

Within the appendices, tables of small finds (including pottery) and coins are provided, with such context information as was available. It is unfortunate that this material is neither fully reported, nor is any of it illustrated. It is also unclear how, and with reference to what excavated material, the dates of the second phase and the commencement of robbing have been arrived at. This means that, as so often, there is no opportunity of comparing the assemblage with other amphitheatre groups in order to examine the potential of material culture studies on such sites. The tables would, however, represent the first step towards undertaking such analysis in the future. This is a minor criticism of a set which has extremely high production values and which, by any standard, represents a major achievement of architectural analysis.

English Heritage

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Dolaucothi-Pumsaint: Survey and Excavations at a Roman Gold-Mining Complex 1987–1999. By B. Burnham and H. Burnham. Oxbow Books, Oxford, 2004. Pp. xi + 339, figs 207, tables 37. Price: £60.00. ISBN 1 84217 112 7.

This volume reports on work between 1987 and 1999 at and around the Dolaucothi gold mines and the nearby Roman fort and *vicus* at Pumsaint in Carmarthenshire. The work includes excavations and survey at the fort and *vicus*, on the leat systems that supplied water for the mining operations, in the vicinity of the Carreg Pumsaint, and around the bath-house, as well as an overview which sets our current understanding of the mines in the context of competing models of their development.

The first and longest section (9–206) is devoted to a report on excavations in the north-west part of the fort in advance of redevelopment for housing by the National Trust. The first phase of the fort included a section of the defences and a timber gate structure, with a well to the rear, and timber structures flanking a gravel road. The timber structures were twice rebuilt during this phase. Subsequently, the defences were replaced by a stone wall and gate, probably when the fort was reduced in size. Probably at this time the well was converted into a cistern, and a fourth phase of timber building started to encroach on the line of the street. The timber building was later rebuilt again, putting the cistern out of use, and further encroaching on the street. Finally, another building was constructed, with a timber-lined cellar in a 2m-deep pit. This was subsequently burned, and the pit infilled with demolition debris. Thereafter the site showed little activity until the late medieval and early modern periods, following which stables or agricultural buildings were erected in the nineteenth century.

The excavation report is presented and argued in detail, but despite the care in excavation and reporting much remains uncertain. The overall chronology, incorporating recent thinking on the dating of Black Burnished ware, indicates that the fort was established *c.* A.D. 75 and abandoned *c.* 125. The various phases, therefore, have to be fitted into this 50-year bracket, but there is nothing from the recent excavations to date them more precisely, for the most critical levels and many key stratigraphic relationships had been truncated. The nature of the relationship between the fort and the gold mines remains unclear; activity at the mines outlasted the fort, as shown by traces of civilian occupation near Melin-y-Milwyr up to the late third century. Important in this context is the observation that the rampart of the fort's stone phase contains crushed quartz from the mining operations, confirming that the mines were in use at the time when the fort was rebuilt, and perhaps strengthening suggestions of a connection between the fort and mines.

One of the most important contributions of the volume to the mining environment as a whole is the section on survey and excavations on the leat systems (207–24). This demonstrates that the Gwenlais leat, discovered in 1989, is part of the same system as the Upper Annell leat; conversely, however, doubt is increased as to whether the Upper Annell/Gwenlais leats and the Lower Annell leats are part of the same system, or whether the former aimed to cross the col to the other side of the Cothi valley. The Upper Annell/Gwenlais leat was three-quarters silted up by *c.* A.D. 800, which strengthens the case for a construction date in the Roman period. This section also presents useful aerial photographic evidence for the Nant Dâr leat, which runs parallel with and above the Cothi leat. Altogether there is now evidence for at least three, and possibly four, leat systems supplying water either for extractive processes or for ore-processing (beneficiation) at the Dolaucothi mines.

The question of what the water was used for is brought into focus by the report on the excavations

near the Carreg Pumsaint (225–90). An artificial mound, thought until recently to be a medieval motte, is now shown to be a dump of crushed quartz, slimes, and clays – and the particle analysis of the deposits shows that these residues consist both of coarsely-crushed and finely-milled material. A carbon-14 date from organic material within the deposits provides a Roman period *terminus post quem*. This chapter provides more detailed support for the argument, already advanced by B. Burnham in *Britannia* 28 (1997), that the Carreg Pumsaint is the anvil stone from a Roman ore-crushing stamp-mill, whose wheel-pit lies adjacent to the artificial dump of crushed quartz and slimes. Not considered in this volume is the additional evidence that the legend about the Carreg Pumsaint stone may provide for this interpretation. The legend that the indentations on the stone's faces were imprints left by five saints who rested against it was current before 1767, when the Carreg Pumsaint was recognised as a probable mortar stone from a stamp-mill (2); and presumably also before 1704, the first attestation of the place name 'Pumsaint' in the Edwinstord Mss. (according to the Archif Melville Richards database).¹ Before this date, therefore, the true purpose of the mortar stone had been forgotten by locals and a legend developed to account for it. Certainly it looks difficult to fit the Carreg Pumsaint into an early modern context; nor is there any evidence for any medieval operation at the site. A Roman date for the Carreg Pumsaint and associated water-powered ore-crushing activities therefore seems the only likely one. The implications of this are considerable, as Burnham's 1997 article already emphasised; it shows that by the late first century A.D. the Romans were able to convert continuous rotary motion into reciprocating linear motion to use water-power to drive ore-stamps. The existence of similar stones at Roman mining sites in north-west Spain suggests that this technology was not confined to Britain.

An appendix to this chapter presents a useful catalogue of all known rotary millstones from the Dolaucothi area, which were evidently used to grind the crushed ore into powder for hydraulic sorting, once it had been crushed in the stamp-mill. It should be emphasised, though, that the photographs clearly show that these were all hand-driven — the spindle socket in the lower stones either does not pierce the lower stone, or is very slender, indicating that they do not derive from water-driven mills. If the ore-crushing was water-powered, the grinding of crushed ore still relied on human muscle power. A question not explicitly considered is whether the slimes and ore-crushing activities relate to the phases of underground mining, overlying the wastes from ground sluicing. If so, might they in fact belong to a reduced-scale civilian operation of the mines?

A chapter on 'Trial Excavation and Geophysical Survey in the Vicinity of the Bath-house, 1997' (291–312) sheds some tantalising light on the suspected civilian settlement south of the river Cothi, between the fort and the mine. A trial trench exposed part of the Roman road, with a series of occupation features adjacent to it, which included at least one clay-floored building. Activity seems to run from the late first through to the mid-second century A.D., so outlasting the fort, but not going as late as the evidence from Melin-y-Milwyr close to the mine. Geophysical survey confirms the presence of other buildings in the vicinity. An appendix discusses the course of the Roman road from Llandovery to Pumsaint. The Roman road, as opposed to later turnpike roads, seems to skirt contours to avoid major changes in elevation; this would make it much more suitable for wheeled traffic transporting the gold from the mines, a point only hinted at in the publication.

The volume concludes with an overview of the excavations and survey work (313–31), assessing the relative merits of the two competing models developed for the operation of the mines, by Jones and Lewis in *Bonner Jahrbücher* 171 (1971) and by Cauuet in 2000, and the contribution that the recent work makes to this debate. The Jones and Lewis model sees the visible remains as predominantly Roman, exploited intensively over a short period by working opencasts hydraulically by means of ground-sluicing and/or hushing using water supplied via the leat systems, followed by a phase of underground mining in deep galleries leading off the exhausted opencasts. Recently this model has been challenged by Béatrice Cauuet, following a two-week survey in 2000, in a privately circulated report which remains unpublished. As summarised in the volume under review (329–30), her argument

¹ The reviewer acknowledges material from Professor Melville Richards' place-name research archive deposited at the University of Wales Bangor, accessed through the Archif Melville Richards database (AMR), a project funded by grants from the University of Wales Board of Celtic Studies and the Arts and Humanities Research Board. (<http://www.e-gymraeg.co.uk/enwaulleoedd/amr/>)

is that the primary deposit of hard rock was worked by fire-setting and with tools, while the leat systems were used for hydraulic working only of the secondary alluvial deposits. She argues that much of the opencast working could have been carried out in the pre-Roman period, with the Romans introducing the hydraulic working of alluvial deposits, and extending the hard-rock mining underground. The relative sequence of both models remains the same, and the debate cannot be resolved on the limited dating evidence from the mining or leat systems currently available. It is clear that the two competing models each owe their genesis to their proponents' familiarity with mining systems elsewhere — Jones and Lewis with the large-scale Roman hydraulic mines of north-west Spain, and Cauuet with the Iron Age hard rock mines of the Limousin region. Cauuet's model relies partly on the supposed ineffectiveness of hushing at hard-rock sites — yet Roman hushing systems are known from the hard rock mines at Puerto del Palo in Spain. Positive evidence from Dolaucothi that might support Cauuet's hypothesis of pre-Roman opencast mining is limited to a single charcoal sample with a date between 925 Cal. BC and 427 Cal. BC at 95 per cent confidence level, found in a context below the dump of slimes (286). However, to construct an argument on this foundation one would need to demonstrate that the origin of the sample was anthropogenic, and that it was not residual. Indeed, the paucity of attested pre-Roman settlement in the vicinity may be a difficulty for Cauuet's hypothesis.

The volume as a whole represents a useful publication of recent fieldwork relating to the Dolaucothi mines and surrounding settlement. The excavation accounts are meticulous and comprehensive, and in the interpretation of the results the authors are scrupulously careful not to go further than the evidence warrants. The introduction and concluding chapter give some unity to the disparate pieces of fieldwork, and one can only hope that the authors will be able to carry out much of the research agenda which they propose in the concluding pages, in particular with a view to addressing the competing models of interpretation of the mines' development.

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The Roman Cemetery at Brougham, Cumbria: Excavations 1966–67. By H.E.M. Cool. Britannia Monograph 21. Society for the Promotion of Roman Studies, London, 2004. Pp. xxviii + 514, illus, CD. Price: £68.00. ISBN 0 907764 31 2.

The third-century A.D. cemetery at Brougham is located on a hilltop to the east of the Roman fort and *vicus*. The assemblage is of enormous importance as one of the very few cemeteries known from northern military sites, but publication has been a long and protracted process. The site was excavated under very difficult rescue conditions in 1966–67 and, while there has been intermittent assessment and some specialist reports, the final programme of analysis and publication only began in 2000. This time lag has obvious disadvantages (such as the poor original written records and the lack of flotation and sieving), but also advantages, such as advances in pottery dating and in the identification of cremated bones.

In terms of the structure of the report, sections on local context and the structural evidence are followed by a very full inventory of the deposits. This brings together the plan and section of each feature, the results of the human bone analysis and a full list of finds. Discussing finds by feature provides crucial context information, but could make life harder for specialists who are only interested in a particular type of object. Even the most narrow-minded specialist has no grounds for complaint, however, for detailed summaries of all the important categories of finds are provided which (together with the index) link back to the individual finds in the inventory. There are sections on human and animal bone, pottery, small finds, and the highly unusual biers decorated with carved bone, as well as a section on the tombstones from Brougham, both from the 1966–67 excavations and earlier antiquarian finds. A CD with all the raw data is also provided. This is potentially a useful tool, but it would have been helpful to provide more guidance on how to query the database and there were some glitches in the search results (e.g. a search for gold small finds also brings up bone and glass objects). What is particularly impressive is the fact that in all the specialist reports an explicit attempt has been made to link the results to the cemetery context. The final two chapters draw all this material together to address questions of identity and status.

Pottery (in particular BB1) dating allows for the identification of three phases of use and there are some spatial patterns, but the most striking result of the analysis is the strong association between