

immiscibility and partial melting, where extensive studies have been published. With such omissions, a more appropriate book title could be 'Nature and Origins of Complex (Plutonic) Granitic Assemblages'.

Despite such imbalance, this book does inform, stimulate and entertain. It is written by a scientist who has contributed more to the subject than most other living geologists. I recommend it as very good value to those advanced students who have already balanced the options by reading 'Igneous Petrology' (Carmichael, Turner and Verhoogen).

G. MALCOM BROWN

Wilson, M. J., Ed. *Clay Mineralogy: Spectroscopic and Chemical Determinative Methods*. Chapman & Hall, London. 1994. 367 pp. Price £79.00. ISBN 0-412-53380-4

In the preface the aim of the book is stated to be to make more accessible to the non-specialist a variety of spectroscopic and chemical techniques now being increasingly used for the study of clay materials.

After a general introduction to molecular spectroscopy methods there then follow six chapters describing specific spectroscopic methods: infra-red, Mössbauer, nuclear magnetic, electron paramagnetic, X-ray photo-electron and X-ray fluorescence spectroscopy. The final two chapters are devoted to chemical analysis of clay materials and the characterisation of poorly ordered minerals by selective chemical leaching. Each chapter follows a similar format outlining the principles of each technique, experimental procedures and their applications with examples.

This volume can be seen as an accompanying one to the 'Handbook of Determinative Methods in Clay Mineralogy' also edited by Dr Wilson. Three of the chapters from this volume have been reproduced with some updating in the current book, namely those on infra-red spectroscopy, chemical analysis and the characterisation of poorly ordered minerals by selective chemical methods. However, the changes to the chapters are minimal and as these three chapters make up 30% of the new book, this might be a disincentive to purchasing it for those who already have the 'Handbook of Determinative Methods in Clay Mineralogy'.

At times the book seems to belie its title with sections in many chapters devoted to the application of the techniques to the study of non-clay minerals e.g. infra-red spectroscopy of olivines, Mössbauer spectroscopy of feldspars.

Perhaps it might have been more appropriate to have referred to Clay Materials or Soil Mineralogy rather than Clay Mineralogy in the title.

Overall the book achieves its aim of introducing these various spectroscopic and chemical techniques for the study of clay materials to the non-specialist. Anyone embarking on the use of these analytical methods for the first time will find this book of great value. It provides in one volume a good compilation of basic information that would otherwise be available only from a variety of different sources. For this reason, despite its high price, I am sure that it will soon be on the shelves of many libraries and part of the book collections of clay mineralogists and soil scientists.

H. F. SHAW

Guthrie, G. D. Jr. and Mossman, B. T., eds. *Health Effects of Mineral Dusts* Washington, D.C. (Mineralogical Society of America: Reviews in Mineralogy, Vol. 28), 1993. xvi + 584 pp. Price \$28.00. ISBN 0-939950-33-2

This new volume in the series 'Reviews in Mineralogy' breaks new ground in the extent to which it is interdisciplinary in coverage and interest. The primary sources of mineral dusts are clearly in the realm of Geology but mineral extraction, separation and industrial processing are also very pertinent. The structures and physics and chemistry of minerals form an essential foundation, but since we are concerned here not with the minerals *per se* but with their interaction with the human body, we necessarily enter the fields of biochemistry, pathology and epidemiology. And because some of the mineral dusts can constitute such serious health hazards, we need to address methods of identification and measurement, and also control and regulatory procedures. All of these aspects, and others, are examined in this review, which follows from an M.S.A. short course endorsed by the American College of Chest Physicians and the U.S. Geological Survey.

After a general introduction the next chapter summarizes the nature of the major constituents of mineral dusts, particularly two which occur in asbestiform varieties, the amphiboles and serpentines, but also micas, clays, silica and zeolites. A fascinating part of this chapter deals with the generation and migration of natural dusts and their quantitative estimation, an often neglected background upon which man-made dusts are superimposed. A further three chapters deal more extensively with the aforementioned minerals and also with oxides and phosphates,

and two more chapters describe methods of sample preparation (separation, etc) and mineral identification, for which purpose X-ray diffraction, electron probe analysis, electron microscopy and diffraction and various spectroscopies can each play a part.

The above sections, constituting the clearly mineralogical part of the book, are followed by some 'cross-over' chapters. One such deals with mineral surfaces which are the meeting place of mineralogical and biological activity. Sorption, oxidation-reduction, catalysis and dissolution may play a part in pathogenesis. The well-known 'Stanton hypothesis' linking pathogenicity with particle morphology is examined next, and while the correlation is strong it is regarded as insufficient to explain all the biological data. There follows an account of 'surface thermodynamic properties of silicates and their interaction with biological materials', which deals mainly with surface tension and electrostatic interactions.

The second half of the book is concerned with epidemiological, pathological and biochemical concepts pertinent to mineral-induced pathogenesis. One chapter focuses on the epidemiology of diseases related to asbestos and another on those related to silica and zeolites. Also examined here are records related to dusts from mining or quarrying gold, iron-ore, coal, slate, diatomaceous earth, talc, kaolinite, bentonite, palygorskite, mica and vermiculite. In several of the latter cases, accessory minerals (e.g. amphibole asbestos), rather than those named, may be implicated in the adverse health effects.

The more medical chapters follow under the headings: 'Asbestos lung burden and disease patterns in man', 'Defense mechanisms against

inhaled particles and associated particle-cell interactions', '*In vivo* assays to evaluate the pathogenic effects of minerals in rodents', '*In vitro* evaluation of mineral cytotoxicity and inflammatory activity', 'Cellular and molecular mechanisms of disease' (the latter includes pulmonary fibrosis, lung cancer and mesothelioma), and 'Biological Studies on the carcinogenic mechanisms of quartz'. The '*In vivo*' experiments have tested not only amphiboles, serpentines, clay minerals, mica, talc, sepiolite, vermiculite, zeolite and silica but also some man-made fibres which are being used increasingly as substitutes for asbestos.

The final chapter presents the major regulations and guidelines for asbestos (occupational exposure, air emissions, waste disposal, etc.) and also for the zeolite erionite, and certain man-made fibres. An appended glossary of terms from geological to medical is particularly appropriate for this volume.

Mineralogists should not be surprised that the medical part of this book does not provide crisp explanations of how the inhalation of mineral dusts causes disease, why one disease and not another, why one mineral is harmful and not another. They should however gain an appreciation of the complexity of such investigations, some pointers as to possible mechanisms of pathogenesis, and of the directions of current and future research.

The many contributors, the volume editors and the Series editor have produced a very worthy 28th addition to the highly successful 'Reviews in Mineralogy', at a price affordable by the individual as well as institutions and libraries.

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