

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.

Both chapters deal partly with a technique developed since Eglinton and Murphy (pyrolysis), which is not well discussed on other current books. A discussion of petrographic techniques (Senftle, Landis and McLaughlin) completes this section.

The following two sections generally cover organic geochemical applications in fossil fuels, and contain material present in other organic chemistry texts. I intended initially, therefore, to gloss over this section, but quickly found myself stopping and going back to the start. This section was, again, refreshing to read because, with contributions by 11 individual authors, specific points were highlighted by each author. Although excellent chapters are provided on standard topics such as thermal alteration, hydrothermal alteration, and hydrous pyrolysis, the chapter format provided a focus on gas hydrates (Kennecutt, Brooks and Cox). I was especially appreciative of the details of biomarker kinetics (Lewis) and water washing (Palmer) together with biodegradation.

So far, this volume has dealt with rather conventional topics. The rest of the book is again commendable for some of the more unconventional topics which have been brought in. The sixth section contains four chapters on organic matter and metalliferous deposits. Apart from conventional chapters by Levanthal, Gize and Manning, Finkelman provides a detailed data base on trace and minor elements in coals. In addition, the technological effects of these metals is highlighted.

The seventh section is devoted to the Precambrian, starting with, personally, one of the most stimulating chapters by James Kasting, on the evolution of the atmosphere and hydrosphere. This topic leads naturally to prebiotic synthesis (Stanley Miller), followed by the fossil and isotopic evidence for organized life (Schidlowski), and then the organic, geochemical and biomarker evidence (Imbus and Dave McKirdy). This section is then nicely rounded by Engel, Macko and Nagy, in a summary of the amino acids in carbonaceous meteorites. In addition to being a summary of the series of publications in *Nature*, I was impressed at the honesty of the authors in the way the arguments for and against extra-terrestrial organic matter were presented. The last chapter is an appropriate dessert, dealing with organic geochemical applications to the Quaternary. Brassell starts with applications of biomarkers as climatic indicators, with an excellent section on alkenones. This is followed by two chapters (Mitterer and Wehmiller) on the classic application of amino acids for dating and stratigraphic research. This is

followed delightfully by three chapters which I wish had been bigger. Firstly, the use of stable isotopes to determine food chains (Ostrum and Fry) is discussed, with an excellent reference list. Immunological techniques to establish phylogenetic links were presented then in an exciting and convincing style (Robbins, Muyzer, Brew, and Lowenstein).

Don't take my word that this book is worth reading. Find out for yourself! A. P. Gize

Nassau, K. *Gemstone Enhancement: History, Science and State of the Art* (Second Edition). Oxford and London (Butterworth Heinemann), 1994. xiv + 252 pp., 35 colour photos. Price £30.00. ISBN 0 7506 1797 7.

During the ten years since the first edition of this work, there has been a tremendous increase not only in the use of treatments to enhance the appearance of gemstones but also in the development of new and sophisticated processes used for this purpose. As is admitted, estimates of the extent to which treatments are now being used, in the form of heating, irradiation and other methods, are largely subjective, but the author suggests that around 70% of all coloured gemstones seen in the jewellery trade have been enhanced. Among several significant developments in treatment processes are the fracture and cavity fillings, including oils, polymers and glass impregnations as well as surface coatings of various types. Heat treatment and irradiation are also described, the latter section including a useful summary on the physics of colour centres.

One of the main sections of the book is the listing of specific treatments for twenty species of gemstones. The entries for such important gem families as beryl, corundum, diamond, opal and topaz are comprehensive and well documented and illustrated, but the details given for the less commercially important gemstones (one hesitates to use the term 'semi-precious') such as feldspar, fluorite, zircon and zoisite are rather scrappy, though there are references given which can lead to enlightenment.

The work includes four fairly lengthy appendices, giving further information on the techniques of heat treatment and of irradiation (sensibly, the reader is warned against courting instant disaster and advised to re-read the earlier chapters before embarking on any specific treatment), light and energy considerations in connection with colour, and finally a useful listing of purveyors of supplies and services (the latter including the addresses of gem-testing laboratories). The index, and the