HMSNEWS

Historical Metallurgy Society

57 Summer 2004

Cast Iron from a Bloomery Furnace

Peter Crew

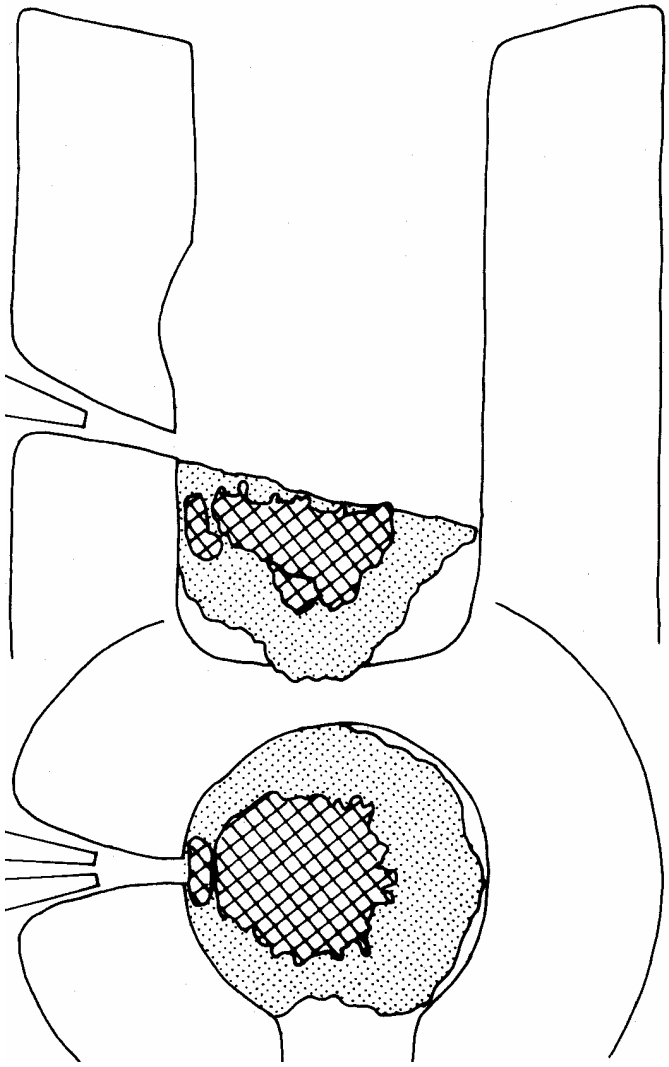
In June 2004 XP92 was carried out at Plas Tan y Bwlch. This was the third in a series of experiments with MSc and PhD students of Thilo Rehren, from the Institute of Archaeology, University College London. The aim of these experiments has been to examine the smelting of high Mn bog ores, as part of the research programme linked to the excavations of the 14th century AD bloomery site at Llwyn Du.

Analyses of the ores and slags found at Llwyn Du have been carried out by Michael Charlton, as part of his PhD research. The ores are quite rich, typically with a gangue content of less than 10%, and they have a variable MnO content of up to 40%. Over 30 samples of the tap slags from Llwyn Du have been analysed, showing them to have an MnO content of between 4% and 23%, with a mean of 10%, making it clear that high Mn ores were being smelted there.

The specific aim of XP92 was to use operating conditions similar to those of Sauder and Williams (*Historical Metallurgy* 36.2, 2002, 122–131), but using a clay furnace and blowing by hand with two large bellows. The estimated air rate for XP92 was between 1000 and 1200 litres of air per minute which resulted in a steady charcoal burning rate of 12.7kg per hour. This is very much faster than in our previous bog ore smelts, but only about half of the charcoal burning rate reported by Sauder and Williams at an ostensibly similar air rate. The ore smelted was a blend of rich ores recovered from the excavations at Llwyn Du and rather leaner ores gleaned from exposures on Crawcwellt moor. The estimated composition of the unroasted ore blend is about 12% SiO_2, 6% Al_2O_3, 8% MnO and 48% Fe_2O_3. The furnace used is based on the archaeological evidence from Llwyn Du and is 400mm internal diameter with walls 230mm thick.

Some 36kg of ore were smelted at a ratio of 1:1.2 in a total time of 5½ hours (pre-heat 30m, smelt 3h, post-heat and burn down 2h). The smelt was remarkably easy with none of the problems of blocking of the blowing hole, as is usual with smelts at lower air rates. Thermocouples set 200mm above the blowing hole level recorded wall temperatures of over 1000°C and over 1300°C above the blowing hole itself, indicating a much higher temperature regime than usual. About 2kg of the furnace wall was melted. No tap slags were made.

The furnace was emptied the following day, revealing a large agglomeration of slag and iron almost completely filling the furnace below the blowing hole and attached to the furnace wall in the normal position of a bloom. Removal of the peripheral slags revealed a core of 7.2kg of cast iron and an isolated 920g block of cast iron in the slags against the front wall. In addition some 1.3kg of small flows, prills and spheres were recovered, giving a total of 9.45kg of cast iron. This is equivalent to a yield from the iron in the ore of some 77% and suggests that the 17kg of slags would have a mean FeO content of only 20%.



XP92 results, showing the location of the cast iron blocks (hatched) within an agglomeration of viscous low iron slags (stippled). Scale 1:10.

Needless to say, the slags are not typical for a bloomery furnace, varying from green/yellow glassy slags to rather denser grey slags, most of which were still attached to the "bloom". Conditions in the furnace had clearly been very hot and very reducing, resulting in the viscous low iron slags and the cast iron products.

Small amounts of cast iron have been recorded from early archaeological contexts, from excavations and from experiments. Recent excavations of an early Medieval site at Ponte di Val Gabbia, near Bienno, have produced several blocks of cast iron up to 3.5kg in weight, possibly from deliberate rather than accidental production. The results of this experiment show that cast iron can be produced in quantity in a bloomery furnace, albeit under rather exceptional conditions. Further experiments will be carried out to try and produce large blooms, with fluid tap slags, more relevant to our archaeological problems.

Neumann Bands and Cold-Working Iron

Tony Swiss

Previous work undertaken as part of a Masters degree has focussed upon the materials and technology of a selection of edged iron tools from the waterlogged levels of Roman Carlisle, England (Swiss and McDonnell HMS forthcoming). The analysis determined that there appeared to be different levels of quality and craftmanship used in the making of the edged tools; "high quality" steel edged, and "low quality" items made from ferritic / phosphoric iron. The metallography showed that several of the iron tools had structures associated with cold-working (distorted/ elongated grains, Neumann Bands, etc), and it was proposed that this technique had been used to enhance the properties of the iron in order to fashion a useful tool that could hold and sustain an edge.

The identification of features associated with cold-working has been reported in several analyses of edged tools, although it has been proposed that these features are not readily visible until the material has sustained a 30% reduction in thickness. Ongoing experimental work at the Department of Archaeological Sciences, Bradford, has demonstrated this figure to be correct. However, and perhaps more importantly, the research has also shown that the greatest increase in hardness is achieved within the first 20% reduction, with an increase of between 40–50%. Therefore, with a minimal amount of work it is possible to substantially increase the hardness of iron, and yet there would be little to no microstructural evidence of this work having taken place except for the elevated hardness.

These results are significant as many more iron artefacts may have been cold-worked than has been previously reported, and the use of this technique may ultimately dictate what survives in the burial environment, as it is expected that a cold-worked/stressed material will preferentially corrode. The full results of this ongoing experimental work will be made available in due course, both through publication and oral presentation.

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Medieval Fish-hooks from Kings Lynn

Becky Slater

Preliminary investigations of an exceptionally well preserved assemblage recovered from Kings Lynn have recently been conducted, examining the manufacturing technology involved in medieval iron wire fish-hook production (see Jane Cowgill in HMNews 53).

Metallographic analysis of the bars, wires, hooks and off-cuts which comprised the assemblage determined that many of the samples of wire and hooks exhibited signs of cold working through grain deformation. The integral relationships between the elements of the assemblage were further explored using percentage reduction models. Wires exhibited a percentage reduction in thickness range of 40–90%, with the grain deformation phenomenon becoming more extreme as the gauge of the wire decreased. Analysis concluded that the wire and hooks had been produced by a process of annealing and cold-drawing. Levels of phosphorous (above 0.1%) were found consistently occurring in the metal; these levels decreased as the wire gauge decreased. The connection between the ghosting effect in phosphoric iron and cold work deformation is currently being explored within the Department of Archaeological Sciences, Bradford.

Analysis of the assemblage also brought to light significant questions concerning non-metallic inclusions and Osmond iron which are currently being investigated for forthcoming publications. The preliminary investigations have been further extended into a comprehensive study of medieval wire production, with a particular focus on fish-hook manufacture, the results of which will be made available in a variety of publications in due course.

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HMS Annual Conference 2003: Dunster, Somerset

Robert Smith

The Annual Conference in 2003 was based in the picturesque and attractive village of Dunster in North Devon — more specifically in the Yarn Market Hotel. The subject of our weekend was Metal Production Landscapes and concentrated on the work done on Exmoor over the preceding 2–3 years. This period has seen the rise in the identification and recording of a wide number of sites and features across the National Park.

The theme of the conference was admirably addressed in presentations on the Friday evening, after dinner at the hotel, by Rob Wilson-North, Gill Juleff, Mick Atkinson and Peter Claughton, introducing us to both the wider issues of management of the historic landscape as well as the specifics of iron and silver mining and processing in the area.

On Saturday there were the customary field trips to see the locality and areas of interest. Due to the distances covered and the number of delegates, it was necessary to divide conference into two groups. The first went to Combe Martin, Sherracombe Ford and Roman Lode. The second party visited Colton Pits, Clatworthy reservoir, Brendon Hills and Horner Wood.

Those on the trip to Combe Martin were treated to the excavations carried out by Trevor Dunkerley. I was reminded very much of what my wife says when I have lost something at home — 'you are sitting on it'. In Trevor's case lead/silver mining and processing which is known to have taken place in Combe Martin but for which no traces have been found. After years of fruitless searching for physical evidence of workings in the 13th–15th centuries, Trevor was reduced to digging in his own back garden where, of course, he found what he had been looking for. However, unlike any digging that I do in the garden, those carried out by Trevor and his team are the most meticulous keyhole type of excavation — a necessity in areas right in the very centre of the village. Extensive analysis by EH is leading to the identification of the industrial smelting sites and the hope that they will eventually pinpoint the site of the smelt mill. Delegates were then taken to see the remains of the later workings, which have been extensively restored by the Combe Martin Silver Mine Preservation Society.

From Combe Martin delegates were taken to Sherracombe Ford on the southern edge of Exmoor. Thought originally to be medieval or post-medieval the site has now been radiocarbon dated to the Late Iron Age to early Romano-British period and work on site has now extended this to suggest that much of the activity took place during the 2nd and 3rd centuries AD. Two excavation seasons have revealed the truncated bases of smelting furnaces and a large expanse of a well-consolidated smithing floor. This floor, which is over 0.3m thick, contains at least one well-defined anvil stand and is formed in at least two major layers, which together with the evidence from the complex stratigraphy indicates that the site was subject to continual clearance and reconfiguration.

Roman Lode refers to a 600m long open mining work on the high moorland a few kilometres from Sherracombe. Largely undated, the site was definitely present in the 19th century when the Knight family, then the owners of Exmoor, started trial mining along its length. Excavations of a series of undulating 'hummocks and hollows', thought at first to have been the remains of ore sorting, revealed that they are, in fact, cut features and the result of mining and prospecting. Further work is hoping to provide dating for this valuable landscape.

The second tour started at Colton Pits, an extensive series of iron mining pits covering an area of some 300x150m, of unknown date but including 19th and early 20th century workings. Work on the site is concentrating on tree clearance and management to emphasize its archaeological importance. Clatworthy Reservoir has yielded extensive evidence for the pre-industrial smelting of iron and it is currently being investigated to determine the extent of the site. Though work is very much in its early stages, pottery finds confirm that this too is a Romano-British smelting site. The next site, Horner Wood near Porlock, has been identified with deposits of slag dating to the late medieval period, with evidence for a water-powered complex. However, the importance of Horner Wood lies in the high number of platforms used in the production of charcoal and the interconnecting system of trackways. Their investigation is hoping to shed light on fuel requirements and the overall history of the site.

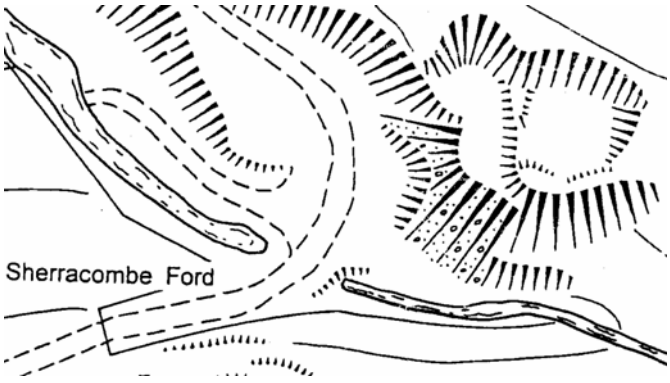
After dinner on the Saturday the usual contributions from members were presented. In all, 7 short presentations were made and as ever, these ranged widely. The subjects included; a progress report on work on Dartmoor's Upper Merrivale tin mill (Tom Greeves) and new survey work at Birch Tor and Vitifer Mines (Phil Newman), Roman iron-making in South Wales (Tim Young), bloomery sites in Austria (Tim Smith), historical research into developments in steel alloying (Andrew Morris), computer modelling of air flow through Sri Lankan wind-driven furnaces (Gill Juleff) and the customary treat from Peter Crew, this year on a hoard of nails from Penmachno.

On the Sunday morning we were treated to a series of lectures on Exmoor, the south-west and other metal producing landscapes. Tim Mighall and Peter Crew gave a thorough account of the environmental impact of Medieval bloomery smelting at Llwyn Du, North Wales. There then followed three short presentations from postgraduate students from Exeter on work associated with the Exmoor Iron project. These included Judith Cannell on woodland management and charcoal production, Chris Carey on geochemical prospection and Lee Bray on the work at Roman Lode. Simon Timberlake then talked about lead smelting at Cwmystwyth and Adam Sharpe gave a computer-based presentation on the use of GIS for mapping mining landscapes in Cornwall. Finally, Trevor Dunkerley entertained us all with a presentation that introduced us through old photographs and folklore to some of the Combe Martin miners and their families.

All the presentations were made in Dunster's charming early twentieth century village hall. Not a state-of-the-art conference centre but adequate for our needs. A weekend of superb weather, comfortable accommodation, good company and careful and inspired planning resulted in a memorable meeting and thanks must go to all those who worked hard to make it such a success.

Furnaces at Sherracombe Ford, Exmoor, on display this summer

Following the completion of the excavations at Sherracombe Ford in the summer of 2003, it has been decided to re-open the site for a limited period of display. The two in situ furnaces and the central part of the site, including some of the massive smithing floor, will be exposed over the summer months before permanent backfilling in late September. The display coincides with the 50th anniversary of the National Park and a number of organised visits to the site are being arranged. Anyone interested in seeing the site and the furnaces should contact Gill Juleff for further information (G.Juleff@exeter.ac.uk).



Archaeometallurgy at the 34th International Archaeometry Symposium

Marcos Martinón-Torres

The 34th International Symposium on Archaeometry was held in Zaragoza (Spain), 3–7th May 2004. The local committee, led by Josefina Pérez-Arantegui and Marius Vendrell-Saz, should be commended for an excellent organisation, which allowed the nearly 200 international delegates to enjoy a wide-ranging scientific programme as well as an exciting social agenda. Almost 20 oral presentations and over 30 posters concerned archaeometallurgy, which provided a fine picture of the breadth of current research on past metallurgy worldwide. Only a few of these can be reported here.

Several papers on ferrous metallurgy may be highlighted. V. Serneels addressed a type of archaeometallurgical remain frequently found but whose informative potential is normally not exploited in full: the plano-convex bottom (PCB) or smithing slag. He classified PCBs in three types, originating from different processes and with diagnostic external and microstructural features. Furthermore, he presented a method for calculating the iron loss during smithing which may allow systematic comparisons of the extent of production and skill of different workshops.

A poster presenting promising analytical developments was that by M. Charlton and A. Reid on iron smelting slag from Uganda. Processing the bulk chemical composition of slag samples by multivariate statistics (principal component analysis) they could differentiate distinct slag types, based on the variable influence of ore, fuel and furnace lining in slag formation. The identification of these "positive constraints" provides a sound basis for the discussion of technological variability, and could be applied to any such remains of iron metallurgy.

It was encouraging to notice that the contribution of fuel-ash and metallurgical ceramics to slag formation — and thus to metal production — is increasingly considered in the interpretation of analytical results. Also in this vein, H. A. Veldhuijzen and Th. Rehren presented the earliest iron smelting site in the Levant, Tell Hammeh in Jordan, dated to the early first millennium BC; and demonstrated the crucial role of the tuyères, which melted during the smelting process, thereby increasing the fluidity of the slag.

P. Dillmann and P. Fluzin presented an analytical study of the metallurgical remains from Glinet, the earliest iron refinery excavated in France (16th century AD). Their research showed the use of low-phosphorus

(≤1%) ores for the production of cast iron, which was subsequently de-phosphorised in a refining process with the addition of lime. Unfortunately, no hypothesis was presented as to the form in which this lime was added.

Also those interested in non-ferrous metallurgy had the chance to learn and discuss the results of varied and interesting research. B. Mille *et al*. presented results of a large-scale project on the development of copper metallurgy in Balochistan (Pakistan), tracking the origins of metallurgy back to the first half of the sixth millennium BC, and documenting the use of lost-wax casting as early as the fifth millennium BC, amongst other examples of a surprisingly skilled Chalcolithic metallurgy. The presentation by R. Muller *et al*. confirmed the long suspected practice of crucible smelting of arsenical copper in Chalcolithic SE Spain, and posed the possibility of fahlore smelting. Experimental fahlore smelting in a one-step process controlled by the oxygen partial pressure, carried out by D. Bourgarit *et al*., makes such a possibility feasible for early metallurgy.

Focussing on the Iberian Peninsula too, Rovira *et al*. discussed a peculiar lead smelting technique current during the Phoenician period (early first millennium BC), which involved the generation of "free silica" slag, probably due to an insufficient combustion of the charge in the top of the furnaces.

Valuable research presented by M. Georgakopoulou revealed the first evidence of Early Bronze Age small-scale copper (and possibly lead/silver) smelting within a settlement in the Cyclades (Greece), contemporary to known larger scale smelting sites at remote locations. This compels a wider review of inter-site relationships and a re-assessment of the organisation of early metal production in this region.

N. Eniosova *et al*. presented analyses of Alanian mirrors from medieval SE Europe. They illustrated how the standard casting technique remained unchanged, while alloys evolved over time from typical high-tin mirror bronzes to more variable ternary and quaternary alloys, thus revealing the loss of an original recipe and/or recycling of scrap metal. In this poster, digital maps were used to present the directions and intensity of culture and metals flow.

J. Bayley and K. Eckstein addressed the variability of archaeological litharge cakes from cupellation hearths. They identified two main types: lined with bone ash or clay marl. They explained formation mechanisms and assessed the relative efficiency of slightly different cupellation processes. A different type of hearth lining, i.e. plant ash, was documented by Th. Rehren *et al*. in their ethnoarchaeometallurgical study of traditional lead/silver smelting in Bolivia. This study showed many variations of the "canon" that are often not considered in the interpretation of archaeological remains, such as the direct reduction of galena in a process with substantial metal losses, and where the availability of fuel appeared as a major constraint.

Numerous litharge cakes, as well as copper smelting remains, have also been found in fourth millennium BC contexts in Central Iran, during an exhaustive archaeometallurgical survey programme reported by Z. Hezarkhani *et al*. In a different context, E. Asderaki and Th. Rehren investigated the use of fresh, desilvered lead in Hellenistic Greece, and showed that part of it was still coming from Laurion at such a relatively late date, a discovery for which written evidence is scarce.

Thanks to the generous support from the HMS Tylecote Fund, I could also present research that I have carried out with Th. Rehren. This included a comparison of the material properties and performance characteristics of the main crucible types used in the post-medieval world: the well-known Hessian wares and the little-known black Obernzell crucibles, both of them produced in Germany and widely traded.

Another area in development is the provenancing of metals by isotope analysis. For example, M. Haustein *et al*. reported current advances in the measurement of tin isotopes, although this technique still needs further refining; P. Degryse *et al*. presented successful work on lead, strontium and osmium isotopes in provenancing iron artefacts excavated in Turkey.

Many other interesting archaeometallurgical studies were presented, also covering the metallurgy of Pre-Columbian America (namely N. Schulze on technological choices on the production of Aztec bells, and L. Limata *et al*. on a Peruvian nose filigree) and details of surface treatments such as a previously unknown cuprite-based black patina documented by F. Mathis *et al*. in a Roman artefact.

Overall, archaeometallurgical research presented at the 34th International Symposium on Archaeometry shows an encouraging trend to ground analytical data in archaeological contexts and questions, a refreshing consideration of cultural aspects in metallurgy, as well as an increasing attention paid to the role of ceramics in metallurgy and to the potential of the combination of written and archaeometric information. Such stimulating scenario provided an excellent forum to celebrate the ever-inspiring work led by Michael S. Tite, on occasion of his formal retirement later this year. The conference proceedings, which will be published electronically, are eagerly expected.

35th International Archaeometry Symposium in China, 11–15th May 2005

The 35th International Archaeometry Symposium will be held in 11–15th May 2005 in Beijing, China. The Symposium will include the usual session on metals; the special session is entitled "Achievements and Perspectives on Chinese Archaeometry". The deadline for the submission of abstracts and registration is the 31st December 2004.

Further details are available from:

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Web: www.archaeometry.ustc.edu.cn

The Archaeology of Industrial Processes

This two-part conference (2nd October in London and 6th November in Coalbrookdale) will cover the results of archaeological investigations of industrial processes and production sites. The conference is jointly organised by the Society for Post-medieval Archaeology, the Historical Metallurgy Society, Ironbridge Archaeology and Pre-Construct Archaeology Ltd, with support from the London Archaeological Archive and Research Centre.

Delegates may chose to attend either conference, and a special discounted rate of £45 will be available for those who wish to attend both. Lunch and tea and coffee is included in the conference fee. For those delegates who wish to attend either the London or the Ironbridge venue alone a rate of £25 is charged.

Further details are available from:

Paul Belford, Ironbridge Archaeology (Industrial Processes Conference), Ironbridge Gorge Museum Trust, Coalbrookdale, Telford, TF8 7DQ

Part One of the conference will be at the London Archaeological Archive and Research Centre (LAARC), Mortimer Wheeler House, 46 Eagle Wharf Road, London on 2nd October 2004.

Gustav Milne (Post-medieval shipyards on the Thames foreshore),
Märit Gaimster (Battersea: an 18th-century enamelling industry),
Hugh Willmott (Glassmaking in 17th-century London, the characterisation of an emerging industry),
Marilyn Palmer (Dressing of lead and tin in the 19th century),
Roy Thomson (Post-medieval Leather manufacture)
Chris Mayo (The manufacture of weapons and munitions at the Woolwich Arsenal, recent discoveries)
David Dawson and Oliver Kent (The development of the bottle kiln in pottery manufacture)
Kieron Tyler (Where is the archaeological evidence for London's industries?)

Part Two of the conference will be at the Glass Classroom, Ironbridge Gorge Museum, Coalbrookdale, Telford, Shropshire, on 6th November 2004.

Lynn Willies (18th century underground quarrying of freestone at Combe Down, Bath)
Shelley White (China clay mining in Cornwall – the landscape evidence)
Stuart Blaylock (A bell and cauldron foundry in Taunton, Somerset)
Austin Ainsworth (The archaeology of the hot blast process in the nineteenth century iron industry)
Anna Badcock (Large- and small-scale steel manufacture in Sheffield)

Archaeometallurgy in Sardinia 9th–10th September 2004, Cagliari and Iglesias, Sardinia

The Associazone Italiana di Metallurgia are organising a conference on early Sardinian metallurgy. There is an impressive list of speakers and discussants (e.g. Paul Craddock, Andreas Hauptmann, Ernst Pernicka, Robert Maddin, James Muhly, Michel Pernot, Rovira Llorens and many more).

Further details are available from:

Associazone Italiana di Metallurgia
Piazzale Rodolfo Morandi, 2
I – 20121 Milano Italy
Tel: +39 02 76021132
E-mail: aim@aimnet.it

1st International Conference of Palaeosiderurgy and Industrial Heritage Recovery
Sán Sebastian, Spain, 11–13th May 2005

This conference will examine iron technologies from their origin to the development of modern ferrous industries, as well as the ways in which the remains of such industries can be preserved for tourism and other purposes. The conference fee is €150 for registrations before 31st January 2005 (€200 for registration between 31st January and 11th May 2005).

Further details are available from:

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2nd International Conference on Ancient Greek Technology
Athens, 17th–21st October 2005

The 2nd International Conference on Ancient Greek Technology will be held in Athens from the 17th to the 21st October 2005. This conference will cover ancient technology from prehistoric times to the Byzantine period. The conference includes sessions on a wide range of organic and inorganic materials (including metals and mining).

There will be a special session on recent research into the Antikythera Mechanism (a clock-like device which may have been used for calculating the motions of stars and planets, see *Scientific American* June 1959, 60–67).

The deadline for the submission of abstracts is 15th October 2004. The Registration fees are:

€80 before 28th February 2005
€100 before 31st May 2005
€150 before 30th July 2005

Further details are available from:

Secretariat of the 2nd International Conference on Ancient Greek Technology,
Technical Chamber of Greece (408)
4, Kar. Servias, 10562, Athens, Greece
Tel: +30 210 32 91 291
Fax: +30 210 32 91 298
Email: emaet@central.tee.gr

HMS Conference 2004: Portsmouth

The 2004 HMS conference will be held in Portsmouth from the 10th to the 12th September. A few places are still available. Please see the enclosed flyer for details and an application form.

HMS Conference 2005: Wensleydale

In 2005 the HMS conference will be held in Wensleydale, North Yorkshire, 9th to the 11th September, based in Middleham. All lectures and meals will be at the Key Centre in the middle of the township which provides a wide range of accommodation. However, the area can be busy in September and early booking is advisable.

The conference theme will focus on lead/silver smelting and refining, with the opportunity to review work done since the *Boles and Smeltmills* conference in Swaledale in 1992, but we are also looking for papers on iron metallurgy, and associated subjects, related to the Yorkshire Dales area.

For details of accommodation on the Internet go to http://www.middlehamonline.com where you will also find information on the conference venue.

Offers of papers, help in organising field trips or any enquiries regarding the conference should be sent to:

Dr Peter Claughton,
Blaenpant Morfil, Clynderwen,
Pembrokeshire, Wales SA66 7RE
Email: P.F.Claughton@exeter.ac.uk

British Iron and Steel Research in the 20th Century

Two privately produced CDs have recently been produced by Don Spenceley and Peter Scholes who contributed a chapter on the British Iron and Steel Research Association for the 2001 book, *British Iron and Steel AD1800–2000 and Beyond* (edited by C. Bodsworth).

BISRA — The Immortal Memory

Their chapter for *British Iron and Steel AD1800–2000 and Beyond* has been revised and substantial new material added. The new CD version traces the history of co-operative research in the UK steel industry up to the formation of BISRA in 1944. During the next 24 years, laboratories were established in London, Middlesbrough, Sheffield and Swansea. In the second part of the CD, an extensive selection of research activities is presented to illustrate the work of the Association. Project areas described cover the whole of steel production route from blast furnace raw materials through to the properties of steels. There are appendices with photographs of laboratories and open days; listings of staff; extracts from staff magazines; and photographs of social events.

British Steel Research Achievements 1970–90

The second CD covers a period of rapid technological change in the British Steel Corporation and during the transition to private ownership, based largely on articles published in *Steelresearch*, to illustrate the breadth and scope of activities undertaken. In describing facilities and organisation, the monograph focuses on 1985 at a time when there were three corporate laboratories and three specialist product laboratories. Selected topics are presented in three sections: Process Research, Product Research and Environmental Research.

Both CDs are available from the authors for £10 each. Further details are available from:

Tel: 01287 632374
Email: phscholes@lineone.net
or don.spenceley@btinternet.com

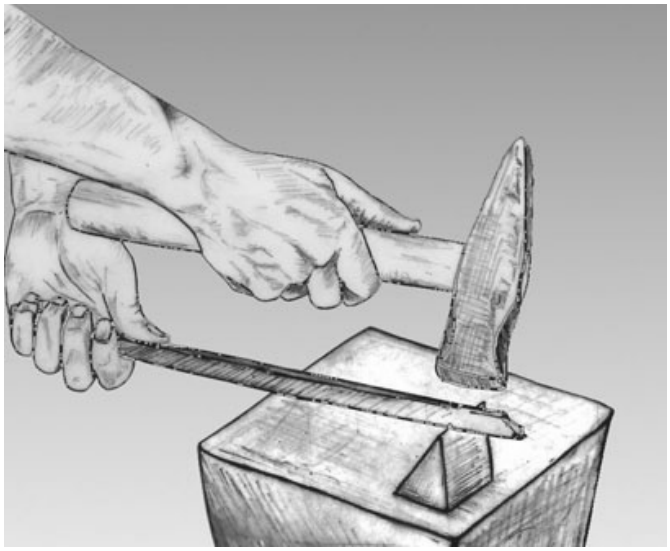
British Decorative Ironwork Foundation

The British Decorative Ironwork Foundation, dedicated to preserving the UK's heritage of decorative ironwork, has just launched a free newsletter, *The Lamplighter*, which can be obtained from:

The British Decorative Ironwork Foundation,
803 Samuel Lewis Building, Ixworth Place,
London SW3 3QG.

Roman Iron Smithing at Châbles

The Roman roadside settlement at Châbles, Switzerland was investigated by archaeologists (and archaeo-metallurgists) ahead of modern road construction. The settlement included stone quarries and iron smithing workshops. The monograph on the site, *Des Artisans a la Campagne.* (ISBN 2 8271 0971 9) by T.J. Anderson, C. Agustoni, A. Duvauchelle, V. Serneels & D. Castella (392 pages) is now available from Paul Verlag (http://www.paulusedition.ch/) for €50.



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 me 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).

The Hon. 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**

Please note that the Membership Secretary and the Hon. Treasurer will not be contactable from 14th October to 12th December 2004. Please contact the Honorary Secretary or Mr Eddie Birch if your business cannot be delayed until their return. The website will be updated with this information.

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