

# HMSNEWS

## Historical Metallurgy Society 67 2007/8

### HMS Annual Conference 2008

#### *Metals in Musical Instruments*

As already announced, the 2008 HMS Conference will be entitled 'Metals in Musical Instruments' and held in Oxford, 12–14 September. Accommodation has been arranged in Wadham College, with a bar extension. An announcement and booking form is included with this issue of the newsletter.

The conference will be based in the Holywell Music Rooms, the oldest surviving purpose built concert hall in Europe, and very convenient to Wadham. John Melvin, the architect responsible for bringing the facilities up to date without spoiling the character or fabric of the building will be giving our 'introductory' lecture on the Friday evening. Also on the Friday evening will be a harpsichord recital and talk by Steven Devine.



Saturday will have a full morning of lectures. Lunch will be under delegates' own arrangements, giving an opportunity to explore the many excellent cafes and sandwich shops of Oxford's covered market of about 1810. On Saturday afternoon we will visit the Bate Collection of Historical Musical Instruments, where some of the instruments will be available to us to 'play' if we wish. We shall also visit the gamelan at the Pitt Rivers Museum, the Museum of the History of Science and the Ashmolean Museum. Crispian Steele-Perkins will give a recital and talk on brass instruments on Saturday evening. He will be accompanied by Steven Devine.

Sunday morning will start with member's contributions and continue with a further lecture session. Lunch will be available in Wadham if booked in advance; sadly the covered market is closed on Sundays.

Offers of papers are welcome. The conference will cover

- Metallurgy and metals used in instruments
- Metal working techniques, including influence on design of instruments
- Makers and their techniques
- Archaeology of metal musical instruments

The full residential fee including the conference fee will be £235 and the conference fee for those organising their own accommodation will be £75. This includes admission to both recitals. A £10 discount is available to HMS members, and a further £10 discount to those booking before April 30th 2008.

As in any ancient city, car parking in Oxford can be difficult; suggestions will be available to those booking. Oxford has an excellent bus service and a direct rail service from London.

If you have any queries, or would like to know more about the conference, please contact Eddie Birch on 01226 370331 or email [mejbirch@aol.com](mailto:mejbirch@aol.com). Offers of papers should be made to Louise Bacon at [lbacon@horniman.ac.uk](mailto:lbacon@horniman.ac.uk).

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### Grants

The society awards grants from the **Coghlan Bequest** and **R.F. Tylecote Memorial Fund** for research and travel. Members are encouraged to apply by completing forms available on the society's website ([www.hist-met.org](http://www.hist-met.org)) and sending them to the Hon. Treasurer. The Coghlan Bequest was set up to facilitate any research into historical metallurgy, including fieldwork, experiments, analysis and travel. Money from the fund is **awarded once a year in March**; applications must be received by the end of the preceding January to be considered. The R.F. Tylecote Memorial Fund commemorates the renowned archaeometallurgist who was a founder member of the HMS and edited the Journal from its beginning until his death. It takes the form of Annual Travel Bursaries to help pay for travel, subsistence and conference fees, which will further the aims of the Society, including research, conferences, seminars, excavations, fieldwork and experimental workings. Money from the fund is **awarded in March and November**; applications must be received by the end of the preceding January and September. As a guide £100–£150 is usually awarded in each round. Following an award, the results of the research undertaken or a report on the study visit must be sent to the HMS for possible inclusion in the Journal the HMS newsletter. Any unused funds must be returned to the HMS.

## Early Ironworking in Europe II

Archaeology, technology and experiment

Plas Tan y Bwlch

17th–21st September 2007

*Xander Veldhuijzen*

In business management jargon, the term ‘hot spot’ is generally applied to indicate a company or department where an unplanned synergy or combination of individuals sparks a creative and successful collaboration that far exceeds the simple sum of the parts. Such hot spots create new ideas, collaborations, and spin-offs, and surpass all normal well-functioning departments or groups. Unfortunately, hot spots happen, they can’t be planned or created on purpose. The ‘Early Ironworking in Europe II’ conference that took place in the stunning hills of Snowdonia National Park in Wales from the 17th to the 21st of September 2007, turned out to be exactly such a hot spot for archaeometallurgists. It is difficult to pin down or to describe why, but an attempt will be made in this review.



*Figure 1. Peter Crew and Neil Fairburn*

The conference brought together some 50 people from all corners of Europe to present and discuss all matters ferrous in Europe and the wider world. Two reasons lay behind the conference. First and foremost the idea was to celebrate the immeasurable contributions to archaeometallurgy by Peter and Susan Crew on ‘their’ retirement as Swyddog Archeoleg (Archaeology Officer) at Parc Cenedlaethol Eryri (Snowdonia National Park). And what better way to do so than by organising a second conference at Plas Tan y Bwlch, ten years after the first seminal iron conference that Peter and Susan held there? This initiative by Thilo Rehren was quickly embraced by Peter and Susan themselves who could not resist helping to organise.

For this ‘EIW II’ conference, inviting a combination of ‘established’ metallurgists and ‘young researchers’ in the field of iron metallurgy was sought, and this was admirably achieved. In fact, many Europeans active in iron metallurgy were present, both ‘young’ and ‘old’. For those who attended the first conference in 1997, this was an opportunity to see how the field has developed and progressed in the last ten years, and meet the young ones, whereas new participants could meet the old guard and try to emulate the tall stories from 10 years ago. So what happened this time?

The ‘hot spot’ effect at this conference started right at the beginning. I suppose most people will agree that conferences usually take a while to get going, and only on the second or third day, when one has met a few people does a group (or groups) feeling start to form. It may have been due to the location, with a beautiful house, beautiful surroundings, as well as gorgeous sunny weather, but within five minutes of arrival, everyone was talking to each other, meeting strangers as long lost friends, and something I can only describe as a feeling of belonging to one family descended on Plas Tan y Bwlch. If not the location or weather, then maybe the absence of other metals played a role here?

As Peter remarked a few months before the conference: “Now that we are retired, we have time for more serious matters”, and this showed in all facets of the conference. Thilo, Peter and Susan organised the conference to perfection, with papers arranged in logical coherent sessions, proper breaks with good coffee and food, and very enjoyable video presentations to end the relatively long days in a relaxed fashion. Fully to the credit of the organisers, all sessions and papers started on time, and with the superb support from the Plas staff, no technical problem occurred at any time. As there were no parallel sessions, everybody could (and did) attend all papers, which further strengthened the already significant group feeling. The splendid meals provided at breakfast, lunch, and dinner in the dining hall of Plas did not hurt either.

Considering the number of papers, it is impossible to discuss each single contribution at length, but an overview with some highlights is presented here. On the day of arrival, the conference got off to a relaxed start with coffee and tea in the afternoon, whilst people could put up their posters, followed by a wine reception and dinner. By the time that Thilo Rehren opened the conference, new friendships had already sprouted everywhere, and an enthusiastic crowd gathered for the first session. Here, we heard messages from Radomir Pleiner and Philippe Fluzin who unfortunately could not attend. Then Peter Crew presented the archaeological and experimental work that took and takes place in

Snowdonia National Park. After this everyone retreated to the bar.

The second day started with Guntram Gassmann, Brigitte Cech, and Andreas Schäfer giving lavishly illustrated presentations on current excavation and survey work in Germany (Black Forest and central Lahn valley) and Austria (Hüttenberg), and Brigitte further invited everyone to the Early Iron Metallurgy conference to be held in Hüttenberg, Austria, 8–12 September 2008. In the next session, Peter Halkon discussed the likely relations between East Yorkshire Iron Age iron and the continent, followed by Jane Cowgill on Northamptonshire iron production evidence, with beautiful furnaces, and Gill Juleff on the diverse furnaces of Exmoor. During the breaks of the conference, Gill also showed the video recording of her renewed visit to Sri Lanka and the new experiments performed there.

The next session clearly showed that iron metallurgy has grown significantly in France since the first EIW conference, with presentations by Philippe Dillmann, Sylvain Bauvias, Marion Berranger, Gaspard Pagès, and Maxime l'Heritier, discussing multifaceted research on topics ranging from raw material acquisition to semi-products, oppida smithing works, Roman shipwrecks, the role of iron in medieval cathedral construction, and the study of slag inclusions, all from different regions of France.

After the break, Ludwig Eshenlohr presented recent excavation work at iron working sites in the Swiss Jura, Marco Tizzoni discussed a late Iron Age iron smelting site in the Italian Alps, whilst Szymon Orzechowski and Florian Sarreste showed us how large-scale iron production took place in the Prezworsk culture outside the borders of the Roman Empire and in the civitas of north-west France respectively.

The day was concluded by two video presentations, the first by Ludwig Eshenlohr, showing two experiments of making charcoal, which made it very clear that charcoal production is not just a minor operation before smelting can take place, but a proper and complicated set of technological operations in its own right. The second video, presented by David Starley, was a documentary by National Geographic on the creation of Samurai Swords. Both videos, besides being extremely informative and well made, gave rise to great amusement, for example when the Swiss charcoal makers started jumping on the earth covered burning pile to check how the process inside was progressing.

The next day started off with a more mixed session, where David Cranstone made clear how much there is still to do close to home by reviewing the large number

of mostly unsurveyed and unexcavated slagheaps in the Lake District. Lars Erik Narmo and Geir Are Johansen wowed the audience with beautiful presentations on Norwegian archaeometallurgy. Geir showed how the sudden sinking of the stunning Gokstad Ship replica in 2004 prompted experimental research into the manufacture of Viking bloomery steel nails. These are needed to connect planks to the keel, and the modern steel nails used originally proved too brittle or hard. They snapped when the flexible structure of the ship in combination with high speed exerted too much tension, thus causing the accident. Lars showed us an example of a smelting experiment using an exact replica of a Viking furnace excavated by Lars Standvik.

Guntram Gassmann presented a review of the current state of knowledge about early iron production in Germany, and also invited everyone to the early iron Metallurgy conference that he is organising in Germany in 2009. Then, Michael Overbeck spoke about the detailed excavation of a medieval production site in Luxembourg. At Peppange, there is interesting evidence for the transition from bloomery iron smelting to early blast furnace on the same site. Peter Crew presented on the excavation of the ironworks at Llwyn Du, in preparation for the excursion to that site that afternoon. In his talk he indicated how analysis of the charcoal from the site indicates that there was no major clearance of trees in the area to sustain the iron production. Tim Mighall's subsequent talk on vegetation change and pollen research in the same region tied into Peter's statement, with Tim showing through the tree pollen levels found in the peat bogs of Wales that there were no extensive clearances of woodland in the area in the periods of major iron production, thus indicating that a (possibly cyclic) management system must have been in operation.



Figure 2. Philippe Dillmann and Peter Crew

In the afternoon, all of us went out in a convoy to visit the 14th century bloomery at Llwyn Du. As could only be expected, this was the only day during the entire conference where true Welsh weather occurred. The pouring rain left us with a strong impression that the ancient smelters would probably have called it a day. After our return, clothing was put in the drying room, and we visited the (luckily sheltered) experimental area at Plas Tan y Bwlch, looked at the slag and iron displays and had a chance to peruse the various posters. The day was again closed with two video presentations, the first a beautiful video of the fieldwork in Luxembourg by Michael Overbeck, showing the work in progress on which he presented earlier that morning, the second a very detailed video from the Lofotr Viking Museum in Norway, showing an iron smelting experiment reconstructing Viking technology. Again both videos created a lot of merriment (the Norwegians also walk over their burning charcoal heaps), with jokes and relevant discussions about the topics shown in equal measures. This relaxed and creative atmosphere easily carried over into the bar, where all talk was of iron once more. Jane Humphris effortlessly gathered everyone around her laptop when showing her brand new video of a smelting reconstruction she performed in Rwanda earlier this year. The images were fantastic, painstakingly recording all aspects of the *chaîne opératoire* of these peoples traditional technology.

The next day started with a more exotic session, with Vincent Serneels and Sébastien Perrret each presenting stunning papers on iron working in the Dogon area of Mali (see HMS News 60). Most of the audience was in awe if not simply jealous of the enormous slagheaps and the amazingly well preserved furnaces and tuyères discussed here. It was very impressive to see how complete the project in Mali is, ranging from mining to smelting and smithing, from survey and excavation to laboratory analyses and from anthropological field work to the reconstruction of the social and economic context of the iron production. Xander Veldhuijzen then presented two papers on some of the earliest known instances of iron smelting, Tell Hammeh in Jordan, and smithing, Tel Beth-Shemesh in Israel. Comparing various aspects of the technologies practised here and their socio-economic embedding. His second paper discussed the particular feature of substantial 'sacrificing' of tuyère ceramic to the smelting process to enable proper slag formation. Interestingly, Sébastien Perrret's research on the Fiko smelters in Mali had indicated that a very similar process of ceramic contribution from the tuyères took place there.

The next session focussed on iron artefacts rather than production processes, starting with Thilo Rehren who discussed what kind of evidence of use and deposition of artefacts can be distilled from corroded iron objects,

e.g. that iron grave goods reveal when they have been in a funeral pyre before burial through a magnetite crust with a thin haematite layer. This was followed by Jiří Hošek discussing Early Medieval knives from a stronghold near Prague, and David Starley setting the record straight on generally held ideas of high quality and pattern welding of Anglo-Saxon spearheads in grave contexts. Nadine Dieudonné-Glad discussed the excavation of a medieval smithy in a priory in the French Limousin region, where detailed excavation methods were applied to recover the hammerscale and other magnetic material from the workshop. Andreas Schäfer then presented a reconstruction of the technology performed at the oppidum of Manching in Bavaria, Germany. The session was closed by Mercedes Urtega, who presented a video reconstruction of how tools found in the Beraketa Street Roman smithy in Irun were used to make iron nails. This is a surprisingly difficult process that requires substantial skill.

After another sumptuous lunch, Janet Lang presented the extensive work on smithing experiments, in particular the reproduction of pattern welded swords. Chris Salter discussed technological aspects of early steel in Britain, in particular how high-carbon steels require a 'coating' of a clay and ash slurry to prevent re-oxidisation during smithing. Brian Gilmour then presented evidence for ironworking in Europe before the 12th century. Especially interesting here was the presentation on his work on early Arabic sources mentioning 'Frankish' iron among many other sources of metal, e.g. the famous 7th century treatise by the Iraqi *al-Kindī*, which is a treasure trove of knowledge on many aspects of early iron technology. Lee Bray finished the session by showing how the value of Roman iron production can be assessed using concepts of commodities and their relative values. Combining different sources and data on various commodities allows for a valuation of iron, which in those times likely equalled imported fine foods and spices in price. This of course has a significant influence on the economic viability and adoption of iron production especially in remoter areas of the Roman Empire.

Andreas Schäfer wowed the audience with a stunning landscape approach to the hinterland of the Titelberg oppidum in Luxembourg. Using aerial laser-scans of the landscape with a 25cm resolution, the entire area was digitised. This in turn allows separation of a wide range of features of the terrain, e.g. 'removing' all vegetation from the map, which allows a study of the ground level which is impossible in the field. The possibilities are too numerous to detail here, but as an example, large number of mining locations were revealed in this way. Tim Young presented a revision of early iron making in Ireland, suggesting a new model where among the common slag-pit furnaces there may have been some

tapping furnaces as well. Neil Fairburn's presentation slotted on to this issue, as he exposed in his paper on metalworking and slag from Ireland how everything there is usually termed a 'bowl furnace', which completely disregards the clear presence of shaft furnaces from the Iron Age onwards. The day was, as usual by now, ended with two video presentations. In the absence of Alain Ploquin, Philippe Dillmann introduced and where necessary translated Alain's video on a blast furnace experiment in France. The video was absolutely brilliant, especially in the complete absence of health and safety regulations which are so common and often restrictive in the UK. All of us surely have indelible images etched into our retina of people in shorts poking a rod into the liquid slag to check progress, then feeling the red-glowing slag at the tip with a finger (ouch!), and subsequently swinging the rod to clear the still liquid slag from the tip. And all this with spectators about two meters away from the proceedings, held back by a thin plastic perimeter band. Phillippe then showed a video illustrating the experimental work of him and his team in reconstructing the early Walloon refining process. Less life-threatening but very informative and spectacular to see.



*Figure 3. Peter and Susan Crew*

With the mood now clearly set for celebrations, a wine reception was held in the library of Plas. Here, several speeches were made and presents given to thank and honour Peter and Susan Crew for the incredible amount of work they have done in archaeometallurgy over the years, and the influence their holistic approach to technology and its place in society has had on many people in the field. Another factor that was not forgotten was the almost parental role Peter and Susan have played towards many of the attendants over the years, always welcoming and always ready to stimulate, challenge, and assist research on iron. It is impossible to capture the heartfelt words of Thilo Rehren, Gill Juleff,

Szymon Orzechowski and others, but I hope to have presented their feelings adequately here. This very special moment was then made complete by the magnificent Conference Dinner that followed.

After a night which witnessed the establishment of exemplary Anglo-Franco-Germano-Swiss-Dutch friendships during the early hours, breakfast on the last day was slightly less tempting for some, but nevertheless everybody was ready and present for the session of the last morning of the conference. Jake Keen presented a captivating and beautifully illustrated paper on his observations of traditional bloomery smelting in Madhya Pradesh, India, a region where this is still practised today, but where hardly any research has been performed. Then David Starley presented the top ten of discoveries made over the years in the Royal Armouries Science laboratory, after which Eva Hjartner-Holdar gave a detailed review of iron production in Sweden, presenting data showing that high quality (high-carbon steel) artefacts were mainly used by the Swedish elite, and that smithing was generally organised on a village or farmstead level.

After the break it was time for Janet Lang to discuss the future of the 'Comité pour la sidérurgie ancienne' (CPSA), now that Radomir Pleiner is retiring as chairman. This job has now been foisted onto Janet herself, and one of the first ideas is to make the news items of the CPSA newsletter available on the web. The last event of the day before lunch and departure were the closing remarks where Peter thanked all participants for their contributions, and very rightly also thanked the Plas Tan y Bwlch staff for their superb support. He also issued a call for contributions towards the proceedings of the conference, which can then ideally be published before the end of 2008.

Now that the conference is behind us, the feeling of an exceptional event still lingers. Without in any way diminishing the quality and importance of the papers and posters presented, what happened in the breaks (and in the bar) was probably even more important for the future of research into iron. In the unique environment where iron was the only topic, new friendships were created at an almost alarming rate, and knowledge from around the world was passed around both during the sessions and outside them. An incredible array of data, techniques, sources of information, analyses, social and economic aspects, experiments and reconstructions, and integration of information from all the above was presented and discussed, undoubtedly enriching each and every participant. Above all it was very clear that no facet of iron technology can be seen as a separate thing, without at least considering the myriad other aspects that surround it. As such, this conference is certainly a fitting tribute to Peter and Susan Crew.

## The Corstopitum Penknives

David Dungworth

This summer Lee Sauder asked the ARCH-METALS email discussion group if anyone knew the fate of the Corbridge 'bloom'. The large mass of bloomery iron had been found during excavations at the Roman town in 1909. It was 1m long and square-sectioned (0.1–0.2m wide) and was almost certainly a beam from or for a bath house. The beam had been subjected to detailed chemical analysis and metallographic examination by Bell, Stead and Louis, and published by Bell in 1912. Keith Elliott (Historic Environment Records Officer for Northumberland County Council) and Georgina Plowright (curator Corbridge Museum) report that there are no records of the surviving beam in local museums but points out that the discussion and correspondence printed at the end of Bell's paper contains an intriguing statement by Stead,

'Since the reading of the paper, with the assistance of Mr. J. L. Potts of Messers. J. H. Andrew & Co. Ltd., Sheffield, the planings and sawing which were produced on cutting and planing the bloom had been welded together and forged into a bar. The bar was passed through a cementation furnace and carburised to the extent of about 1¼ per cent. carbon. It was then forged down, and about twenty-five penknives made from the steel by Mr. Joseph Westby of Sheffield, the blades being stamped with the word "Corstopitum." Those blades were of unique interest, representing as they did—excepting for the small amount of carbon added—material made more than 1500 years ago.'

Fate of any of these knives, as well as the beam itself, is unknown but I would love to hear from any members who know where any of them are now.

Bell, H 1912 'Notes on a bloom of Roman iron found at Corstopitum (Corbridge)' *Journal of the Iron and Steel Institute* 85, 118–133

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## Woodworking Chisels

Brian Read

I am looking at the development of woodworking chisels but these appear to be very rarely identified in modern archaeological reports. Finds reported as "chisels" frequently turn out to be either for stone or metal working when looked at more carefully. Does any one know of papers giving examples of woodworking chisels that I could consult. [brian.read2@ntlworld.com](mailto:brian.read2@ntlworld.com)

## HMS Programme

Eddie Birch and Bob Smith

The following HMS Spring Meetings and Conferences are planned. There will be additional conferences organised by the subject committees.

### 2008 AGM, Cambridge, 14 June

Theme/title: Scientific Instruments

Organiser: Bob Smith

### 2008 Conference, Oxford, 12–14 September

Theme/title: Metals in Musical Instruments

Organisers: Eddie Birch and Louise Bacon

### 2009 Conference and AGM, Ironbridge, 3–7 June

Theme/title: 1709–2009: Heritage of Industry Archaeology and Metallurgy. A celebration of 300 years of coke smelting of iron and 50 years since the restoration of the old furnace at Coalbrookdale. As the 2009 Conference will incorporate the AGM there will also be an Autumn Meeting that year.

Organiser: Paul Belford

### 2010 Conference, West Dean

Theme/title: Smelting, melting and forging: experimental and accidental archaeology

Organiser: David Dungworth

It is planned that the Conference in 2012 will celebrate 50 years of the Society.

Current ideas not yet confirmed include:

#### Conferences

- *Steel Industry — South Wales*
- *The economics of the production, trade and use of metals*
- *Metallurgical innovation and warfare*
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#### AGM Spring Meetings

- *Tradition and innovation: Metals in the third world*
- *Metals in Jewellery*
- *Metals in cooking*
- *Metals in the transmission and transport of energy*
- *Metals in agriculture*
- *GWR — Didcot*

The program committee always welcome suggestions for meetings and conferences. Bob Smith can be contacted on [smithbrown@basiliscoe.fsnet.co.uk](mailto:smithbrown@basiliscoe.fsnet.co.uk) or Eddie Birch on [mejbirch@aol.com](mailto:mejbirch@aol.com).

## HMS Annual Conference 2007 Dublin

*Eleanor Blakelock*

This year's annual HMS conference was held jointly with the Mining Heritage Trust of Ireland from the 14th to 16th of September in Dublin. It was attended by over 60 members and guests. Excellent accommodation and evening meals were provided in the majestic setting of Trinity College, home of the Book of Kells. The conference was mostly based at the National Museum in Dublin, by kind invitation from its director Dr Patrick Wallace.



*Figure 1. Patrick Wallace*

On Friday morning some delegates assembled at Trinity College for the first of two field trips, to the Ballycorus leadworks, lead by Rob Goodbody and Mathew Parkes. After initial confusion over car sharing we finally arrived at the Ballycorus smelter which operated between the 19th and early 20th century. The site included a reverberatory and refining furnace, slag hearths, a blast engine, stamps and a mill pond. Originally ore from Lughnure (Co Wicklow), Caime (Co Wexford) and Ballycorus (Co Dublin) was used, but when these sources were depleted the works continued by importing ore from the Isle of Man. The smelter at Ballycorus manufactured shot and litharge as well as lead piping and sheets used in the Dublin construction industry. Many of the buildings have now been converted for modern industrial use; some buildings were left derelict while some have disappeared altogether.

Further up the hill was the shot manufactory building, now a private residence. The shot tower was demolished some years ago but a free-standing granite chimney still survives revealing the location of the smelter. The melted lead formed spheres during free fall

through the 45m (150ft) vat of water. To create the vertical drop required the shot tower was located above an abandoned mine shaft, with the extra height gained by adding the tower above. The spheres once collected were sorted, polished, graded and bagged in the riddle building prior to being sold.



*Figure 2. Chimney from a lead smelter at Ballycorus*

The final stop of the fieldtrip was the hill top landmark chimney which is 26m tall and 235m above sea level. With glorious views over Dublin Mountains and Dublin itself, this chimney is a remnant of the 19th century lead industry. The chimney was originally even taller and would have had a safety rail on the external spiral granite staircase. Both the chimney and the 2m high flue which stretches for almost a mile were constructed in 1836, after complaints that the fumes from the smelting works at Ballycorus were affecting local livestock. As well as disposing of the fumes, the long length of the flue meant that the hot gases were able to cool leaving the valuable lead deposited on the interior brickwork; this was recovered using the doors at regular intervals along the flue.

We then made our way down the hill and back into Dublin for registration. After which we made our way to the National Museum in Kildare Street where the director, Dr Patrick Wallace warmly welcomed us. He provided an excellent overview of the metal artefacts and evidence for metalworking in the National Museum. He

explained how the museum would like to contribute to the larger picture of metalworking in Europe. He also shared his hopes that the future will bring less emphasis on purely stylistic and typological studies and more on scientific research so that we can gain a more detailed understanding of ancient metalworking technology. After this introduction conversations continued over excellent wine, served by the extremely friendly museum staff.



Figure 3. The National Museum in Kildare Street, Dublin

The following morning we re-assembled at the National Museum for our visits to the various collections. We started with the Viking gallery with Ragnall Ó Floin and Justine Bayley on hand to answer any questions. The Viking metalwork on display is particularly fine quality, with excellent examples of Viking iron work including pattern-welded swords, along with non-ferrous metal artefacts and the evidence for non-ferrous metal working from the site. Mary Cahill enthusiastically introduced us to the museum's fantastic collection of Bronze Age gold work, one of the largest and most important collections in Western Europe. She explained how examination of the various different items revealed a variety of methods of construction, often using hammered thin sheets of gold with stamped, twisted and gold wire filigree decoration. The tour of the treasury was led by Ragnall Ó Floin, who explained that this gallery was inspired by the great church treasuries of medieval Europe and contained outstanding religious and secular metal work, dating from Pagan Celtic Ireland to the end of the Middle Ages, and beyond. The Iron Age metalwork displays outstanding skill in the production of bronze and gold metal artefacts, but during the Early Christian period new styles and techniques were added to the smith's repertoire. Highlights of this tour included the Tara Brooch, the Ardagh Chalice, the Moylough Belt Shrine and the Tully Lough cross.

After lunch we made our way to Collins Barracks (also part of the National Museum of Dublin) for the first

lecture session of the weekend. The first paper on Ireland's metal deposits was presented by *Mathew Parkes*. He provided a very informative *introduction to the geology of Ireland*, with a brief overview of the main events in geological history and their associated metal and other economic deposits. In addition, he revealed how the Mining Heritage Trust of Ireland ([www.mhti.com](http://www.mhti.com)) had been trying to raise awareness of the importance of Ireland's mining history.

*Mary Cahill* then gave a paper entitled *cuirass to gorget*. During our tour of the Bronze Age gold collection we were shown many examples of these impressive large gold collars, or 'gorgets'. The lack of any development between the surviving examples might suggest that the gold smiths were unimaginative but Mary suggested that the appearance, style and decoration may actually relate to links between the 'Cuirass' a sheet bronze body armour found in mainland Europe.

*Angela Wallace* presented a paper on her examination of the *organisation of iron production from three Irish sites*. Excavations at Tonybaun revealed an Iron Age site with evidence for small scale smelting and smithing activity, with a possible stone-lined furnace and smithing hearths. Two early medieval sites Lowpark and Ratoath also revealed evidence for iron production and working. Lowpark had evidence for large scale production in four distinct areas and 1.3 tonnes of ironworking waste, while the evidence at Ratoath suggested it was primarily a smithing site.

After a quick break we returned to the lecture session. Next up was *Tim Young* who provided us with a *new look at early Irish iron working*. The large number of road development projects has produced an enormous amount of new iron production and working sites. Several Iron Age smelting sites have been discovered along with evidence for slag pit furnaces. This furnace type appears to continue in use as late as the 18th century AD, although other furnace types may have been in use during the Middle Ages and a possible slag tapping furnace was identified dating to the 9th-10th century AD.

The final paper of this session was given by *Justine Bayley* on the preliminary results from the analysis of the large quantities of *non-ferrous metalworking evidence from Viking Dublin*. The analysis has revealed evidence for copper-alloy casting and smithing, brazing, as well as precious metal refining and working. During excavations a variety of crucibles, both locally made and imported, and other metalworking tools were identified, this included an iron file which analysis determined had been used on both brasses and silver objects.



After dinner we reconvened at the Swift lecture theatre at Trinity College for a series of short contributions from members. *Susan La Niece* spoke about recent analysis of Bronze Age gold lock rings which was carried out to determine how they were constructed. This revealed that most were hollow but some had non-metallic cores, such as bees wax. *Brian Dolan* then told us about his research into the archaeology of early medieval Irish iron working that he is just about to embark on for his PhD, where he hopes to explore the social and technological context of iron working in Ireland. The results from experimental attempts to recreate Irish Bronze Age technology, using a variety of furnaces types and moulds to cast copper alloys were then shared by *Cordula Hansen* and her group ([www.umha-aois.com](http://www.umha-aois.com)). *Neil Fairburn* then gave his view on the presence of bowl furnaces in Ireland, he believes that the term bowl furnace has been overused and that the iron slag should be examined more closely as the evidence suggests that other furnaces were in use in Ireland. After which delegates were treated to a double act with *Peter Claughton* and *Janis Heward* who shared their recent research and survey results into the location and use of potash kilns used to create white coal for lead smelting. Finally *David Dungworth* presented a short paper on the National slag collection which needs to be re-examined and organised. After all these contributions many archaeometallurgical discussions continued over a few pints, mostly Guinness, in a local pub.



Figure 4. The National Museum at Collins Barracks, Dublin

Sunday morning everyone made their way to Collins Barracks for the second set of presentations. *Rob Goodbody* started us off with a *detailed history of two lead mines Ballycorus in County Dublin and Glendalough in County Wicklow*. He explained to us how mining exploration had started in the 19th century and then how they were closed in the late 19th century, followed by a detailed explanation of the later phases of mining in the Glendalough area in the early 20th century. These two mines were linked by common

ownership, and by the fact that the ore from both sites was being transported and used at the smelting and lead works at Ballycorus, visited during the Friday fieldtrip.

*Effie Photo-Jones* next gave an overview of her results from the study of *metallurgical features and iron working waste products from excavations in Ireland*. In her presentation she placed an emphasis on the study of features which have often been neglected and proposed a new method of soil analysis, which may reveal more about the site than technological studies of slag alone.

*Anthony Read* then presented a paper on the *investigation and conservation of the Wollaston Anglo-Saxon helmet* which was found in a rich burial at Wollaston near Wellingborough. This helmet is only one of four found in England, other examples include those from Sutton Hoo and Coppergate. Extensive investigation work was carried out using CT scans and X-radiography which revealed a very plain helmet, possibly designed purely for fighting.

After a short break we returned to the lecture theatre for more presentations. *Geraldine Carville* provided us with an *historical account of the iron works and operations based in County Kildare and Laois*, with particular reference to those at Monasterevin, Mount Meelick and Mountrath. Some of the iron from these iron works supplied the rebels with weapons during the time of civil unrest in the 1790s and possibly through the Napoleonic War.

*Neil Fairburn* then provided us with an insight into the *copper smelting evidence from Irish sites*. There have been many theories as to why there is an absence of copper smelting slag in Ireland (or even Britain) before the Industrial Revolution. His recent examination of what was originally identified as iron-working slag from a number of sites around Ireland has now turned up five copper smelting sites, which may suggest that copper slag is not being recognised due to its similar appearance to iron working slag.

The last presentation of the weekend was by *Griffin Murray* who provided us with an *argument on the status of goldsmiths in early medieval Ireland*. Many of the most sophisticated and accomplished precious metalwork was produced for the Church. The craftsmen who made these pieces have often been thought to be illiterate but the evidence such as inscriptions including name of the smith, suggests that the master craftsmen most likely both designed and made the pieces, and was most likely linked in some way to the church.

After a superb lunch at the Barracks we were then divided into groups to visit particular galleries and collections in the Museum. To get to the Viking period

ironwork and metalworking finds we had to go behind the scenes, where Justine Bayley had laid out an assemblage of the metalworking finds, which included crucibles, moulds and trail pieces. Jennifer Mulrooney on the other hand provided us with an overview of the X-radiograph survey of the Viking Dublin ironwork she has been carrying out. Many of the X-radiographs and objects were available for us to look at and Jennifer shared with us some of her new discoveries and thoughts.

The conference was a huge success mostly due to the efforts of organiser Justine Bayley. Big thanks should also go to Patrick Wallace and all the staff at the National Museum of Dublin who made our stay very welcoming, the staff at Trinity College, and also to Rob Goodbody and Mathew Parkes who organised and ran the two fieldtrips. It was certainly one of the best conferences that I have attended, with a good mix of fieldtrips, tours, presentations and socialising.

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## Völklingen Hütte

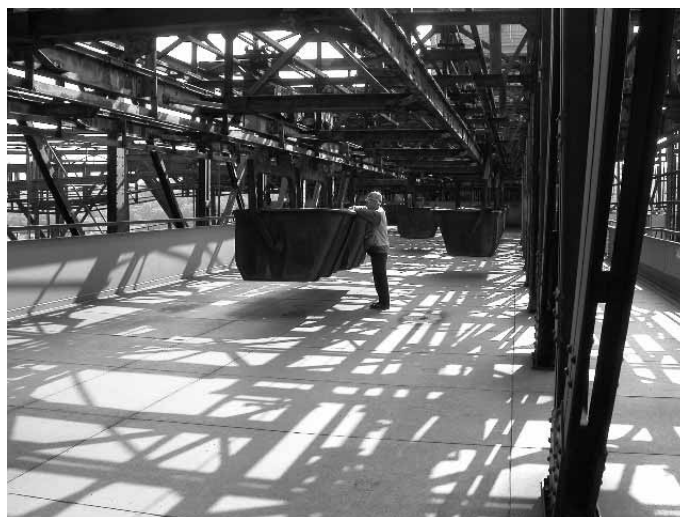
*Justine Bayley*

Many years ago now, when I was invited to join the HMS Council by Charles Blick, I replied that I didn't think I was the sort of person they wanted as I wasn't interested in dead blast furnaces. That, he said, was just why they did want me! How things change though – this summer I spent a short holiday in Alsace and visited the World Heritage Site Völklingen Hütte, just over the border in the Saarland (Figure 1).

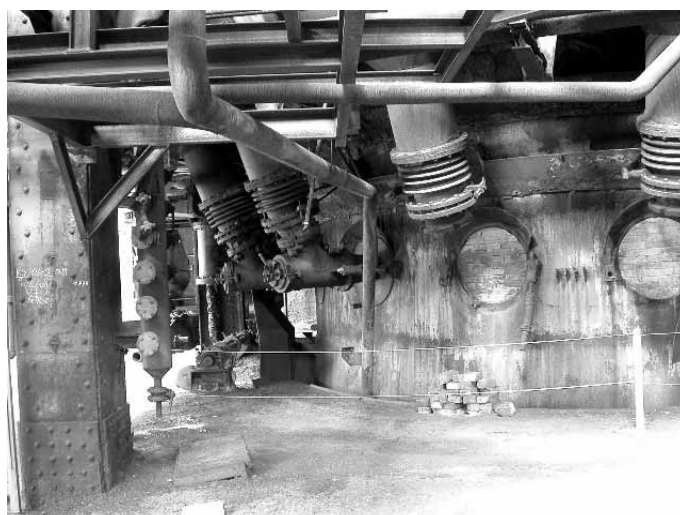
I thought I'd be there for an hour or so, but spent the whole day wandering round the iron works, without enough time to visit the extensive museum displays on site, or the nearby mining museum. As the pictures show, it is a complex of six blast furnaces that were built in the 19th century and were continually updated until they ceased to be operational in the 1980s. The site has been preserved in its entirety so you can see the rail lines that brought in the ore and coal, the vast ore shed, the coking plant, the blowing hall, and the heat exchangers clustering round each furnace. You can also climb ladders up onto the charging platform (Figure 3) and see the monorail tubs that brought the burden up the inclined ramp and tipped it into the top of the furnaces when the bell was lifted. Down below are the tuyères (Figure 3) and the tapping floor where the molten iron was run down into the railway wagons below, and taken to a nearby steel plant. It's all well worth a visit, so do add it to your 'must see' list!



*Figure 1. the World Heritage Site, Völklingen Hütte, Germany*



*Figure 2. Völklingen Hütte, charging platform with monorail tubs*



*Figure 3. Völklingen Hütte, the tuyères*

## The Wealden Iron Research Group

Digest of *Wealden Iron* volume 27

*Jeremy Hodgkinson*

Volume 27 in the second series of *Wealden Iron*, the group's annual bulletin, was published in July with its usual mix of notes on fieldwork and longer articles. Discoveries of bloomery sites in Rotherfield, Fletching and Brightling, all in East Sussex, are described, together with additional notes on sites previously discovered in Maresfield and Icklesham; one of them has been dated to the Roman period. Over 600 bloomery sites have been recorded in the Weald, and, as this year's Bulletin indicates, they continue to be found.

Excavations at a 2nd-century AD site, which has included a substantial ore-roasting area, has prompted some experiments to explore possible coverings for ore pits on early sites. A comparison was made between ore roasting when covered by leafy foliage, and by the same with an additional covering of mud and a side air inlet. Poor results attended the ore covered by foliage only, while that additionally covered with mud succeeded in producing a good quantity of roasted ore. When the unroasted ore was reburnt in the pit with a greenery covering, but with the side inlet, good results were again obtained.

The subjects of religion and ironworking come together in two articles. In the first, the trial and condemnation of Richard Woodman, a Sussex ironmaster, whose Protestant faith during the Marian persecution led to him being burned at the stake in Lewes in 1557, is described. In the second, the religious subject matter of a group of 17th century iron firebacks suggests a common provenance. English firebacks with religious designs are rare, and the chimney plates under discussion display continental influences of both a thematic and pictorial nature, and many may have been the work of a particular founder.

### The WIRG Online Sites Database

The iron industry in the Weald has been extensively studied since the mid 19th century, with writers, from Mark Antony Lower to Henry Cleere & David Crossley, compiling gazetteers of sites where iron-making took place in the Weald. To date, more than 800 sites, dating from the pre-Roman Iron Age to the 19th century AD, have been discovered and new ones are found every year. As well as their intrinsic importance as evidence of the growth and development of the iron industry, the existence of sites in a parish contributes to the economic and social history of those localities. With the regular discovery of new sites, printed studies rapidly fall out of date, so the Wealden Iron Research

Group determined that an online database of sites, that could be regularly updated, would be a useful tool for historians, archaeologists and others. Adapted from an Access database compiled over the past 20 years, and incorporating site information originally published in *The Iron Industry of the Weald* in the group's own journal, *Wealden Iron*, and in other sources, the opportunity has been taken to allow a wide range of fields to be searched, and bibliographic sources to be included. This latter feature will be extended in due course to become a more general bibliography of the iron industry. Other features, including images, may be incorporated in due course. Search facilities are available to any user, without password, editorial access being reserved for the managers of the database. Corrections, amendments, and information about newly discovered sites are actively encouraged, and the Editor will be pleased to hear from any would-be contributors.

The database can be accessed from the Wealden Iron Research Group's website: [www.wealdeniron.org.uk](http://www.wealdeniron.org.uk).

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#### CONFERENCE REVIEW

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### Changing Technology in Medieval and Post-Medieval Metalworking

Saturday 10th November

*Celise Richardson*

Eleanor Blakelock (on behalf of the Historical Metallurgy Society and the Department of Archaeology, University of Bradford) organised a highly successful meeting in Bradford. The areas discussed pinpointed the changing technologies of metalwork between the early medieval to post-medieval periods, focusing particularly on iron technology between AD 450–1650. The conference consisted of oral presentations, good poster displays, and a tour of the laboratories which included a display of some slag found at Rievaulx Abbey, North Yorkshire.

The production of metallic iron was covered by two papers by Gerry McDonnell and David Crossley. Gerry summarised the multi-disciplinary investigation of an iron production landscape in North Yorkshire (the Bilsdale/Rievaulx area). In the short time available, Gerry concentrated on the results of the excavation of several smelting sites in Bilsdale and the bore hole surveys around the Cistercian monastery at Rievaulx. One of the most interesting ideas was that the iron smelting furnaces that pre-dated the introduction of the blast furnace also produced cast iron. The discussion which followed was lively and productive, although occasionally hampered by terminological problems — if pre-blast furnaces did not produce blooms what shall we call them? David Crossley provided a candid

summary of the evidence from his 1960s excavations at Rockley, South Yorkshire. He expressed concern that Rockley had become a type site for post-medieval water-powered bloomeries, given the nature of the evidence. The discussion which followed touched on several archaeometallurgical sites of the post-medieval period (including Stony Hazel and Muncaster) and raised difficult questions about how well we know what was really happening.

The secondary working of iron was well covered by four papers (Allan Daoust, David Starley, David Dungworth and Geoff Egan). Allan's opening paper highlighted the fact that smelting has received most attention and that blacksmithing is still a misunderstood and under-researched topic. He has undertaken the systematic analysis of smithing slags and slag inclusions (from weld lines) in iron artefacts from the Saxon smithy at Wharram Percy. This showed two compositional groups (an iron-rich and an iron-poor group) which are present in both the smithing slags and the slag inclusions. David Starley reported on the metallographic examination of Saxon weapons from burials. In general, the Saxon period is seen as a metallurgical high point with widespread use of steel and heat treatment. Archaeologists and military historians often assume that the weapons found in burials will be good examples of military technology, however, the metallographic examination of spear heads show that they make use of less advanced technology compared to knives. David explored the ways in which those who organised burials could deliberately manipulate artefacts to their own ends— it is possible that some artefacts were produced specifically for burials rather than use during life. Geoff Egan illustrated the enormous range of iron artefacts that had been recovered from post-medieval London (in particular the site of the new London Council headquarters). Almost every imaginable iron artefact is represented (as well as some which are as yet unidentified). The recurrence of unfinished knives, keys, horseshoes and other items raises interesting questions about the organisation and control of iron smithing. Theoretical issues were explored by David Dungworth who argued that insights from other disciplines (e.g. cognitive psychology/anthropology) can enrich our understanding of early smiths.

The day finished with two papers looking at non-ferrous metals. Justine Bayley looked at innovations in late medieval technology. She highlighted why changes occurred during metalworking, and considered the effects they had on quality and quantity during the middle ages. Lastly, Peter Cloughton along with Janis Heward presented a fine report on technological change in lead smelting which introduced the beginning of the ore-hearth process during the medieval period.

Overall the conference delivered a valuable insight into the current study of the medieval and post-medieval metallurgy. The day clearly opened a range of opportunities for further research within this subject. Thank you to the University of Bradford and others for their contribution to a stimulating day. The day proved to be a worthwhile experience for many and I shall be certainly be attending the next meeting.

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CONFERENCE REVIEW

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## Archaeometallurgy in Europe 2007

*Claudio Giardino*

The second international conference on "Archaeometallurgy in Europe" was based in Aquileia (Udine, Italy). Like the 2003 conference, it was organised by the Associazione Italiana di Metallurgia. The Organising Committee (composed of F. Bassani, M. Cavallini, A. Donzelli, G.L. Garagnani, A. Giumlia-Mair, E. Lucchini and W. Nicodemi) should be commended for the excellent organization that allowed all the participants to share information on almost all aspects of archaeometallurgy.

Over 200 delegates attended the meeting, that covered a wide range of different themes related to the history of European and non-European metallurgy, from the very beginning of the use of the metals until 18th century AD. The greatest number of papers was on the topic related to *Copper and copper alloys* whose contributions were discussed in three sessions. Other sessions were devoted to the following subjects: *Iron, Gold, Coins and tools, Mines, Ores, Smelting processes and refractories, Silver and lead, Non-European metallurgy, Forging, joining and metal finishing, Slag, History of metallurgy, Production and products, and Archaeometry*. More than 130 oral presentations and over 60 posters provided a significant picture of the current research in archaeometallurgy worldwide. Of course only few papers can be remembered here.

The large numbers of papers presented led the organisers to arrange numerous parallel sessions, which were unfortunately held in different parts of the town. Therefore the participants had to make some hard judgements about which sessions to attend and which to miss. This review of the conference is of course limited to those sessions that I was able to attend

All participants received a CD-Rom with the full text of a large number (but not all, unfortunately!) of the papers presented at the conference; it is expected that the proceedings will be published in due course.

The conference began with the opening lectures by P.T. Craddock (on the lack of early smelting sites in western Europe with slag) and A. Giunlia-Mair (on the production of mercury in Slovenia).

A Spanish archaeometallurgical group (M.A. Hunt Ortiz, V. Hurtado Pérez, I. Montero Ruiz, S. Rovira Llorens & J. F. Santos Zaldegui) presented a preliminary investigation on the Chalcolithic finds and the pyrotechnological structures from San Blas (Cheles, Badajoz, SW Spain). Here different stages of the productive chain were identified. Minerals, fragments of furnaces, crucibles, copper globules, slag, metallic objects allowed the characterisation of the prehistoric production process used to obtain copper and arsenical copper.

Neolithic and Early Bronze Age copper based artefacts from Armenia were studied by Kh. Meliksetian, R. Badalyan & E. Pernicka. In south Caucasus and adjacent regions copper objects appeared as early as 6th millennium BC; nevertheless the finds from that area are still not well studied, therefore contributions like this are rather important. The paper presented the results on metal objects from the Neolithic site of Aratashen (pure copper) and from the EBA sites of Aragats and Gegharot (mainly arsenic copper alloy with variable content of arsenic). Lead isotope analyses suggest that ores came from the Ararat Valley, the Shirak plateau and northern Armenia. The metallurgy of the Caucasus was also investigated by A. Courcier, A. Gasanova & A. Hauptmann who studied the metals found in two kurgans at Soyuk Bulak, in Azerbaijan (4th millennium BC).

M. Benvenuti, L. Chiarantini, P. Costagliola, I. Giunti, A. Dini, L. Giuntini & M. Massi presented a paper on the so-called "aes rude", un-worked copper-based lumps found in many Etruscan and Roman sites from 6th to 3rd century BC. These objects were probably the result of casting the smelted raw copper from polymetallic sulphides (rich in iron). Pb isotope composition is in agreement with a provenance from the southern Tuscany districts.

An Italian-French group constituted by G. Artioli, I. Angelini, F. Burger, D. Bourgarit & F. Colpani presented a paper on their investigations of early copper smelting in northern Italy. Their analyses of Neolithic and Early Bronze Age slags show differences in the degree of ore reaction and smelting efficiency, that are peculiar to non-standard extraction processes. They suggested that the Late Neolithic/Early Eneolithic copper slags were produced by a charge containing sulphide and oxidised copper ore, while the Middle Eneolithic/Early Bronze Age slags were produced from sulphide ores only.

F. Burger, D. Bourgarit, P. Rostan, L. Carozza & G. Artioli presented a paper on the copper smelting *Plattenschlacke* from the Early Bronze Age site of Saint-Véran which was one of the earliest copper mass-production centres in the Alps. The site has yielded only thin flat slag, very homogeneous in composition, generally with columnar fracture surface. The authors discussed the hypothesis of a process without preliminary roasting of the mineral ore, in this case probably Bornite.

The metallurgy of Oman was the subject of several different papers. C. Giardino, G. Guida & S. Ridolfi presented a paper on the earliest metals found in Oman, at Ra's al-Hadd. Excavations have revealed Early Bronze Age evidence for the production of copper-based objects. Non-destructive analyses indicate the early use of an arsenic-copper alloy and demonstrate the presence of high levels of nickel in several objects. Another paper by A. Avanzini, C. Chiavari, M. Degli Esposti, G.L. Garagnani & D. Prandstraller reported the examination of lost wax cast vessels (with raised inscriptions) from Sumhuram. These are dated between the 1st and 4th centuries AD and were made using a leaded bronze alloy. Omani metallurgy was also investigated in a poster by L. Chiarantini, M. Benvenuti, P. Costagliola and A. Avanzini who examined iron smithing slags and a forge from Sumhuram which flourished from 3rd century BC to 1st century AD.

In the section dedicated to the mines G. Marras, P.G. Valera, R.G. Valera Metal presented a paper on supply and domestic metal trades in Nuragic Sardinia. Sardinia, an island rich in small to medium sized metal deposits, is a focal place to understand the copper production and copper trades in the Mediterranean area. Lead isotope analyses revealed a discrepancy between the ox-hide ingots found in many place of the island and the composition of the Nuragic bronzes produced with Sardinian copper. The authors had supposed a large trade of ore along Sardinia, beneficiated locally and processed in metallurgical specialised sites, probably in Iglesiente region. The ox-hide copper was probably mixed together with local copper in the melting phase: this could explain the lack of Cypriot copper in the finished objects.

L. Aguilano, Th. Rehren, W. Müller and B. Rothenberg studied the Spanish process to extract silver in antiquity from the jarosites; they reconstructed this long-term activity by comparison between the four technological periods that was possible to recognise studying the slag from Corta Lago, in the municipality of Rio Tinto, in South-Western Spain, from the Bronze Age up to the Imperial phase. To explain the differences, the paper took into account not only the technological evolution,

but also the complex historical and economical situation in West Mediterranean at the end of the first millennium BC. I. Montero-Ruiz, P. Castanyer, M. Gener, M. Hunt, J.M. Mata, E. Pons, S. Rovira-Llorens, C. Rovira-Hortalá, M. Renzi, M. Santos-Retolaza, J.F. Santos-Zalduegui also were dealing with silver production in ancient Spain, but from another area, Catalonia. They analysed ores and artefacts from the Greek colony of Emporion (Girona). They examined also lead isotope signature of the ore from a large area around Catalonia, including the South of France and the South East of the Iberian Peninsula: this demonstrated the diversification of the mineral resources used at Ampurias; the lead was traded as raw material, as lead ingot and also as litharge.

M. Bode, P. Rotenhöfer, N. Hanel, A. Hauptmann, K. Mezger, W. Eck, studying the *plumbum germanicum* (German lead) ingots, re-analysed the complex question of the Roman lead ingots. Generally this kind of evidence can be easily assigned to the ore districts using lead isotope analyses, because ingots were cast only with lead coming from a single source; moreover the inscriptions give information about the metallurgical process applied, the mining operator, their age and the region of origin.

S. Shalev dealt with the complex metal alloying period of Middle Bronze Age (end of the 3rd to the middle of 2nd millennium BC) in the Levant. He pointed out some conceptual restrictions in the use of metal data for an archaeological reconstruction of the past, or better, to use his own words, “how far shall we take the archaeometallurgical data?”. He remembered we must take into consideration that the original composition of the object could be modified by the selective corrosion of inhomogeneous microstructures. Besides he states that it is very hard to presume the existence of different productive centres only on the basis of the differences in composition of artefacts from different sites. Shalev suggested that differences could also reflect a comparison between prestige artefacts and other production made with scrap metal. The difference in composition between MBA II object from Jericho (Palestine) and from Tall ad-Dab’a (Egypt) could reflect two separate metallurgical centres, but also the Egyptian prestige weapons from the Palestine similar typological material made by scrape metal.

The poster session was also rich in intriguing and interesting papers; unfortunately it is possible to summarise only few of them. The poster by S. Shalev, S. Sh. Shilstein and Yu. Yekutieli was of great interest for the study of the slag: they examined slag from the well known site of Timna (Israel) using X-ray fluorescence (XRF) to analyse the fluxing material (Fe or Mn) and the copper left in the slag for the

identification of different pyrometallurgical processes. They had also measured the metal content in the charcoal incorporated in the slag.

A. Dolfini, G. Artioli, I. Angelici, T. Frizzi and R. Alberti investigated how during the Copper Age metallurgy was introduced and progressively integrated into central Italian societies.

C. Giardino and S. Rovira examined the copper smelting slag from Pyrgos-Mavroraki, a Cypriot site of the beginning of 2nd millennium BC. The analyses suggest that the slag, of non-tapped type, were obtained by the use of copper sulphide ore, such as chalcopyrite, chalcocite and covellite. The smelting process was rather primitive, running in unstable redox condition, at the temperature of about 1000–1200°C. Roasting could take place inside the furnace itself. The slag were crushed in order to recover the entrapped copper prills.

E. Franceschi, I. Cascone and D. Nole presented a poster about metallurgy of Liguria, a region not well known in archaeometallurgical studies, although there were found the earliest evidence of copper mining in Italy. They had studied objects coming from two different sites, one dated to 25th–20th century BC (Castellari), another to 15th century BC (Sant’Antonino di Pertis).



Fig 1. Delegates relaxing during the conference dinner

After two congresses organised in Italy, “Archaeometallurgy in Europe” will move to Germany. Next conference will be organized in Bochum.

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Would all members please note that when sending post to the Membership Secretary or other officers of HMS that there has been a change to the postage rates. If you are sending material in a large A4 size envelope from the UK the stamp should reflect this by having an L (Large Letter) on it as well as 1st or 2nd class. We have mail that has had to be collected from the delivery office, with a charge of £1.22 because insufficient postage has been applied.

## Who is in the HMS?

*A survey of membership details*

The Historical Metallurgy Society began in 1962 but has grown significantly with current membership standing at about 500. The current membership is still to be found mainly in the United Kingdom (62%) with smaller numbers in the rest of Europe (19%) and North America (13%). Other parts of the world contribute 6% of the membership (Table 1).

*Table 1. The locations of HMS members*

UK	307
Rest of Europe	95
North America	65
Asia	28
Africa	2

The UK membership is fairly evenly spread, although with a low representation in the North East and the East Midlands (5% of the members reside in each of these regions). Most UK members are to be found in the South West (16%), South East (15%), Yorkshire (13%), and London (11%). In Europe (excluding the UK), there are members from 21 different countries with most in Italy (16%), Germany (11%) and France (11%).

*Table 2. Types of membership*

	UK	The Rest of the World
Ordinary/Overseas	137	145
Student	15	0
Retired	83	1
Family	20	1
Library	18	18
Institution	10	5
Other	24	20

The Society offers several different types of membership with ordinary (28%) and overseas (29%) members making up the majority (Table 2). The retired, family and student members (20%) are almost all UK members. The remaining various institutional, exchange and library members (20%) are to be found in the UK and the beyond.

NB: The Society holds information about the members that is necessary to ensure the collection of membership fees and delivery of the journal, the newsletter and Society correspondence. In accordance with the 1998 Data Protection Act, no personal data will be disclosed to third parties.

## HMS Archaeology Committee

*David Cranstone*

The role of the Archaeology Committee is to develop and strengthen contacts between archaeologists and archaeometallurgists, both within the Society and beyond. This very much includes conservation (both policy-setting and more reactive ‘casework’), and the Conservation Officer is therefore an *ex officio* member (as is the Chairman of the Society). Current members of the Committee are:

Anna Badcock, Justine Bayley, Paul Belford (Conservation Officer), David Cranstone (Chair), David Dungworth (Secretary), Brian Gilmour, Jon Hoyle Gill Juleff, Lynne Keys, Matthew Ponting, Sue Stallibrass, and Tim Young (Chairman of Society).

At the moment our main activities are:–

- A Research Frameworks document, designed to be read (and acted on!) by the field and curatorial archaeologists who control the fate of archaeological sites and can impose the need for protection, excavation, and scientific analysis.
- A glossary of terms, to cut down the confusing and sometimes contradictory use of terminology in our subject.
- The National Slag Collection. This collection was put together by the ‘first generation’ of historical metallurgists, including many of the founders of this Society; it therefore has importance for the history of the Society and the subject, as well as being potentially an extremely important national reference collection. It is stored at Ironbridge; we are currently sorting out issues around storage and curation, and have completed a first assessment of the collection — this confirms that it is an important collection, and is identifying the (substantial) gaps that we need to fill in order to turn it into the comprehensive national reference collection that we intend it to become (see page 16).
- Workshops and meetings. The Committee organises small-scale workshops and meetings on specific topics, to complement the Society’s larger and more wide-ranging conferences (see the Bradford conference report on page 11). Currently we have two in preparation (Sheffield in April [see page 16] and London in Autumn), and are thinking about future topics.

## 19th-century Ferrous Metallurgy

HMS Archaeology committee Spring workshop  
Sheffield, 18th April 2008.

### CALL FOR CONTRIBUTORS

The spring workshop provides a forum to discuss recent and ongoing investigations into all aspects of archaeometallurgy. This year, the theme is 19th-century ironmaking. The development of coke blast furnaces into the early 19th century is quite well understood, but what about the archaeology and archaeometallurgy of hot blast, and particularly the massive 19th century development of the forge and foundry sectors - how do we best approach excavation and analysis on these sites? And how do we understand the often 'difficult' evidence that we uncover? 20-minute papers will be presented, with plenty of time for general discussion about current approaches, new discoveries, scientific techniques, and archaeological fieldwork. The workshop is open to all, and we hope that most of those actively involved in the subject will take part.

If you would like to present a short paper, please contact Anna Badcock on 0114 2222957 (a.badcock@sheffield.ac.uk) or write to her at ARCUS, Westcourt, 2 Mappin St, Sheffield S1 4DT.

#### Workshop details:

The workshop will be held in the Humanities Research Institute at the University of Sheffield. Further details about the programme, venue etc will be available on the HMS website. The anticipated cost will be in the region of £15.

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## The National Slag Collection

*David Dungworth*

The National Slag Collection (NSC) originated from the private collections of several members of the Historical Metallurgy Society, such as Reg Morton and Michael Davies-Shiel. Substantial quantities of material were also deposited in the late 1970s and early 1980s.

The NSC currently comprises 157 boxes in the stores of the Ironbridge Museum (Figure 1). The entire collection has been subjected to an initial assessment which has revealed that some of the collection is not metallurgical (some of the odder things include a bar of soap, a shoe, flints and numerous fossils). The packaging and labelling are not ideal and in many cases it is not clear where the slag samples came from or what process they relate to. Nevertheless, the NSC contains some highly significant material from canonical metallurgical sites.

The strengths of the NSC are currently for post-medieval ferrous metallurgy of the West Midlands and the Lake District.



*Figure 1. The National Slag Collection, housed at the Ironbridge Institute*

The full assessment and recommendations for de-accessioning is being prepared for submission to the Ironbridge Institute. It is hoped that we can re-package the collection, make a full catalogue available via the internet and make the collection more accessible in 2008.

Anyone who would like to volunteer to help with the re-packaging should contact David Dungworth, English Heritage, Centre for Archaeology, Fort Cumberland, Portsmouth, PO4 9LD. Tel 023 9285 6783  
Email: [david.dungworth@english-heritage.org.uk](mailto:david.dungworth@english-heritage.org.uk)

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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).

**Newsletter Editor, David Dungworth,**  
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