

tably find much of it only marginally relevant to their own interests. Although terrestrial issues are addressed, the book really seems to be aimed at the planetary community. And trying to choreograph so many different contributions is equally inevitably a lengthy process. (Two of the authors are listed as deceased). Thus, the resulting book is less up-to date than it should be. Though some chapters include references up to 1992, most are based on the literature of the 1970s and 80s. There is also no mention of recent important missions, such as the spectacularly successful Clementine mission to the Moon, and the Galileo encounters with asteroids Gaspra and Ida. Both spacecraft obtained new multispectral data of the first importance for the planetary remote sensing community. It is particularly surprising that there is no mention at all of microwave studies of Venus, which have provided *some* data on its surface properties. While the book must be regarded as a major accomplishment, the editors might have been better advised to aim for a shorter, more focused book, which could have been more speedily delivered.

P. W. FRANCIS

Peckett, A. *The Colour of Opaque Minerals* (Chichester and New York (John Wiley and Sons), 1992. xxxix + 471pp., Price £95.00. ISBN 0 471 93347 3

Colour is often the first characteristic we use to describe an object, opaque minerals are no exception. However, in episcopy it is one of the most enigmatic properties of a mineral, apparently variable and dependent on 'outside' influences. The controls on mineral colour in reflected light are, of course, very complex but nonetheless controlled by well established parameters; the problem is the variability in the eyes' perception of colour. In this definitive text on the subject, Andrew Peckett documents the complex interactions between photons and electrons that govern a mineral's colour and gives detailed analysis of the quantitative methods of colour characterization. He also dramatically reveals the limitations of the eye in colour estimation.

In the introduction and preface Dr Peckett acknowledges the debt owed to the late Norman Henry and Roy Philips for their contribution to this work. Reflected light microscopists do, indeed, owe much to these two researchers who did much to change a purely qualitative science into a quantitative one. Their work was unfinished and it is fortunate that Andrew Peckett has collated their unpublished work, merging it with

his own knowledge of the subject to produce a book of great merit.

The book comprises three main explanatory chapters (2–4) and then a vast database of information on the properties of opaque minerals (chapters 5–13). Its coverage is immense, dealing not only with the controls on colour but also the wider aspects of optics and their theoretical and practical basis. Chapter 2 covers 'the nature of light and colours' and deals with a whole range of topics relevant to 'colour'. For instance, the mechanics of the eye are detailed and then the subjectivity of qualitative colour description is cruelly exposed using a series of illustrative plates — this section should be read by every ore microscopist before embarking on mineral description. Chromaticity and its quantification are covered in detail and this section benefits from someone with an extensive practical knowledge of the subject.

Chapter 3, entitled 'light and crystals' explains the theoretical basis of colour generation due to the interaction between light and solids. Light waves, photons and quantum mechanics are all explained, revealing their role in colour generation. Bonding models are outlined and their relative merits discussed. In all cases the discussion of each subject is much broader than that relevant to colour alone. Chapter 4 focuses on 'reflected light microscopy' treating the subject in great detail and dealing with both plane and crossed polarized light. The early sections explain the theoretical basis for optical properties. Tensors are used to explain the important parameters governing these properties, especially the permittivity tensor that is of relevance to reflectance. The calculation of reflectances using data obtained from the principal axes is documented and the relationship between wavelength, reflectance and colour is demonstrated.

Chapters 5–13 comprise a database of information on the opaque phases. Dominated by sulphides, it also includes data on metals, alloys and oxides. Included under each entry are data on the qualitative and quantitative colour of the phase, crystallographic and structural information, and source references. The latter often includes the most recent citation in *Mineralogical Abstracts* — a useful piece of information in its own right. Furthermore, the entries often include a summary discussion of the crystallographic and electronic structure of the mineral and its variants.

In dealing with the physico-chemical concepts, the author starts at an elementary level, building quickly to a level where useful discussion of their effect can be made. Thus, those with little background knowledge, as well as the expert can

derive an improved understanding from the book. Where extra information or more detailed explanations are required, the reader is directed to the relevant literature. An extensive reference list and appendices explaining pertinent mathematical concepts further enhance the book's value.

The book has many merits, not the least that it contains a vast amount of information. In many ways it is unlike typical scientific texts produced today in that the discussion is not always focused on the main subject, colour, perhaps reflecting its origins from the notes of three different workers. However, this in many ways is a strength because it provides a very good coverage of the background that is needed for a complete understanding. It contains everything the ore microscopist wanted to know about colour, and much more. It is aimed at mineralogists and is sympathetically written. I'm sure Norman Henry and Roy Philips approve of Dr Peckett's portrayal of the subject. The cost may inevitably prohibit individual purchase but it should be available for reference in all mineralogical libraries.

R. A. D. PATTRICK

Engel, M. H. and Macko, S. A., Eds. *Organic Geochemistry: Principles and Applications*. London and New York (Plenum Press), 1993. xxiv + 860 pp. Price \$79.50. ISBN 0-306-44378-3.

In 1969, Prof. Geoff Eglinton and Sister Mary Murphy edited a volume entitled *Organic Geochemistry: Methods and Results*. This volume became a foundation stone in a new discipline, merging natural products chemistry, geochemistry and new analytical techniques. It has become THE BOOK for generations of students. It is still invaluable reading. Nearly 25 years later, Mike Engel and Steve Macko have edited a book with almost the same title, in the same general discipline. This new volume could have been a challenge to the foundation volume, and given the strengths of the 1969 volume, potentially a damp squib.

There are several excellent books already available on organic geochemistry. The contents are reasonably predictable. Sections will usually include natural product chemistry, biological productivity, a catalogue of compounds, and then there will be a heavy focus on applications to the fossil fuel industries. So is the Engel and Macko volume another in this vein?

It is not! Buy it, borrow it, get it out on loan, do anything to get it, but be certain to read it! This volume is not restricted to organic geochemists,

but easily readable by interested scientists from all disciplines. At the same time, if you are an organic geochemist, have Eglinton and Murphy beside you. Engel and Macko are to be congratulated on compiling a volume which compliments and complements Eglinton and Murphy. This new volume contains 40 chapters by 58 authors. This new volume is refreshing and scientifically exciting to read.

There are 9 sections. Section 1 (3 chapters) is termed 'Introduction' and I was captured in the very first chapter. A standard approach to organic geochemistry books is to discuss the factors which control biological productivity and preservation. In this new edition instead, Roger Summons introduces the reader to biogeochemical cycles, and also successfully weaves in some biochemistry, isotopic work, and the fundamental points of taxonomy. Rather than progress to chemical fossils as is the usual tendency, de Leeuw and Largeau next discuss the biochemically and geologically more important macromolecules, including the geopolymer, kerogen. The last chapter in this stunning 'Introduction' is by Marilyn Fogel and Luis Cifuentes, on isotope (C, N, O and S) fractionation during primary production. Rather than a dry theoretical discussion, the authors' emphases take the reader into the field and describe the marked isotopic variation in an existing estuary. In the first three chapters, a new approach is taken, and the reader is introduced to living systems, biochemistry, present day environments, isotope fractionation, macromolecules, polymers, etc.. These three chapters justify the book alone. But the quality goes on!

The next section is on early diagenesis. Again, a refreshing deviation from the anticipated. Nine thought-provoking chapters. This section starts off with a discussion, by Susan Henrichs, of the rates of cycling of organic compounds in a variety of environments. I have now read this chapter several times, and modified some research programmes as a consequence. It is heavily researched, and deserves reading alongside Berner. Although all the chapters deserve reading, I was especially pleased to find a chapter devoted to particulate organic matter by Wakeham and Cindy Lee, addressing this analytically difficult organic fraction. Another chapter on organic matter at interfaces, and the compositional changes which can be induced, has given me hours of thought.

The third section (3 chapters) is devoted to the volumetrically major organic fraction geologically, the polymer kerogen. The first two chapters (Steve Larter and Brian Horsfield, then Jean Whelan and Carolyn Thompson-Rizer) are simply excellent.