HMS NEWS

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Copper Production in the British Bronze Age

Roger Doonan

Despite centuries of scholarship, countless excavations and a wealth of theoretical literature for the British Bronze Age it is notable that we still have no direct clear evidence for how Bronze Age people transformed copper minerals into the dense, lustrous, reddish-gold coloured metal that we call Bronze. There are numerous explanations for this, not least the fact that many archaeologists, because of wrong-headed attitudes to 'technology', have preferentially chosen to recover either 'domestic' assemblages from 'domestic' contexts or 'funerary' assemblages from 'funerary' contexts. Scholars who have been interested in early copper production have tended to be of a more scientific bent and have thus, more often than not, conducted their studies from the laboratory bench choosing finished artefacts for their focus of study. Whilst the study of mineral extraction has blossomed over the last two decades, mainly as a result of the excavations undertaken by the Early Mines Research Group, the study, search even, for early smelting sites has in comparison been unproductive.

Several models have been proposed to account for the absence of copper smelting evidence in the British Isles including low temperature solid-state reduction and non-slagging processes, both supposedly leaving scant evidence. Although these models are initially attractive explanations, under scrutiny each model appears to contain logical inconsistencies or internal contradictions. When we draw comparisons with continental Europe the British situation seems even more odd. Smelting remains are generally visible and frequently found in close association with Bronze Age copper mines, see for instance the Mitterberg in Austria, Cabrières in France, and Skouries on the Island of Kythnos. Perhaps stranger for the British Isles is that this absence is not restricted to the Bronze Age but extends to the Iron Age meaning that copper production is pretty much absent for the whole of prehistory.

It is felt that this absence is perhaps structured more by an absence of looking for evidence than it is by any real absence. Recent studies at Ross Island (O'Brien 2005) and by Dave Chapman at the Orme may not have provided clear indications of what the copper smelting processes were but they have at least indicated the massive potential and benefits that field work in these areas can provide.

Recently, archaeologists from the Peak District National Park in collaboration with The University of Sheffield and The Early Mines Research Group and with the support of English Heritage have initiated an integrated project which aims, in part, to evaluate the potential for identifying evidence of early copper smelting in the vicinity of Bronze Age mines at Ecton Hill, Staffordshire.

Work to-date has focussed on methods of wide-scale prospection employing topographic analysis along with geophysical and geochemical techniques. Recent innovations in instrumentation for soil geochemistry have allowed what might be the most extensive and high resolution soil chemistry survey ever undertaken in British Archaeology. Preliminary excavation of identified hotspots have, so far, not recovered clear evidence of copper production but they have at least allowed team members to better understand the range of anomalies which are encountered at these sites.

Figure 1. Geochemical prospection at Ecton Hill using portable XRF (note mining spoil and Bronze Age barrow in background)

Future work will concentrate on extending the programme of prospection and developing the methods used. The project should result in an evaluation of various anomalies encountered in a multi-period extraction site and at the very least evaluate the possibility of finding smelting sites in the proximity of sites with known Bronze Age extraction.

Roger Doonan, Department of Archaeology and Prehistory, University of Sheffield, Northgate House, West Street, Sheffield, United Kingdom
Email: r.doonan@sheffield.ac.uk

Calstock Roman Fort

Chris Smart

Recent research in Cornwall has identified a previously unknown Roman fort. Roman forts are rare enough in Cornwall but what has made this discovery even more interesting is the possible association with metal production.

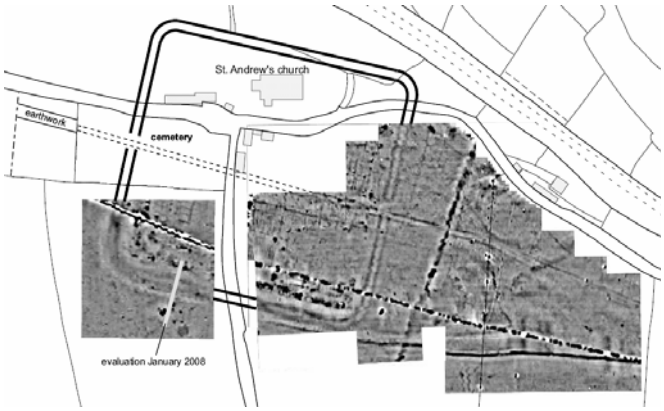

Figure 1. Geophysical survey to the south of Calstock church

The site was discovered as part of the 'Bere Ferrers Project' which was based in the Department of Archaeology at the University of Exeter and came to an end in February 2008. The project was a collaborative scheme headed by Prof. Stephen Rippon with landscape archaeologist Dr Chris Smart and economic historian Dr Peter Claughton. Late thirteenth and fourteenth century Crown accounts, exceptional in their survival, show that silver mined on the Devon side of the River Tamar was taken across the river to Calstock for processing. The same documents suggest that not only did smelting occur near to the parish church, but that an enclosed administrative centre (a ditched and earthen-banked *curia* containing a two-storey 'King's Hall with tiled roof, plastered and thatched buildings, a silver refinery, a smithy, stores and stables etc) was established in the vicinity. It is also documented that smelting was carried out at *vetus castrum de Calistok*, the 'old castle' (wage roll for 3 Aug. 1302), for which the fort must be a strong contender. Reports of charcoal found during digging in the cemetery hinted at the possible location of this fourteenth century smelting activity. A magnetometer survey conducted close-by in the adjacent field during October 2007 sought to investigate this possibility. While this survey failed to provide evidence for the medieval complex, it instead revealed the distinctive defences of a Roman fort (Figure 1) It also showed a strong magnetic anomaly to the south of the fort defences that was tentatively considered as one of the documented medieval smelting boles (furnaces). The royal silver mines were of national importance and their produce was used to strengthen an ailing economy during the reign of Edward I. No sites associated with the Crown silver mines in Devon have ever been excavated and it was with this in mind that the evaluation sought to investigate one of the possible smelting furnaces as well as establish the character of the Roman military defences.

Sponsors of the Bere Ferrers Project, The Leverhulme Trust, kindly allowed the diversion of finance to fund a small evaluation by Dr Smart in January 2008. A trench measuring 45 by 2m was positioned across the defences and the potential medieval smelting furnace. The Roman military character of the site was confirmed, with a timber-revetted rampart fronted by two substantial V-shaped ditches. To the inside of the rampart, within the *intervallum*, there was a substantial chambered field oven and traces of a possible metalled surface. The limited exposure also revealed a post set within a trench, indicating the potential for structural remains immediately inside of the defences. A second stone-capped 'rampart' was observed on the outside of the outer ditch, but is not a comparable feature of other Roman forts. It is probable that this 'rampart' represents a later construction. Geophysical survey shows that this 'rampart' follows the western and southern line of the fort's defences but extend beyond its south east angle, enclosing a larger area. A critical research aim of further excavation will be to ascertain the character and date of this stone-capped 'rampart'. A 'work area' consisting of a furnace set within a deposit containing charcoal and furnace lining, extended for 15m beyond the defences (to the end of the trench), and shows the potential scale and character of extra-mural activity.

Geological specimens recovered from the fill of the inner ditch and a layer just outside of the defences that also contained reduced furnace lining fragments have been preliminarily ascribed to mineralised lead-silver deposits. The small assemblage of pottery is dated to between *c*.AD 50–85, with a single sherd from the early second century. The bulk of the assemblage contains fabrics currently unparalleled in Devon or Cornwall. The remainder of the assemblage consists of samian, with a few coarsewares sourced from the Exeter area. Locally produced pottery forms a minimal component. Five radiocarbon determinations confirm the date range presented by the pottery for the features already excavated. No medieval material was recovered and radiocarbon dates and pottery from contexts associated with the furnace indicates that it was one element of extra-mural activity contemporary with the fort's occupation, rather than the Crown mines 1200 years later.

Chris Smart
Exeter Archaeology, Custom House, The Quay, Exeter, Devon EX2 4AN

Adaptation of Archaeometry Techniques to the Study of 18th- to 20th-century Copper Sheathings in Ships

Manuel Bethencourt

The Department of Materials Science and Metallurgical Engineering and Inorganic Chemistry of the University of Cadiz (www.labcyp.com) is based in the Faculty of Marine and Environmental Sciences of this University. Currently the activity of the group is divided between three main areas: the development of research projects, technological support tasks, and educational and training courses. One of the main research areas is archaeometry, coordinated by the Scientific and Technological Diving Unit of the University (www.ubtc-cadiz.com). This is an interdisciplinary line of research in collaboration with archaeologists and conservation specialists of the Andalusia Institute of Historical Heritage (IAPH). It involves the utilisation of different instrumental techniques to obtain technological, cultural and historical information on recovered objects and their archaeological contexts.

Figure 1. General view of copper sheathing in the hull of the Gades (Spanish Tug Boat, 1901)

Nowadays, the group is studying different samples of copper and brass sheathing from shipwrecks of the eighteenth, nineteenth and twentieth centuries. As is well known, officially the first use of copper as sheathing was by the Royal Navy in 1761, when the HMS Alarm frigate was coppered as an experiment to prevent attack of the wooden hull by several organisms, principally the mollusc *Teredo navalis*. The copper was also found to reduce biofouling of the hull, which gave a great advantage of speed when compared with those dragging round a vast growth of marine weed (Figure 1). The success of this technique was quickly translated to the merchant navy and others arms. As a result an important industry developed for the manufacture of copper sheets, associated with the generation of many patents.

The study of different copper sheathing has the potential to provide archaeologists and historians with another diagnostic tool for dating shipwrecks. When a piece of sheathing is recovered in an unidentified shipwreck, composition analysis can be performed that gives the exact amounts of the constituent elements. The accuracy of the composition tests, coupled with analysis of the metallic grain structure, can create a sort of fingerprint for each sheathing sample. The fingerprint can be used to identify two ships that were sheathed from the same lot of metal or even identify differences in sheathing origin across the hull of a single vessel. The fingerprints can also be compared to patent records or other known examples from precisely dated shipwrecks.

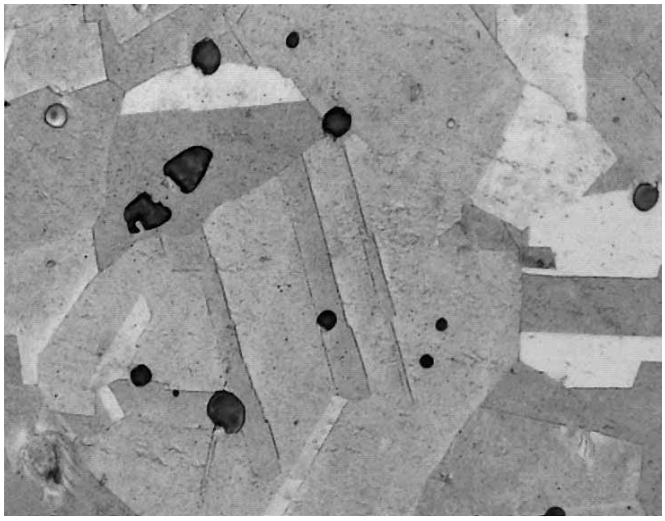

Figure 2. Photomicrograph of copper sheathing from Section from the Bucentaure *(French Ship-of-the-line, 1804–1805). Equiaxed grains and twin bands, with second phase precipitates. This microstructure is characteristic of hot forming. The composition is 0.013% Pb, 0.134% As and 99,80% Cu. This composition corresponds with the sheathing employed in France in the later 18th century.*

The metallographic characterization has been accomplished through different methods optimised for the studied alloys (Figure 2). The obtained data have been complemented with SEM-EDS, microhardness and compositional analysis through spark spectrometer. The results show many differences between the analysed sheathings of shipwrecks, according to the country of origin or manufacturing technique of the same. To date we have examined 18 samples from French, English, Italian, Norway and Spanish ships, from 1773 (Spanish Frigate *Magdalena*) to 1917 (Norway Whaler *Fortuna*).

Recently, for example, the analysis of samples from the Spanish Frigate *Triunfante* (sunk in 1795) has shown that it was subjected to a new sheathing in the yards of Cartagena, which used a higher amount of lead in the

manufacture of sheets ("hard copper"). These dates have served to the historians to document the repairs that were carried out in the yard.

Dr. Manuel Bethencourt, Corrosion and Protection Laboratory (researcher), Scientific and Technological Diving Unit (manager), Faculty of Marine and Environmental Sciences, University of Cadiz, Poligono Rio San Pedro s/n, 11510- Puerto Real (SPAIN
Email: manuel.bethencourt@uca.es, unidad.buceo@uca.es.

Middle Bronze Age copper metallurgy on the Southern Ural Steppe

Roger Doonan

It was V. Gordon Childe who drew attention to the importance of the Southern Ural Steppe region for our understanding of Eurasian Prehistory. In doing so, Childe initiated a tradition of scholarly research which has played a central role in discussions ranging from the Indo-European 'problem' to the application of World Systems theory. In contrast to other continental European scholars who favoured a more westerly homeland for the Aryan people, Childe thought the Southern Russian Steppe was the most likely candidate for the homeland of the Indo-European people.

Figure1. Map of Asia showing national boundaries and the area of the Sintashta Culture

More recent archaeological investigation in the Soviet and post-communist periods have again highlighted the significance of this area for our understanding of social development and cultural transmission during the Eurasian Bronze Age, especially during the Middle Bronze Age (c.2400BC) and the so-called Sintashta culture (Figure 1). The survey and excavation of Sintashta sites, most notably Arkaim in the 1980's, has noted the prominence of copper metallurgy. It is the identification of metallurgy as a key feature of Sintashta sites which has been used, in part, to argue that the Sintashta phenomenon represents a key horizon in the emergence of complex societies. However, whilst archaeologists have identified the presence of copper metallurgy at such sites, studies of metallurgical practice and its organisation remain at a preliminary stage.

Figure 2. Potential Bronze Age copper mine, trench feature in close proximity to test pit which produced Bronze Age ceramics

Recently, the Universities of Pittsburgh, Chelyabinsk, and Sheffield have begun a collaboration which seeks to better understand the practices of Middle Bronze Age mining and metal-producing communities. The project focuses on the excavation of a Sintashta period settlement in tandem with a regional survey of mineral deposits. Two seasons of fieldwork have so far resulted in concentrations of copper slag being identified at the settlement site and evidence of Bronze Age copper mining in the immediate vicinity of the settlement sites. Although these results are still being evaluated, they

represent important developments since prevailing models for the organisation of Sintashta metallurgy assume that copper minerals were transported significant distances, often hundreds of kilometres, to smelting sites. Thus has been seen as supporting evidence for the idea of a coherent cultural group.

Fieldwork is still ongoing (Figure 2) on this multi-disciplinary study but results are anticipated that will furnish more detail about the specific technological choices associated with copper smelting and production in this area. It is a key aim of the project to develop a detailed understanding of how metallurgy was organised and in light of this to reassess our understanding of social organisation for this important period.

Roger Doonan, Department of Archaeology and Prehistory, University of Sheffield, Northgate House, West Street, Sheffield, United Kingdom
r.doonan@sheffield.ac.uk

A Survey of Archaeometallurgy within Commercial Archaeology

Matt Nicholas

The continuing professional development or training of archaeologists has been an increasing issue over the last few years. Both the Institute for Archaeologists (IfA) and the British Archaeological Jobs Resource (BAJR) have sought to address the issues of training (or continuing professional development) of an often transient workforce. Studies such as the IfA's *Profiling the Profession* (Aitchison and Edwards 2008, 105) have sought the opinions of managers but due to necessity focus on fairly broad categories rather than drilling down into specific artefact areas. Consequently, and after some personal experience of a lack of knowledge of metallurgical deposits in the field the author decided in spring 2008 to try and begin to quantify opinions on the current state of archaeometallurgy in commercial archaeology.

The survey was carried out using Google documents (www.google.com/docs) which allowed for an online form to feed live results immediately back into a spreadsheet. The survey was publicised via email and Facebook. An attempt was made to ensure the survey could be filled out quickly with the majority of questions having multiple choice options with optional free text areas to allow the respondent to expand on a point if they so wished. For the majority of questions there were no wrong or right answers, the aim of the survey was to gather opinions not submit people to an exam. The exceptions to this were question 9 and 10 (can you define hammerscale and fuel ash slag?). Hammerscale and fuel ash slag were chosen as being categories of material which may be expected to be encountered relatively frequently on excavations, and also in the authors experience be the source of some confusion. The reader should be aware that whilst percentages of right and wrong answers are given the nature of the questions makes quantification of the results a matter of interpretation.

Job classifications were based (approximately not exclusively) on the guide available at the British Archaeological Jobs Resource website (www.bajr.org/jobs). The classification was simplified to allow respondents to classify themselves; allowing for the variation in job titles and positions across the sector, and also to allow for individuals who may have found themselves working consistently above the grade under which they were employed. The focus of the survey was on individuals working in commercial archaeology and the breakdown of job types reflected this. It was not an aim to exclude particular sectors of archaeology such as academics or curators (i.e. local authority development and control archaeologists) and so an option was included for these categories, although without the varying levels of responsibility available for those in the commercial sector. A selected summary of results is presented below.

Question 2. At approximately what level/position have you been predominantly employed as over the last 12 months?

Job	**No.**
Trainee	4
Excavation staff	33
Supervisory level	11
Management	11
Senior management	6
Curatorial	4
Academic	3
Specialist	2
Total	74

In total 88% of respondents classified themselves as working in commercial archaeology versus 12% in other roles (academic, curatorial etc). Based on a UK estimated archaeological workforce of 6865 in 2007–08 (Aitchison and Edwards 2008, 11) this response rate represents approximately 1.1% of professional archaeologists.

Question 3: Have you come across slag or other finds or deposits associated with high temperature activities in the past 12 months?

Yes	**No**	**No Answer**	**Total**
55	17	2	74

Responses to question 3 show that around three-quarters of the respondents had come across evidence for high-temperature industries in the last year, however, most staff were unaware of the involvement of a specialist in only a minority of cases (question 6). Whilst the involvement of relevant specialists is recommended in guidance such as MAP2 (Andrews 1991) and the recent HMS research framework (Bayley *et al*. 2008, 69) this is only possible when the potential is identified in preliminary research such as desk based assessments. There is a significant difference in the awareness of staff at different levels of the management chain, 89% of excavators were unaware compared with 50% of managers.

Question 6: Were you aware of the involvement of any specialists (i.e. metal/glass or other) in the pre excavation process?

Job	Yes	No	Total
Trainee	1	3	4
Excavation staff	3	30	33
Supervisor	2	9	11
Management	5	6	11
Senior management	2	4	6
Curatorial	2	2	4
Academic	2	1	3
Specialist	2		2
Total	19	55	74

Question 7: Are you aware of the English Heritage Archaeometallurgy guidelines?

Job	Yes	No	Total
Trainee		4	4
Excavation staff	5	28	33
Supervisory level	2	9	11
Management	9	2	11
Senior Management	5	1	6
Curatorial	1	3	4
Academic		3	3
Specialist	2	0	2
Total	24	50	74

The English Heritage Archaeometallurgy Guidelines (Bayley *et al*. 2001) provide one of the best guides to metallurgical archaeological materials in England. The guide is freely available in both print and .pdf format and aimed at a varied audience. Only 32% of all respondents were aware of the existence of the guidelines. When the results are broken down by job type a disparity emerges between the management and field staff, 82% of managers were aware of the guidelines, compared to only 15% of excavators.

In questions 9 and 10 respondents were asked to describe fuel ash slag and hammerscale. 73% of all respondents could give a reasonable description of hammerscale, compared to 26% who could successfully describe fuel ash slag. There were no significant differences in the responses between different job classifications.

Question 9: Do you know what hammerscale is?

Job	Yes	No	No Answer	Total
Trainee	1		3	4
Excavation staff	24	1	8	33
Supervisor	9		2	11
Management	8		3	11
Senior management	5		1	6
Curatorial	4			4
Academic	1		2	3
Specialist	2			2
Total	54	1	19	74

Question 10: Do you know what fuel ash slag is?

Job	Yes	No	No Answer	Total
Trainee			4	4
Excavation staff	2	8	23	33
Supervisor	4	2	5	11
Management	3	2	6	11
Senior management	4		2	6
Curatorial	3	1		4
Academic	1		2	3
Specialist	2			2
Total	19	13	42	74

Question 11: Would you say slag when recovered is treated comparably to other artefact categories on site?

Job category	Yes	No	Total
Trainee	1	3	4
Excavation staff	6	27	33
Supervisory level	3	8	11
Management	2	9	11
Senior Management	3	3	6
Curatorial	1	3	4
Academic	1	2	3
Specialist		2	2
Total	17	57	74

Most respondents thought that slag is not treated comparably with other artefact categories and, when asked why (Question 12), the following comments were made:

- “I don't think slag is treated comparably. People are not generally encouraged to keep slag as it is thought that it won’t get beyond the finds washing in post-excavation”
- “It is seen as being useless for dating, and therefore it is seldom kept”
- “I was told to ‘chuck it’ as (apparently) the money and expertise to analyse it were not available”
- “Most supervisors don’t treat it as valuable as other artefact types. And personally, silly as this may

sound, I'm still unsure when I'm dealing with slag or not."

Although the answers to question 11 are relatively negative 97% thought the study of waste materials such as slags could add much to the interpretation of a site (Question 13). When asked what solutions might be pursued, respondent were asked to select up to four options (Question 14). Most of the solutions were popular with the respondents, in particular the idea of closer integration between fieldwork staff and specialists.

Question 14: What do you think could be done to improve knowledge of slag in the field?

Solution	**No.**
Formal workplace training	41
Better/increased undergraduate teaching	43
Informal workplace training	55
Closer integration between fieldwork staff and specialists	59

A final question (16) allowed people the freedom to expand on any opinions they had. Comments with a combined word count of over 2000 were submitted. A selection of the statements is reproduced below:

- "Not much attention is given to the importance of slag, except for the fact that it provides proof of metalworking on a site. We certainly aren't told about differences between hammerscale and fuel ash slag and any other differences unless someone else knows, reads up on it and informs us of it."
- "I think industry processes and by-products should be taken more seriously by most outfits - especially for later periods. The phrase 'machine away all the post medieval crap' is a term still very much in use I'm afraid."
- "Guidelines are generally referenced on paper but ignored in practice because they are guidelines rather than rules."
- "Always told to dig through the rubbish to get to the 'good stuff' and on sites I've worked on slag generally considered rubbish. Have taken small samples on research digs but on commercial ones have only had to note its presence."

Discussion of results

There is considerable difference between excavators and management in the awareness of the English Heritage guidelines (82% of management compared to 15% of excavators) and the involvement of specialists. In part this may simply be a reflection of the small proportion of management levels completing the survey. It is also perhaps natural (although not desirable) to expect management levels to be more aware of specialist involvement in projects (as evidenced in question 6). It is however worrying that those who have 'first contact' with archaeometallurgical material have the least guidance available to them.

In the free text responses (questions 12 and 16) several individuals stated that metallurgical debris is ignored as post medieval or later layers are removed to get to the earlier deposits which are perceived as the 'good stuff'. Whilst the excavation of post medieval or industrial archaeological deposits (especially those associated with metallurgy) does require careful evaluation and the development of intelligent sampling strategies (as was discussed at the HMS spring meeting 2008) it is very worrying that an important part our heritage can receive short shrift. It is also slightly perturbing that metallurgy is often exclusively associated with the last 500 years despite many of our first encounters with archaeology and prehistory as school children being the three-age system, with metals somewhat at the heart of the definition.

Bridging the skills gap

Although limited in its scope it is clear from this survey that many field staff feel there is a skills gap. Knowledge is making its way through to management levels, but it would not appear to be percolating through to excavators. In question 14 the majority of respondents felt that closer integration between field staff and specialists would be one of the best ways of bridging the knowledge divide. Few companies however are likely to have in house specialists in this area, and in the recent *Profiling the Profession 2007/08* report (Aitchison and Edwards 2008) some companies stated that buying in specialists for training could be difficult. The same report also states that artefact research had the highest amount of training undertaken in the last 12 months (Aitchison and Edwards 2008: 105). While this data is not specifically for archaeometallurgy it is promising that within general area companies have identified and are attempting to tackle skills deficits, although it remains to be seen how this investment will be affected during an economic downturn.

What is not fully known from the IfA data is what proportion of the training is provided for excavators who often exist on short-term contracts and may move between several companies in a year (the infamous circuit). That even free booklets are not passed on would suggest little.

With 77% of archaeologists having at least an undergraduate education (Aitchison and Edwards 2008, 55, table 39) it is clear that universities have a significant role to play. The answers to questions 9 and 10 perhaps suggest that the knowledge gained on an undergraduate course can have a long term lasting

impact, levelling the playing field between different grades and years of experience. It would be interesting in any future surveys to delve further into this area and gain more concrete data. Unfortunately such training is reliant on academic fashions, and not all universities offer courses or modules in such areas.

It is clear that action needs to be taken if we are not to lose valuable knowledge about the nation's heritage. The limited financial resources of the archaeology sector as a whole restricts options. One possibility is to create a greater general awareness of the area. This could be achieved by utilising the internet which reduces distribution costs to near zero, allows people to access material and develop their knowledge at their chosen pace and when required. By utilising existing networks of archaeologists awareness of resources could be spread quickly. The HMS is already undertaking this with planned articles in the IfA's periodical *The Archaeologist*, and the IfA Finds Group held a Slag and Wasters training day during summer 2008. The timing of the training day however was enough to cause ire with one survey respondent who emailed to express their frustration:

- "Any field archaeologists interested in finds could not attend this due to its weekday venue (many conferences/seminar days in other fields are on a weekend or at least a Friday, this is on a Wednesday!). I think this (an IFA event) is evidence enough of the lack of opportunities for field archaeologists wanting to move into a specialism – it speaks volumes in fact and strongly discourages field archaeologists from career progression in this direction".

One way of providing an immediate resolution to such issues could be through the particularly influential and valuable resource that is the BAJR website. It is the first, and predominantly only, stop for many archaeological job hunters in the UK and with an active community. Engagement could provide a valuable opportunity for direct communication with many of those who are left untouched by current training regimes.

Conclusion

The current survey has provided a brief snapshot of opinions, and should by no means be considered an authoritative window onto archaeometallurgy within commercial archaeology. Many areas were unsatisfactorily dealt with such as regional variation. Companies who routinely encounter metallurgical deposits (such as those in the West Midlands) are more likely to have the training and procedures in place to respond to enable staff to respond the challenge, and any future such surveys would need to take this into consideration.

Despite the limitations of the questions and the small sample size it is suggested that a clear skills gap has been identified. Much accessible material is already available free online through English Heritage (Bayley *et al*. 2001; Dungworth and Paynter 2007) and the HMS website, including the recent archaeometallurgy research framework (Bayley *et al*. 2008) which places metals in a comprehensive geographic and temporal framework. Whilst the learning materials are available traditional methods of dissemination are failing, and a new phase of engagement between specialists and field archaeologists is required to ensure the best possible understanding of our metallurgical heritage.

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Changes to the Newsletter

David Dungworth

After five years of editing the newsletter I am now looking to hand over to someone else. I have been the Newsletter Editor for some five year now and have greatly enjoyed the experience. My only regret is that because of my background I have not managed to solicit as many historical (as opposed to archaeological) pieces for the Newsletter as it deserves. In part I am looking to hand over to someone else because I have taken on rather a lot HMS duties (Newsletter, Website, Council and two committees).

Roger Doonan of the University of Sheffield is joining, as of this issue, as an Editorial Assistant, and in the next year or so I will step down as editor and Roger will take over (subject to approval by HMS Council). Roger can then nominate a new Editorial Assistant who can take over from him in due course.

Wealden Iron Research Group Digest

Jeremy Hodgkinson

Celebrating its 40th anniversary this year, the evidence of its latest annual Bulletin (2nd series, vol. 28) shows that the Group continues to make new discoveries in the Weald of south-east England. No less than ten hitherto-undiscovered bloomery sites have been added to the database, all in East Sussex, where the early iron industry was concentrated. None, as yet, has been dated. Imprecise locating of sites discovered in the past, when Ordnance Survey mapping was less easily available, has been highlighted in a recent survey of the archaeological sites on Ashdown Forest, prompting a revision of the locations of iron-working sites there using modern GPS.

In a departure from usual practice, an article is included on Mungo Park's observations of bloomery iron making around the River Niger in west Africa in the 1790s. Park described operations at three places in what is modern Mali; areas which have been the subject of more recent studies.

The supply of ploughshares in the Archbishop of Canterbury's manors in the Thirteenth Century, and their probable sources in the area between Uckfield and Wadhurst in Sussex, is examined. Manors away from the Weald were able to obtain the iron for their farm implements from elsewhere in the Archbishop's holdings, giving employment to his Wealden tenants in a region notoriously poor.

Cast-iron graveslabs are a distinctive feature of Wealden churches, although found in small numbers in other regions. Most have survived where they were intended, but a few have been removed over the years. Periodically these come to light, and the catalogue of such plates, started in 1988, has received two additions with the identification of Seventeenth-century examples relating to the prominent ironworking families of Fowle and Baker.

Iron discarded from blast furnaces in the form of bears is not uncommon on Wealden sites, but two masses of iron, which probably formed around the tuyere inside furnaces, and were later made use of probably for animal husbandry, form the subject of a short article. Also described is a rare survival – the contents of a blast furnace forehearth and its attached runner, which having frozen when a furnace was blown out, was similarly discarded and 'recycled'.

Finally, there is the third and last part of a series of articles tracing the career of John Browne, the most important gun founder of the Stuart period, at the stage where his iron guns were just becoming accepted by the navy, but his monopoly was under threat.

Further details about the WIRG can be found on their website http://www.wealdeniron.org.uk/.

HMS Annual Conference 2008:
Metals in Musical Instruments,
12th–14th September, Oxford, UK

Tim Young

The 2008 Annual Conference was held in the Holywell Music Room, Oxford, the oldest surviving purpose-built concert hall in Europe, having been built in 1742. This wonderful room provided an apt setting for a truly remarkable conference. Accommodation for the conference was provided by Wadham College (to which the Holywell Room is attached). The conference organisers, Eddie Birch and Louise Bacon, had set themselves the ambitious task of running a conference which would not only have a rich and full programme of talks, but also concert-lectures in which exponents of historic musical instruments would demonstrate and explain their instrument using performance. To add to the task of the organisers, the concert-lectures would be public events, adding ticket sales to the conference income, but also adding another dimension to the administrative task.

The conference programme on started on Friday evening with a presentation about the Holywell Music Room itself by ***John Melvin*** which described both the history of the building and the somewhat controversial plans for its future development. This was followed by the first of the concert-lectures, a delightful blend of performance and of explanation of the harpsichord by ***Steven Devine***.

The Saturday morning lectures commenced with a presentation by ***John Berry and others*** concerning the tonal quality of brass instruments, and its relationship to both materials and the effects of time. The talk highlighted the difficulty of reconciling the scientific approach to the subject with the experience of performers. The second talk described the Europe-wide investigation of corrosion in lead-rich organ pipes by ***Carla Martini & Christina Chiavari***, driven by a need to conserve the 15th-century pipes of the Stellwagen organ of the St. Jakobi Church in Lübeck , Germany. The "culprits" were eventually identified as organic acids derived from the wooden (particularly oak) components of the organs. ***Raul Ybarra*** then described experimental reconstruction of the casting of Pre-Hispanic bells, using small ceramic furnaces and bamboo blowpipes. Investigations into the nature and

possible origins of a newly-discovered pre-1606 trumpet mouthpiece from Jamestown, , were the subject of the following presentation by ***Sabine Klaus***. ***Martha Goodway*** then talked on the metallurgy of overspun strings in English square pianos; these turned out not to be of the brass compositions claimed. The final presentation for the morning was an examination of 150 years of brass instrument manufacture at Boosey & Hawkes and associated companies by ***Bradley Strauchen***. This talk demonstrated the wealth of data available from company archives and from the museum established by the company in the late 19th century and now housed in the collections of the Horniman Museum.

Saturday afternoon was spent visiting various museums and collections, with the highlight for many being the opportunity to participate in playing a Javanese Gamelan. Even the initially reticent were encouraged to show respect to the instrument by removing their shoes and then to join in the action themselves!

The second of the concert-lectures was held on Saturday evening, with ***Crispian Steele-Perkins*** (accompanied by Leslie Pearson) demonstrating the history of the trumpet from earliest times to the present. This wonderful evening ranged from simple the simplest of instruments (demonstrated by an excerpt from Handel's Water Music played on a piece of garden hose!), through explanations of how the various tones were added, and overall size reduced, by increasing complexity of the plumbing, to some sublime performances of music played on both modern and contemporary instruments.

The presentations on Sunday morning continued with the description of the metallography of a Byzantine trumpet by ***Killian Anheuser*** and that of medieval music wire by ***Justine Bayley & Sharon Penton***. ***Ny Björn Gustafsson*** then spoke on a copper alloy Gotlandic string bridge with a review of some other similar bridges and a discussion of the type(s) of instrument they might represent. ***Tim Young*** described experiments to reproduce the brazing used in the fabrication of early Christian handbells from Ireland. ***Louise Bacon & Brian Gilmour*** presented a review of "German silver": Brian describing the evolution of the nature of 18th- and 19th-century nickel brass from Chinese paktong though to European copies and then Louise illustrating these changes with reference to the instruments manufactured by the Pace family in the 1830s and 40s. ***Mike Dobby*** provided the final paper, with a description and demonstration of a handheld XRF device. In the following public demonstration several attendees bravely offered their family heirlooms for analysis, fortunately without any major disappointment! The concluding remarks on the conference were made by ***Prof. Arnold Myers***, who commented on the desirability of cross-disciplinary research in organology, with the potential for projects involving historical metallurgists in collaboration with members of other groups and disciplines.

To achieve such a well-themed and coherent programme was a remarkable achievement. The weekend was a great success, not only for providing a forum for those directly involved in such an interesting area of the application of historical metallurgy, but also for those, like myself, who are not specialists in the field, but left the meeting having been both educated and entertained! Eddie and Louise are to be congratulated for achieving a wonderful balance with the meeting and for demonstrating, once again, the great diversity of interest that is embraced by historical metallurgy.

Early Iron in Europe

Hüttenberg, Austria, 8th–12th September 2008

David Dungworth

The Early Iron in Europe conference, organised by Brigitte Cech and Thilo Rehren, drew iron specialists from across Europe. In a beautiful setting in the mountains of Carinthia we enjoyed over 50 papers and nearly 40 posters. It is difficult to review a conference which included so many papers and posters, however, it was the breadth of coverage that made the conference work so well. The contributions provided an up to the moment summary of what is going on in the archaeological reconstruction of iron production in most of Europe. There were sessions (or groups of papers) and posters which looked at the latest excavations and laboratory-based research into iron manufacture in Austria, Germany, France, Italy, Britain, Ireland, and Scandinavia.

Brigitte Cech opened the conference with a summary of her excavations at Semlach/Eisner. The area around Hüttenberg has long been associated with the production of Norican steel (*Ferrum Noricum*) but before the present project, there had been no modern systematic investigations of production sites. A site at Semlach/Eisner was selected for archaeological excavation after extensive geophysical surveys. Five seasons of excavations have uncovered approximately 500m^2 which includes six furnaces and numerous hearths and other features. Dating (using archaeomagnetism, ceramic artefacts and dendrochronology) show that the site was in use from the second half of the 1st century BC to the middle of the 4th century AD. The furnaces were dug up to 1m into the bedrock and were up to 1.2m diameter at the base.

Jeremy Hodgkinson's paper on the Roman iron industry of the Weald used estimates of the size of the slag heaps to make some fascinating suggestions about the nature of the industry. He divided sites into three groups: Grade I with less than 100m^3 of slag, Grade II with 100–1,000m^3, Grade III with 1,000–10,000m^3 and Grade IV with more than 10,000m^3. While most sites fall into grades I and II, it was the larger sites that probably produced the majority of the iron — indeed the three sites in grade IV probably produced almost half of all the iron made in the Weald. ***Lee Bray*** provided a powerful archaeological analysis of the contexts which contain slag. He looked at the density of slag and other materials within individual contexts and the ways in which various contexts built up over time. Using two contrasting sites from Exmoor he showed how the character of industries could be revealed.

Florian Sarreste and ***Vincent Le Quellec*** gave two excellent papers which showed the dramatic advances that could be obtained by surveys and excavations in previously neglected areas (Sarthe and Finistère, respectively). ***Guntram Gassman*** summarised a major new project looking at the prehistoric iron industry in Siegerland, Germany. Despite previous fieldwork, there remain significant gaps in our knowledge of this important production region. A multi-disciplinary team is now examining the landscape and individual sites using a variety of techniques, including survey, and excavation, as well material science and environmental science approaches. ***Arne Jouttijärvi*** illustrated how archaeological remains of the same slag-pit furnaces in Denmark had been interpreted and reconstructed in very different ways in successive publications.

The conference organisers intend to produce a publication with a selection of the papers with a focus on Roman iron production.

Fe09: Coalbrookdale 300
Footprints of Industry

3rd to 7th June 2009

Announcement and Call for Papers

The 300th anniversary of the first successful commercial use of coke to smelt iron is an appropriate moment to consider the impact of the industrial revolution on the modern world.

It will be 50 years since the iconic blast furnace at the centre of the 'Birthplace of Industry' was rediscovered. That last half century has seen a dramatic expansion of research into historical industrialisation, coupled with overwhelming public support for the conservation of its material remains. The wide range of disciplines involved – archaeology, history, metallurgy and conservation – have themselves developed in response to the challenges of understanding this often fragile heritage. Big themes and issues arise which have tremendous relevance to the world today: environmental change, social transformation, technological progress, leisure as industry and industry as leisure. This conference provides an exciting opportunity for inter-disciplinary debate, discussion and analysis, through which we can find ways to take forward the study of these important processes and bring our findings to bear on the reality of life today.

Venue

The conference will be hosted by the Ironbridge Gorge Museum Trust in Coalbrookdale, Shropshire with the support of the Historical Metallurgy Society, the Society for Post-Medieval Archaeology, the Association for Industrial Archaeology and the Newcomen Society.

The Conference is being organised by Paul Belford.
Email: paul.belford@ironbridge.org.uk

Further details on the HMS website
www.hist-met.org/conf2009.html

HMS Spring Meeting 2009
Urban Archaeometallurgy: historical metallurgy in towns and cities

21st February 2009

Information

A great number of archaeometallurgical remains are found in urban contexts. These include, among others, foundry remains, forges, goldsmith workshops, mints, assay offices or just stray finds of crucibles, slag or metal objects. Although these assemblages are increasingly studied by specialists, many remain unidentified or neglected in archaeological archives.

Urban metallurgists used skills and techniques quite different from those used by miners and smelters, and played an important technological and economic role in urban life. Their endeavours were closely related to those of other crafts, and their products were directly relevant to those living in the immediate vicinity. Thus, the documentation and study of urban metallurgical workshops and artefacts provides an interesting path to the functioning of historical towns and cities, as well as insights into relatively unexplored areas of historical metallurgy.

This workshop aims to provide a forum for the presentation of studies on metallurgical remains

excavated in urban contexts. To provide a balance for the focus on ferrous metallurgy of previous HMS workshops, we particularly encourage presentations of research on non-ferrous and noble metals, and we welcome studies of both metalworking debris and finished artefacts. The chronological and geographical remit is purposefully broad, but we hope to showcase studies of materials recovered during rescue excavations in historical cities. The underlying intention is to provide examples of the use of such assemblages for research purposes, maximising their informative potential and saving them from neglect. By inviting urban archaeologists and finds specialists as well as archaeometallurgists, we also intend to create a network for the development of future projects.

Venue
The spring day meeting of the Historical Metallurgy Society will be held at the Institute of Archaeology at University College London.

Organiser
The Day Meeting is being organised by Marcos Martinón-Torres. Email: m.martinon-torres@ucl.ac.uk

Please send abstracts (up to 250 words) for proposed papers to Marcos Martinón-Torres.

WORLD OF IRON CONFERENCE 2009 (WIC)

London, 16th to 20th February 2009.

The 'World of Iron' conference sets out to explore and celebrate the significance of prehistoric iron production outside Europe. Interlacing regional and themed sessions, it will relate archaeological and archaeometallurgical studies to wider anthropological issues such as technological style; technological variation, change and development; technical and social adaptation; and the evolving influences of iron on society and the physical environment.

The Regional Sessions will include:
- Africa
- East Asia
- Indian Subcontinent
- Western and Central Asia

The Themed Sessions will include:
- Invention, Innovation and Inspiration
- Theoretical Approaches to Technology
- Scientific Approaches to Technology
- Analytical and Environmental Considerations

Further details from the website:
http://www.ironsmelting.net/wic2009/

Registration Fees
Before December 1st 2008: £200 (Students £150)
On December 1st 2008 or later: £250 (Students: £200)

Organisers
Jane Humphris, Thilo Rehren, Xander Veldhuijzen, WIC2009@ironsmelting.net

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Transactions of the Newcomen Society becomes International Journal for the History of Engineering & Technology

Transactions of the Newcomen Society, the leading journal on all aspects of the history of engineering and technology, is being re-launched as the *International Journal for the History of Engineering & Technology* in a new agreement between the Newcomen Society and Maney Publishing.

For more information please visit
www.maney.co.uk/journals/het.

While submissions to the Newsletter are welcome at any time, if you want to have something in a specific issue of the newsletter then it needs to be with the Editors by the following deadlines.

1st March, 1st July 1st November
Contributions can be sent in any format (hand-written, typed, email, floppy disk, CD-ROM, etc).

Newsletter Editor, David Dungworth,
English Heritage, Centre for Archaeology, Fort Cumberland, Portsmouth, PO4 9LD. Tel 023 9285 6783
Email: **david.dungworth@english-heritage.org.uk**

Newsletter Editorial Assistant, Roger Doonan,
Department of Archaeology and Prehistory, University of Sheffield, Northgate House, West Street, Sheffield
Email: **r.doonan@sheffield.ac.uk**

Membership Secretary, Mrs Lesley Cowell,
"Little Gables" 17a Thorncote, Northill, Beds, SG18 9AQ. Email: lesley@mcowell.flyer.co.uk

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