continental keels and recrystallizing there as eclogite. The basaltic crust contained carbon (some of organic origin) and recrystallized as diamond; heating or fluid infiltration of this continental keel caused kimberlite to form, which under the right conditions ascended rapidly to the Earths's surface.

After a brief chapter (Harlow, Shatsky and Sobolev) outlining the collision and return of ultra-high-pressure terrains, permitting formation and preservation of diamonds in the continental crust, there is a detailed chronological and geographical account of the discovery of diamond sources (Levinson). This chapter presents many fascinating insights into diamond production, firstly in India which was the sole source until around 1730, when diamonds were found in Brazil; then from around 1870 to the present day, with South Africa, Namibia, Botswana and some 10 other African countries, followed by the Russian kimberlite sources mainly in Siberia (mining started in 1957), the Australian development in the lamproite of the Argyle mine (from 1979), China, and currently the active exploration in the Lac de Gras region of the Northwest Territories of Canada. This account is accompanied by numerous production statistics, but it is not always easy to compare production in terms of weight of carats produced with the value of diamonds mined, there being wide variations in the proportions of gem-quality diamonds in the different deposits: thus in 1995 the Argyle mine produced about 38% of the world's diamonds on a weight basis, but only about 6% on a value basis.

Sandwiched in the middle of the book is a chapter on the world's great diamonds, but here unfortunately two colour plates have been transposed relative to their legends, making the Koh-i-Noor appear in the Imperial State Crown! This is followed by various chapters outlining the history of diamonds as gemstones, their place as regal ornaments through the centuries, their value in English literature, diamond jewellery in Russia, Hollywood and the rest of the world, and into the twentieth century.

The final three chapters are likely to be of greater interest to geologists and mineralogists, dealing as they do with the processing of diamonds from the Earth to fashioned objects (Harlow), diamonds as gemstones (Shigley and Moses) and the synthesis of diamonds and their applications in modem technology (Collins). The production figures are interesting, being 100 tons per year (500 million carats) of which 80% is represented by the production of synthetic diamond grit for industrial use; mined natural diamonds amount to 100 million carats per year of which 25 million carats are used in the gem trade.

Altogether, this is a fascinating book, covering almost all aspects of diamonds from the aesthetic to their possible use in supercomputers, and from their discovery in the frozen wastes of Siberia to their synthesis by chemical-vapour deposition. The presentation is excellent, with many clear diagrams and sketch-maps. Almost my only regret (apart from the mislabelling of plates mentioned above) is that surprisingly there is no mention, either in the chapter on famous diamonds or in those concerned with colour in diamonds,of the wonderful Williamson 54.5 carat pink diamond (23.60 ct after cutting) presented to H.M. Queen Elizabeth II to celebrate her Coronation.

R. A. HOWIE

O'Donoghue, M. *Synthetic, Imitation and Treated Gemstones*. Oxford (Butterworth/Heinenmm), 1997, x + 203 pp. Price £35.00. ISBN 0-7506-3173-2.

This book sets out to describe a range of gem and ornamental materials, species by species, covering synthesis, simulation and both permanent or short-term colour enhancement. That 'nothing is quite what it seems' is a guiding principle – and then there is the problem as to what to call it, in attempts to avoid the weasel words or grandiose names seen in many advertisments .

After a summary of the various methods employed for the growth of gem-quality crystals, and an introduction to the techniques used in gem testing, there is a brief exposition on the major natural gemstones (taken by the author as diamond, corundum, spinel, beryl, quartz, opal, alexandrite and topaz) which includes a useful warning about the somewhat fanciful language often used to describe inclusions, e.g. 'silk', 'feathers' and 'fingerprints'. The meat of this book lies in the chapters concerned with the individual gemstones and methods of simulating them, ranging from glass to synthetic materials such as cubic zirconia, YAG, GGG and spinel, and including the many refinements such as carefully crafted doublets and triplets, the filling of fractures and the enhancement of colour. Even gem-quality diamonds have now been success-

fully synthesized by at least three firms, and although they are unlikely to be encountered, it is important that a gemmologist is aware of their existence and how they can be recognized.

The chapter on ruby and sapphire makes the interesting point that of all the deceptions practised on inexperienced buyers of gemstones, the sale of vanadium-doped synthetic sapphires as 'synthetic alexandrite' or more generally just as 'alexandrite' is by far the most common and particularly affects those with some mineralogical or gemmological knowledge (those completely ignorant of these disciplines being unlikely to have heard of alexandrite). The distinction of flame-fusion grown (Vernuil) corundum from ruby and sapphire produced by flux growth and hydrothermal methods is explained and both induced inclusions in synthetic stones and the typical two-phase inclusions of natural stones aire described. In the beryl group, only emerald is synthesized though aquamarine is often imitated. Synthetic flux-grown emerald is relatively expensive and can be distinguished by use of the Chelsea filter. Most natural emeralds contain numerous flaws and cracks and it is standard practice to improve the appearance of such stones by immersing the stone in oil with a similar refractive index to the emerald; leaving aside the vexed question of whether this treatment should always be made known to the purchaser (it may be claimed that this is a universally applied process which does not need to be mentioned), on opening a parcel of emeralds the oily smell may be noticeable, while for single stones a suspicious mind is recommended.

Opal, the quartz family, alexandrite, spinel, topaz, turquoise and jade are each dealt with rather more summarily, before a final chapter on glasses, composites and experimental materials. One of the more useful aspects of this book is the inclusion at the end of each chapter on the major species a section "Reports of interesting and unusual examples from the literature". Although perhaps less elegantly written than the main text, these sections will be of very great use when attempting to unravel exactly what is going on in a stone under examination; here the reader will find chapter and verse accounts of small but significant tell-tale features previously recorded in gemstones from all parts of the world and which have undergone a great variety of treatments to enhance their apparent value.

The highly dispersive and highly birefringent green SiC (H. 9¼) has been well known for years as a commercial product, and indeed is mentioned in the last chapter, but even since the book appeared a vitually colourless synthetic variety of this has been manufactured especially for the gem market, and is much closer to diamond in its overall appearance than any previous diamond simulant: so much so that it cannot be distinguished by the normal thermal probes, but only by a new instrument (designed by the same manufacturers), though it can be distinguished from diamond by its anisotropism (M.A. 98M/2654). This merely serves to underline the necessity for a gemmologist to keep constantly abreast of the latest attempts at simulation and enhancement, and this book will surely need to he available as a guide through the many potential minefields set to trap the unwary. It is eminently readable and the author's exposure to the occurrence of gemstones both in the field and in the laboratory makes him well placed to produce this useful and authoritative text.

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