

BOOK REVIEWS

Laverov, N. P. and Distler, V. V. (Eds) St. Petersburg & Athens (Theophrastus Publications) *International Platinum*, 224 pp. US \$69 (post-free). ISBN 5-88-143-051-4

This is a publication which arose from the 7th International Platinum conference held in Moscow in 1994. It contains contributions from an international collection of top platinum-group element (PGE) geologists.

The volume is divided into two parts. Part I is entitled 'PGE in Abyssal Magmatic Processes' and deals with PGE in igneous complexes ranging from the major economic PGE-producing complexes such as the Bushveld in South Africa and Noril'sk in northern Siberia to lesser PGE-enriched layered complexes and ophiolite complexes. There is an emphasis on PGE in layered intrusions in the Kola Peninsula which formed the focus for the pre-conference fieldtrip and the volume contains a useful collection of PGE papers for these areas, written by the Russian field excursion leaders and a Finnish group including Heikki Papunen. There is also an excellent review paper on modelling of the Noril'sk complex, the location of the post conference fieldtrip, with an international group of authors including Tony Naldrett's Canadian team, Z. Johan from BRGM France and their Russian colleagues.

Some of the other highlights in part I are a paper by A. Rice on the modelling of PGE deposits where he argues that major world PGE deposits require thick ultramafic units, and a paper by R. Merkle on a description of platinum-group minerals (PGM) in the UG2 of the Bushveld. D. Ohnenstetter and D. Watkinson examine the low temperature evolution of PGM in the Two Duck Lake intrusion in Canada with precipitation of arsenides and sulpharsenides at intermediate, but post-magmatic temperatures, followed by low temperature formation of tellurides and antimonides and then PGE-bearing alloys. There is also a very valuable paper describing the distribution of PGM in the New Caledonian ophiolite complex by Augé *et al.* The balance of papers in this part of the volume is approximately 50% Russian and 50% western.

Part II is shorter, containing five papers by Russian authors and one paper by S. Augustithis,

from Greece, on placer PGM from Yubdo in Ethiopia. In this part, Russian authors tackle PGE deposits in geological environments not typically recognized for hosting major PGE concentrations, such as black shales. There is also a paper on placer PGM from Konder, Siberia.

The book is well illustrated with many tables, diagrams and plates; it contains an abundance of mineralogical data with lists of PGM associated with different complexes and a considerable number of photomicrographs of PGM from igneous host lithologies and placer settings. This volume contains a number of very valuable contributions to the PGE and PGM literature and should be in all PGE specialists' book collections.

H. M. PRICHARD

Grady, M. M., Hutchison, R., McCall, G. J. H. and Rothery, D. A. *Meteorites: Flux with Time and Impact Effects*. London (Geological Society Special Publication 140) 1998. x + 278 pp. Price £69.00. ISBN 1-86239-017-7.

The Earth has always been pelted by high-velocity projectiles from space. The significance of this bombardment for the course of geological history has been amply demonstrated in recent years by the discovery that the end-Cretaceous extinction event correlates with a world-wide layer of iridium-rich impact ejecta and an enormous crater in Mexico. The discovery has captured the popular imagination, and it is now widely 'known' that an asteroidal impact explosion killed off the dinosaurs and, moreover, that future asteroidal impacts pose a very real threat to human civilization.

But is this newly acquired 'knowledge' supported by reliable evidence? Was the demise of the dinosaurs really caused by the enormous impact event or was it going to happen anyway? How much extraterrestrial material arrives each year, and what is its size distribution? Has debris from space been delivered to Earth at a constant rate over geological time? What exactly happens when a large body strikes the Earth's surface?

This book provides authoritative answers to these kinds of question. It is a collection of seventeen invited papers that were presented at

the Geological Society's prestigious Fermor Meeting in 1997. Following a brief overview of the scope of the meeting by the book's editors, the first eight papers deal with the flux of extra-terrestrial material to the Earth, the next six papers are about craters and impactites, and the final three papers review the palaeontological evidence for a link between mass extinctions and impacts.

The book is dedicated to the memory of Dr Eugene M. Shoemaker, the Fermor Lecturer, who was tragically killed in a motor accident while studying impact craters in Australia just a few months after the meeting. His, the first paper, is effectively restricted to the extended abstract which he provided at the meeting, and includes the somewhat surprising conclusion that the rate of cratering over the last 200 million years is about double what it was during the Archaean. The next two papers discuss the contribution of comets to the impact record on Earth and, in one of these, W. Napier develops the fascinating hypothesis that a ~27 myr periodicity in the terrestrial cratering rate is linked to the vertical oscillation of the solar system through the galactic plane, and the resulting gravitational disturbance of Oort Cloud comets. D. Hughes also discusses comets and comments on the general problems of estimating the mass distribution of impactors. The next four papers discuss the contribution of meteorite finds in hot deserts and Antarctica to an estimation of the meteorite flux, and show that despite problems of pairing, meteorite removal, and measuring the age of fall, the calculated flux is remarkably similar to that obtained from fireball observations today.

The six papers relating to cratering include an excellent review of terrestrial impacts by R. Grieve, a discussion of the recognition of the projectile material in impactites by C. Koeberl, two papers on the end-Cretaceous Chicxulub structure in Mexico, a paper by J. Spray on the localized nature of shock effects at impact sites, and a paper by I. Gilmour on the survival of carbon in different forms in crater settings.

In the first of the three palaeontological contributions, N. MacLeod contends that a demonstration of a causative link between major impacts and mass extinctions is precluded by the nature of the fossil record. More specifically, A. Milner shows that the fossil record of dinosaur extinction is too limited and diffuse to prove that it occurred precisely at the end of the Cretaceous. Finally, A. Hallam concludes that of all the mass

extinctions in the Phanerozoic, only the end-Cretaceous event correlates with an impact and, even in this case, proof of a causative link is diffused by the concurrence of other sources of environmental stress.

The book's broad, topical interest, and the high international standing of its contributors, make it a valuable source of information in this cross-disciplinary field, and every self-respecting geological library should possess a copy. However, its price probably puts the book beyond the reach of many individual would-be-purchasers, even with the significant reductions offered to AAPG and Geological Society members.

I. SANDERS

Hazen, R. M. *The Diamond Makers*. Cambridge (Cambridge Univ. Press), 1999, xiv + 244 pp. Price (paperback) £9.95 (\$15.95) ISBN 0-521-65474-2.

This book spans centuries of ground-breaking science, bitter rivalry, outright fraud and self-delusion, and is centred on the brilliant but often controversial pioneers of high-pressure research. It represents a new and heavily revised edition of *The New Alchemists* (1994), and is presented as a blend of dramatic personal stories and scientific advances (and failures) in the quest to create synthetic diamonds. After a brief account of the natural occurrences of diamond, details are presented of the early work by Hannay, Moissan, Crookes, Hershey and Sir Charles Parsons, and the founding of modern high-pressure research techniques by P.W. Bridgman, before turning to the first true synthesis of diamond by ASEA in Sweden in 1953 followed by the General Electric Company in the U.S.A. in 1955.

One of the delights of this book is its inclusion of many photographs of the experimenters and their apparatus. We are given insights into the belt apparatus, the tetrahedral-anvil press and the cubic-anvil press with its six carbide anvils arranged in three opposed pairs to give a cube-shaped sample chamber.

A whole chapter is devoted to the crystal syntheses carried out by Loring Coes, a chemist working for the Norton Company. Rather than tackle diamond synthesis directly, Coes crept up on the conditions necessary for its formation by first producing more than 40 silicates never before synthesized, such as pyrope, staurolite, kyanite,