introduced in an attempt to interpret, for instance, zircon data. There *is* a discussion of zircon data, but it is not comprehensive and is unlikely to be fully comprehensible to the newcomer to this subject without considerable reference to the original literature. This is not atypical of the book as a whole. A glaring omission would seem to be the absence of a discussion of the controversy in the literature about the suggestion by Ulrych (1967) that an independent age of the earth may be derived from analysis of oceanic basaltic lead data.

In place of a proper discussion of systematics we are presented for the simpler cases with equations but with no proper discussion of the models upon which they are based. Neither is there a proper discussion of the modern developments in trace analytical techniques for U, Th and Pb, or of the developments in mass spectrometry which allow much more precise measurements of lead isotopic ratios than hitherto – yet such developments are vital for successful application of the more refined models which are now beginning to be used. In mitigation of this omission, there is a very useful comprehensive and up-to-date table which lists (with references) the chief recent technical developments.

Apart from these particular deficiencies, the monograph nowhere attempts a clear orderly account of the objectives and potentialities of the subject. It is therefore hardly likely to be successful in expounding the relevance of lead isotope studies to workers in related fields in the earth sciences. Neither is it likely to be as useful as might be desired in assisting beginning research workers in the same field, or indeed practising geochronologists not already fairly well acquainted with lead isotopes.

However, it has undoubted value to workers in the field in that it collects together in one place a very comprehensive set of tables of published lead isotope data and an equally comprehensive set of references to the literature, including references to much Russian work which has often (sometimes unjustly) been ignored. There is no doubt that in this regard the monograph serves a very useful purpose, for lead isotope papers are scattered through diverse journals and there has hitherto been no adequate bibliography apart from that circulated privately by Doe in 1968. Further, although perhaps no single topic receives as full a treatment as it deserves, the discussion in the text does at least sketch the chief modern applications of lead isotopes up to the work on Apollo 11 Lunar samples.

A final criticism (for which the author can in no way be blamed) is the somewhat excessive price for such a slender volume. It will nevertheless be a necessary purchase for laboratories actively engaged in lead isotope work, and perhaps for others who need a modern bibliography of the subject.

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REFERENCE

Ulrych, T.J., 1967. *Science*, 158: 252.