

Book reviews

The Triumph of Vulcan: Sculptors' tools, porphyry, and the prince in Ducal Florence by S B Butters. *Olschki, Florence, 1996. 2 vols of 726pp, 210 plates, 68 in colour. ISBN 88 222 4411 7. £137.*

Porphyry is a very hard (comparable to basalt) stone, of a purplish hue, mined in Egypt, and used for statuary by Roman emperors. Statues and columns were reused in Byzantium and by the medieval church, but no new works in porphyry were produced until the Renaissance stimulated a desire among princes and popes to match the achievements of the Ancient World. Hard stones had traditionally been worked by abrasive techniques, and by the 15th century, porphyry veneers were being sawn into shape in Florence. But the stone could not be carved; Vasari commented in 1550 that his contemporaries (even Michelangelo) were unable to execute statues in it. But in 1568 he reported a breakthrough in the art of working porphyry; Duke Cosimo dei' Medici spurred on by his wish for a porphyry fountain, oversaw the distillation of a herbal 'temper' so effective that steel tools 'tempered' in it became hard enough to work porphyry. With this secret, a stonecutter called Tadda was able to execute the fountain to Vasari's design.

Cosimo took a keen interest in all kinds of applied science, and collected recipes for the 'tempering' of arms and armour as well as of tools. In 1568 Cosimo had persuaded a member of the Piatti family of Milan to set up a permanent workshop in Florence to supply the Medici court. There are numerous manuscript recipes in the Medici archives for hardening armour, and the author has excavated a great many of them, and presents them here, with a detailed commentary. The presumption is that these may show the same innovations in metallurgy that contemporary stonecutters' tools did.

Unfortunately, no armour produced by Piatti can be positively identified (because, of course, court armourers who did not produce for sale would have had no requirements for a 'show' mark) and the metallurgical evidence from other Italian armours of the 16th century is not encouraging to anyone seeking to find a correlation with improved tools. There is a marked decline in the metallurgical skills displayed by armourers in 16th century Italy, but of course, Tadda's secret may not have been a strictly metallurgical one. (It might, for example,

have been an unprecedented willingness to discard tools after a little working).

The author has produced an interesting account of the many influences on sculptors and stonecutters in the 16th century, and the milieu in which they worked. Lavishly illustrated (if somewhat expensive), these volumes are worth the perusal of historians of metallurgy, who too frequently neglect the uses to which their artefacts may be put.

Alan Williams

Grey gold: men, mining and metallurgy at the Greenside lead mine in Cumbria, England 1825 to 1962 by Samuel Murphy. *Moiety Publishing, Tanworth-in-Arden, 1996. v+481pp, 266x180mm, 168 figs, tables, index. ISBN 0 9526360 7 7. £26 (hb). Available from the publishers at The Corner House, The Green, Tanworth-in-Arden, Warwickshire B94 5AL, UK; add £2-95 P&P for UK and European addresses, £11-50 for USA or £13-50 for Far East and Australasia.*

Greenside was the last major lead mine to operate in Britain, and it is fitting that its history should be probably the most massive and best-researched mine history yet to appear. That this has been a labour of love for its author shows clearly; despite its length the book is not in any way padded out. Inevitably a book of this size and content is not a light read, but Murphy's style is lively and digestible, and the volume is well laid-out and well-illustrated (including a wealth of contemporary photographs), with a light touch in the headings.

The book is arranged chronologically, from the origins of the mine (first documented in 1799) to its final use as a test-bed for seismic monitoring of nuclear tests in 1962. The mine was in almost continuous production through this period, and Murphy traces its development in scale and technology in considerable detail; the historical data, like the lead vein, is both rich and expertly mined. Like all mines of any size, Greenside processed its own ore, and the dressing technology is described in detail (especially for the successive twentieth-century developments, where the detail, while a delight to the specialist, may well be excessive for many readers). Unlike most lead mines, Greenside was both sufficiently

large and sufficiently isolated to smelt its own ore for much of its working life (from 1828 to 1918), and the development of the smeltnill, with its alternations between ore hearth and reverberatory smelting, is also described in detail. The detailed descriptions of process flow in both ore processing and smelting are highly impressive, and it was a minor revelation to this reviewer to see clear evidence that the term 'calcining' referred to the remelting of smelted pig lead – like many colleagues, I had taken this term to be synonymous with 'roasting', as a preliminary treatment for the ore. The book is indeed impressive for the way in which its author has integrated the historical evidence, the technology of mining, ore processing, and smelting, and (especially for the twentieth century, where direct memories are available), the human aspect of mining.

Inevitably in a work of this scale there are some quibbles and disappointments. Murphy is clearly aiming at the informed mining historian and historical metallurgist – while many readers of *Historical Metallurgy* will be in their element, and the author's style is lively and accessible, the book would have been open to a wider readership had the technology been more clearly explained in layman's language. It is also clear that Murphy's love is for the mine, its people, and its technology, rather than for the world of mining history – he makes surprisingly little reference to mining history literature. As a result, the wider connections of Greenside in the mining world are insufficiently brought out. Potential readers with interests in other areas will find many valuable snippets – or rather, will all too often *not* find, since the index is inadequate, and many place- and personal names in the text do not appear. In a similar vein, a surprising number of non-local place- and mine names are misspelled (eg Tresayean for Tresavean, and Silvertonnage for Silvertongue). The mine's connections were consistent to the Alston and broader North Pennine area (although Murphy finds no evidence for the widely-repeated story that Greenside ore was taken to Alston for smelting), and connections to Yorkshire, Cornwall and the Llanrwst area of North Wales also developed at times. To the present reviewer, a notable absentee is Coniston – for whatever reason, it appears that the Lake District's two premier mines had remarkably little contact or exchange of personnel between them.

At the level of quibbles, the footnotes do not always appear on the page to which they refer, and Murphy persistently refers to the nineteenth century crushers as *Cornish* rolls for no apparent reason (the evidence for a Cornish or North Pennine origin for the roller crusher is contradictory – the present reviewer suspects a degree of simultaneous but independent development). And while the connections between the mine's prosperity and problems and the price of lead are firmly made in the text, graphs of the lead price (for examples those used in

Burt 1984) would have made the point more clearly.

It is also disappointing that, despite Murphy's obvious and deep familiarity with the surviving features of the site, and the excellent photographic coverage, there is no systematic description of the field evidence; this reviewer would gladly have sacrificed some detail of the twentieth century ore processing (for instance), to make room for a chapter on the surviving features of the mine.

But these are minor criticisms in a work of such scale and quality – this book is not cheap but is excellent value, and every serious student of the history of mining, ore processing or lead smelting should have it on her/his shelves.

David Cranstone

Reference:

Burt, R, 1984 *The British Lead Mining Industry* (Dyllansow Truran, Redruth)

Metals in the service of man by Arthur Street and William Alexander. *Penguin Books, Harmondsworth, 1994 (10th, golden jubilee edition). xvii+309pp, 197x128mm, figs, plates, index. ISBN 0-14-014889-2. £8-99 (pb).*

What an astonishing book this is! After fifty years it is still arguably the best introductory text to the world of metallurgy. The metallurgical processes used to extract the different metals from their ores and process them into saleable products are clearly and succinctly described, and the information is remarkably up-to-date, pointing to a thorough revision in this latest edition, although a few minor errors have escaped attention. What impresses most is that in this most general of books, the authors have managed to convey sufficient detail in each case to be genuinely useful, yet cover a range of materials which extends to the latest products of the materials engineer. New sections include coinage and the conservation of materials and energy.

The book covers both major and minor metals, the latter briefly but quite sufficient for the intended entry-level of readership, skips lightly over joining and corrosion, and even has a few words to say about non-metallic materials. Cast iron and steel are properly given the most attention, reflecting the fact that these ferrous alloys are by far the most widely-used metallic materials. The historical development of steel manufacturing processes is particularly well done, and very interesting for those whose acquaintance with steel making is marginal or long forgotten. Few realise just how widely the concast process has been adopted for bulk steel manufacture, as well as its better known use by the aluminium and copper alloy industries.

From the archaeometallurgical point of view the book has flaws and flashes of brilliance. The slight references to the ancient history of metals production and manipulation do not always reflect the most recent discoveries, but more recent history is excellent. The delightfully simple, clear expositions on structures and phase transformations in steels and non-ferrous alloys will be gratefully received by any archaeologist fumbling for an understanding of what can be a very difficult area.

Alloy steels and irons are dealt with pretty thoroughly and their special applications noted, but a welcome new feature is the section on the new classes of high-strength low alloy and micro-alloyed steels which are of growing commercial importance. These and other new products vividly demonstrate the success of recent research in making products exactly fitted to their intended applications, and at a very small price premium over traditional alloys. Strength is the property usually thought of as a measure of success in materials development, but the authors show that high stiffness, and good formability, weldability, machinability and corrosion resistance are highly valued properties for many

applications.

The chapter on shaping metals shows that the ancient art of the foundryman is still flourishing, and in general automated casting is still the cheapest method of producing highly-shaped products. New processes such as vacuum and 'pore-free' diecasting, semi-solid casting, squeeze-forming and so on are also covered, and show that there is still room for development, but the rise of castings at the expense of wrought products is itself being threatened by an increased use of powder metallurgy. Sintered powder components mostly require no machining at all, and produce almost no process scrap in manufacture. Once used only for tiny components, they are now being made in sizes where they compete directly with castings and forgings.

As a comprehensive and comprehensible introductory guide to modern metallurgical products and processes, this little book is a gem. It will also give a good grounding in basic metallurgical science for the non-specialist, and is highly recommended.

Sam Murphy