

The impact structures are arranged alphabetically by continent, which immediately raises problems, such as the location of the Europe–Asia boundary (which results in Russian and Ukrainian meteorite craters being considered in separate chapters). The organization of the text also precludes obtaining readily all the craters in a particular country or state. Although the book is fairly comprehensive and extensively illustrated, there are several surprising omissions, e.g. no mention is made of the Tunguska impact phenomenon. The meteorites which produced the structures are hardly mentioned at all: for instance, in the description of the Barringer Crater, the fact that the cause of this feature is better known as the Canyon Diablo meteorite is completely overlooked. The text gives the impression that preservation of fragments of the impactors is rare, which is not the case — we have many meteorites in our collections which are associated with known impact craters.

The writing style is perhaps a little too casual: "blobs of rock" is not a generally recognized technical term. There are also several careless typographical errors, which should have been noticed, including one in the frontispiece of the book. The text sits awkwardly between a popular 'coffee-table' offering and a specialist monograph. If the former were the market, then a more general description of associated features, such as tektites, should have been included in the introduction. Colour photographs would also have been essential. The sketch-maps and locality descriptions will be valuable for visitors to crater sites, but since any such visits are likely to be geographically-based, rather than alphabetically, the organization of the book is not helpful. The book lacks figures or tables which collate the data together, such as global, age or size distributions of craters. Specialists in meteorite craters will still turn to Grieve's invaluable review paper on the subject (*Meteoritics*, 1991, **26**, 175–194), rather than this book, which has itself drawn heavily on Grieve's work.

Notwithstanding these criticisms, the book is informative and easy to read. It is well-illustrated, and would be a valuable addition to any library, as it provides a general introduction to the study of impact craters, and helpful (if slightly dated) references to more specialist works.

M. M. GRADY

Heide, F. and Wlotzka, F. *Meteorites. Messengers from Space*. (Springer-Verlag), 1994. Price paperback DM 38.00. ISBN 3 540 58105 7. 231 pp.

This book is the English translation of the third edition of a German text which first appeared in 1934. As such, it contains valuable historical

references and photographs, the latter of which are unavailable elsewhere. The book is organized into three main sections: Fall Phenomena, Meteorites, and The origin and formation of meteorites, with a short introduction and a final list of appendices.

The first section, on fall phenomena, is a comprehensive and detailed description of the effects of a meteorite landing on Earth. Starting with observations of the light and sounds which often accompany a meteorite fall, the authors then go on to describe impact-related phenomena, including a report of the consequences of the fall of small meteorites, effects which are often overlooked, given the far-reaching destruction caused by hypervelocity impacts. This section also includes an historical overview of the first recorded observations of meteorite falls, and the gradual awareness that meteorites were natural phenomena. The historical aspects of the text are an important record of the development of the field of meteoritics as a recognized physical science.

Section 2 (The meteorites) is an account of the classification and properties of the different meteorite groups, and includes a discussion of cosmic dust and its connection to asteroids and comets. The section focuses on mineralogy and petrology, but also has a short additional section on geochemistry. One of the shortcomings of the text is that the more recent discoveries in meteoritics, such as the extensive research undertaken on presolar grains, is only considered in a very abbreviated fashion. Any future edition of the book would do well to incorporate more detailed discussion of the importance of isotope studies on meteorites (including the enormous database of information used for oxygen isotope classification of meteorites).

Section 3 concerns the origin and formation of meteorites, and details the different age-dating techniques for the samples. It is not until this section that we learn of the great age of meteorites, and their relation to the formation of the solar system. In this respect, the organisation of the text is perhaps a little awkward.

Overall, the book is a clearly-written and fairly comprehensive, description of meteorites and meteoritics. Translation from the original German is excellent — there is none of the stiltedness of flow so often characteristic of translated text. The book is well-illustrated throughout, with numerous black and white photographs and diagrams. Although the text has been revised and extensively up-dated since its first publication, the historical basis of the book is still clear from its organisation, and its concentration on classical descriptive science, rather than the more recent instrument-based geochemical studies. This is no bad thing, and the book provides a valuable, clear and well-written introduction to the study of

meteoritics. One major criticism, however, is the abbreviated reference list in the final appendix. I feel that to be of greater use to students, the book should contain a more inclusive and up-to-date list of references to more specialist publications. Notwithstanding this comment, I have no hesitation in recommending the purchase of this volume, as an interesting addition to the library of any specialist or student of meteoritics.

M. M. GRADY

Vaughan, D. J. and Patrick, R. A. D., Eds. *Mineral Surfaces*. London (Chapman and Hall), 1995. x + 370 pp. Price £26.00. ISBN 0-412-56340-1.

This splendid book is the fifth in the Mineralogical Society series and results from a meeting held at Manchester University. The study of mineral surfaces is becoming increasingly important, because of the role that they play in many geological processes. This excellent book provides an up-to-date summary of the methods of study and applications of mineral surface science.

The initial chapter, by Professor David Vaughan, provides an overview of mineral surfaces, and includes a general discussion of surface-science

techniques and a review of the many areas where mineral surfaces determine geological and environmental processes. This general review chapter is followed by one written by Michael Hochella, which describes in detail the tools of mineral-surface science, and discusses the physics, chemistry and reactivity of mineral surfaces. The next chapter by Jack Tossell, places mineral-surface studies in their theoretical context, and outlines the state-of-the-art of atomistic simulations and quantum mechanical studies of surfaces. The final techniques-based chapter, by Dr G. N. Greaves, introduces new X-ray techniques and approaches to mineral surfaces.

The remaining chapters in the book focus on specific aspects of surface mineralogy, with excellent reviews of sorption at mineral-water interfaces, surface processes during dissolution, the surfaces of sulphides, the role of surfaces in flotation, and final chapters on clay and zeolite surfaces and reactivity.

As a whole the book is well written and presented, and provides an excellent introduction to a developing and important subject. The authors and publishers should feel proud of this contribution to the literature, and the book should appear on all library and many scientists' shelves.

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