

# HMSNEWS

## Historical Metallurgy Society

48

Summer2001

### FORTHCOMING EVENTS

**Archaeological Science 29th August to 1st September 2001**  
at University of Newcastle upon Tyne.

**HMS Annual Conference** will be based at Northamptonshire over the weekend of **14th to 16th September and will be themed Iron and Steel.**

The Introduction of Iron in Eurasia, Uppsala, 4–8th Oct 2001. Details obtainable from David Starley (see end of Archaeometallurgy)

Joint HMS/Roman Finds Group Meeting, Exeter 8 Oct. 2001 (Further particulars should be obtainable from Justine Bayley)

**Colloque Semant/Instrumentum, Erpeldange, 26–28th Oct 2001.** Particulars Michel Polfer, Seminaire d'Etudes Anciennes, Centre Univeritaire de Luxembourg, 162A Avenue de la Faiencerie L-1511 Luxembourg Tel: (00) 352-81.11.77. Fax (00) 352-81.12.07. Mailpolfer@cu.lu

**Early Materials Forum, Bradford, 1st–2nd November 2001**  
Contact: Lyn Wilson, Dept Archaeological Sciences, University of Bradford, BD7 1DP. Tel +44 (0) 1274 235190. Email: L. Wilson2@Bradford.ac.uk

#### HMS and NEWCOMEN

Joint meeting at 5.45p.m. on **Wednesday 12th December** at the Science Museum, London. Mr E.F. Clark, Dr Paul Shelton, Dr J K Almond and Mr P Heward will present a paper entitled "Metallurgical examination of the tyre of the *Lion* locomotive"

**33rd International Symposium on Archaeometry 22nd–26th April 2002.** to be held in Amsterdam at Vrije Universiteit, (near Schiphol Airport). Includes metals among other things. Web site [www.archaeometry.vu.nl](http://www.archaeometry.vu.nl). or write: to VU Conference, De Boelelaan 1105, 1081 HV Amsterdam, The Netherlands.

**HMS Annual General Meeting 2002** will be held on Saturday **11th May** at Ironbridge. The associated meeting will address Structural Metalwork. This is planned as a two-day event, with presentations on the Saturday and field trips on the Sunday. Anyone who wishes to present a paper, please contact Paul Belford, Ironbridge Gorge Museum Trust (Tel: 01952 432141)

**HMS Annual Conference 2002** will be held on 13–15th September (starting Friday evening) in the Sussex and Kent Weald.

**Archaeometallurgy in Europe 24–26th Sept. 2003. Milan Italy.** The Conference aims at gathering and sharing information on all aspects of the history of iron and copper metallurgy in European countries. 1st call for papers. English will be the Conference language. For a leaflet contact AIM - Associazione Italiana di Metallurgia, Piazzale Rodolfo Morandi, 2.1-20121 Milano.

**International Symposium on Ancient Gold Technology. Madrid 23-25 October 2002.** First call for papers. Contact E-mail: [situa@ceh.csic.es](mailto:situa@ceh.csic.es) Alicia Perea. Depto. de Prehistoria, Institute de Historia, CSIC. Serrano 13, 28001 Madrid

### Obituary

#### Dr Manfred Wolf

Dr Manfred Wolf died unexpectedly on 12th April 2001 aged 63 in his hometown Zurich.

A long time member of HMS and the Historical Committee of the German Iron and Steel Institute (VDEh), Manfred was always able to provide useful contacts to further various enquiries of a historical nature.

He studied Iron and Steel Technology at the school of Leoben, Austria and started his professional work with Schoeller-Bleckmann in Ternitz, Austria, soon joining Concast, Zurich where his career accompanied the development of continuous casting practically from the beginning of the process to its industrial use. His name was very much connected to continuous casting throughout his professional life.

Thus he was fully acquainted with the history of continuous casting knowing personally nearly all of the people involved in this technology across the world. His publications on the history of continuous casting have become works of reference<sup>(1)</sup>.

He was also involved in the education of students of engineering at the schools of mining at Leoben, Austria, and Freiberg, Germany. The many papers

he presented around the world made him internationally well known.

He became very interested in the history of iron and steel making and thus was elected a member of the working committee of the historical committee of the German Iron and Steel Institute where he contributed much of his knowledge of the history of iron and steel. He also possessed an excellent collection of historical postcards depicting the current iron and steel technologies of the day.

He was a frequent visitor to England and accompanied the German historical metallurgy tour to Coalbrookdale and Sheffield last summer.

All his technical and historical colleagues appreciated him very much and will remember him.

(1) Iron & Steel Society, 75th Steelmaking Conference Proceedings 1992

Tim Smith

### **Charles and Audrey Blick**

Concerning the obituary for Charles in HMSNews 47, my apologies for thinking that Charles was awarded the MBE for services to the Steel Industry; we were mistaken—it was given in 1945 and is therefore likely to have been related to his work in the Royal Artillery, intercepting and destroying the unmanned missiles aimed for London, commonly called *Doodlebugs*.

Audrey would like to send her very best wishes to you all and to thank all members who have sent her such kind letters.

Amina Chatwin

### **HMS AGM 2001**

This year the AGM was held in Sheffield and our hosts were The London and Scandinavian Metallurgical Company Limited.

Eddie Birch, the Chairman, welcomed us to the meeting. It was mostly business as usual.

The accounts needed some explanation because there were large changes from last year. The year end in 1999 coincided with a change in our investments. Over the years we have been fortunate

in having our accounts managed, free of charge, by Flemings because they managed the Institute accounts. We were told that they would no longer do this. They advised us to move our investments to the Common Investment Fund, which is an approved fund for Charities. We were in the course of doing so at the 1999 year end. This meant that the accumulated increase in value of our investments appeared as profit. This year we reverted to normal. As far as the Treasurer can judge the new investment has proved if anything to be slightly more profitable than the old.

We elected Gill Juleff as our new Chairman. On election she thanked Eddie Birch for his work over the past two years. Eddie responded and thanked the Committee, and particularly the retiring members, for keeping the Society in business. Mike Cowell and David Crossley were re-elected as Treasurer and Editor. Unusually we needed 5 ordinary members and Kilian Anheuser, Ruggero Ranieri, Brian Read, Richard Smith and Robert Smith were elected. The Auditors, Long and Company, were appointed for another year.

After the meeting we had a talk describing the activated nickel plant. Nickel is used as a catalyst in the production of such things as margarine and other fats by hydrogenisation of vegetable oils. For this application the more surface area the nickel has the better it will work. Presently the most satisfactory process for making high surface area nickel is the process in use at LSM. The nickel is alloyed with aluminium to produce a brittle alloy. This is crushed to a powder. Once this has been done the aluminium can be dissolved in a caustic soda solution leaving the nickel behind. The resultant powder has such a large surface area to weight ratio that it is pyrophoric and has to be kept in water. It looks rather like thin black semolina. We went to look at the plant, which was very high tech and was largely run by a computer. Like all water based chemical processes the plant was not very exciting though the view was good.

After an excellent lunch we went to Magna. Before we went into the exhibition building we were treated to an account of the project. The building is the old Steel, Peach and Tozer Templeborough arc melting shop. This was erected on the site of the largest cold charged open hearth shop in the world as part of the SPEAR project in the 1960s. It has been preserved

and now houses a science based activity centre. There is a brief account of the steelworks that it originally housed (which I later watched on my own). We were then free to look around. There were sparks every- where. It was divided into earth, air, fire and water and was full of youngsters having a good time. It was a very impressive display of science based trickery and clearly had caught the fancy of the intended audience. Whether they learned anything while they were being entertained it is hard to say, as with all these things.

### **Tondu Ironworks excavations.**

See also under Archaeometallurgy, page 4.

The Hon Secretary, with other industrial archaeologists, was invited to an open day at the Tondu iron-works. The works was established in 1838 by Sir Robert Price MP who ran it for some years. The ore, and maybe the coal, seems to have been brought in by mules. We know little about this phase of the works. In 1856 the works was taken over by John Brogden and extensively modernised. He built two larger furnaces and extensive ranges of beehive coke ovens, some of which survive. There is a huge rectangular kiln which dominates the site and probably was built by the John Brogden. Railways ran everywhere, even up to the houses at the top of the site. The Brigden were succeeded by Col. North who modernised the works again in about 1888, building one larger cupola style furnace. This needed a lift to the charging platform. The lift tower is still standing.

The reason for the open day was that the site is being transformed into a park. As part of the transformation an excavation was carried out in the furnace area. This revealed the almost complete foundation of the North furnace and its stoves. Part of the foundations of one of the Brogden furnaces was also exposed. This was reburied soon after our visit below the stage area of an arena. The two engine houses have been restored for use as offices. Nothing has been lost by doing this because they were gutted for re-use long ago.

There is a fuller account with pictures on the web site ([histmet.org](http://histmet.org)) with the conference reports.

Peter Hutchison

## **ARCHAEOLOGICAL METALLURGY**

### **Earliest French chalcolithic copper smelting site**

The Cabrieres copper-mining district in Herault, southern France contains the oldest copper mines and copper-smelting sites in France, dating from the beginning of the 3rd millennium B.C. (Ambert, 1995). Unlike most known Chalcolithic mining, which exploited copper oxide ores, Cabrieres was without doubt smelting copper sulfides. Comparison of slags and metallic copper artefacts from secondary deposits, with the products of field smelting experiments, led to the first technical characterisation of this earliest chalcolithic metallurgy (Bourgarit and Mille, 1999).

Excavations in spring 2001 have now revealed a complete chalcolithic copper-smelting workshop at La Capitelle du Broum. Three small areas subjected to high temperatures have been located and numerous copper slags and metallic copper pieces and prills related to sulfide ore smelting were found in the vicinity. Also associated were many metallurgical tools (crushing stones and hammers, bone pellets). The excavations and laboratory studies are still in progress, but it is already clear that, as the oldest dated metallurgical site of the Cabrieres district (Radiocarbon date  $4390 \pm 40$  BP; 3100–2900 Cal BC), La Capitelle du Broum, represents a major site for the understanding of the chalcolithic copper extractive metallurgy in south-western Europe.

The team involved in the project are:

P Ambert W D Bourgarit(2), B Mille(2), J Coularou(1), C Cert(1) J-L. Guendon(3)

(1) Centre d'Anthropologie UMR 8555 CNRS, Toulouse, France

(2) Centre de Recherche et de Restauration des Musees de France, Paris, France, [david.bourgarit@culture.gouv.fr](mailto:david.bourgarit@culture.gouv.fr)  
[benoit.mille@culture.gouv.fr](mailto:benoit.mille@culture.gouv.fr)

(3) Maison mediterraneenne des Sciences de l'Homme, Aix en Provence, France

### **Bibliography**

Ambert, P, 1995 Les mines préhistoriques de Cabrieres (Herault): quinze ans de recherches. Etat de la question. *Bulletin de la Société Préhistorique Française*, 92, 4, 499–508

Bourgarit, D et Mille, B, 1999 La métallurgie chalcolithique de Cabrieres: confrontation des données expérimentales et archéologiques en laboratoire, *Archéologie en Languedoc*, 21, 51–63

## **Excavation, consolidation and preservation of C19th Welsh Ironworks**

Excavation and consolidation at the Tondu ironworks near Bridgend has been undertaken by a team from the Oxford Archaeological Unit, directed by Rob Kinchin-Smith. A number of structures on the site, had survived due to their Scheduled Ancient Monument status, but had become partially buried. These features included beehive coking ovens, calcining kilns, a blowing engine house and a unique lift tower, used for charging one of the furnaces. Unfortunately, other, non-scheduled buildings, had been demolished when the Coal Board left the site in 1991. When the project began in 1996 the site was derelict and completely overgrown. The excavations have now uncovered a number of previously hidden features. These include a well-preserved c.1880 blast furnace base; the remains of an earlier, mid nineteenth century masonry blast furnace; the 1880's hot blast flue system and a rolling mill. The site, Tondu Park is now managed by Groundwork Bridgend, a not-for-profit regeneration organisation and is to become an industrial heritage centre.

### **Tudor tin-plated iron sheet?**

**Clodna Devitt**, who runs a textile conservation studio in Dublin has been restoring a "cap of maintenance", a hat presented to the inhabitants of Waterford, Republic of Ireland by Henry VIII in 1536. The hat has obviously been repaired in the past, but it is unclear whether a tin-plated iron disc in the crown is original or dates from a repair. The disc is 22cm in diameter and the thickness varies from 0.6mm where the corrosion is thin to 1.2mm where corrosion is thickest. XRF analysis shows that the coating is tin, without significant additions. If anyone has knowledge of such uniformly thin material being produced at this early date please let Clodna or the Newsletter know.

Clodna Devitt Textile Conservation Studio, Unit 51, The Tower, Trinity College Enterprise Centre, 111 Pearse St. Dublin 2, Republic of Ireland.

### **Historic silver plating**

Silver plating technology on 18/19th century decorative metalwork is being investigated by Kilian Anheuser at Cardiff University in collaboration with the Prussian Palace Administration in Potsdam (Germany). A number of different silvering methods were used at the time (silver foil, silvering pastes, early galvanic plating, possibly amalgam silvering),

and the project aims to give definite guidelines for their identification. This, combined with metal analysis, will be used to distinguish between 18th century chandeliers purchased by the Prussian kings in Paris or from local Prussian manufacturers, and high quality 19th century copies.

A related study, in collaboration with the National Museum of Wales, Cardiff, is investigating the silver plating technology of 3rd century Roman coins which carry a very thin silver wash.

### **Proposed research on the Bronze Age tin trade**

**Reinhard Hoffman** is looking for assistance in his research, investigating; the extent to which Cornish tin was traded, the influence of Cornwall and the Wessex culture on the countries receiving their tin and vice versa and the yields of Cornish Ore deposits compared to those of Saxony and Asia. He wishes also to re-examine the accepted view that metallurgy developed from the east to west.

With the participation of **Ernst Pernicka**, at the **Technical University** of Freiberg in Saxony, **The Max Planck** Institute of Chemistry in Mainz has found slight but systematic differences between central European and Mediterranean bronze. Dr. Pernicka has also studied isotopes of tin from Asia using mass spectrometry and is now interested in material from South-West England. If anyone has access to samples of tin or copper from mines in South-West England that Reinhard could submit for analysis he would like to hear from you:

Reinhard Hoffman, Barbacher Str. 1, 56570 Biebrich/n. Nastatten, Germany

### **Investigation of copper ores from northern Italy.**

**Rob Ixer**, working with **Marco Tizzoni** from the **University of Bergamo** has carried out detailed mineralogical investigation of vein-style copper mineralization from the Iron Age Copper Mines of Campolungo, Bienno, Northern Italy, essentially confirming earlier descriptions by Dr Tizzoni. The primary mineralization is both uniform and simple, comprising chalcopyrite accompanied by very minor amounts of pyrite and trace amounts of electrum (a silver-rich gold alloy) in a quartz gangue. Alteration of the primary sulphides has produced a number of secondary copper sulphides, including digenite and covellite but mainly malachite, brochantite, azurite and limonite. Electrum particles is small (up to 10 microns in diameter) and often associated with limonite replacing chalcopyrite. The mineralization

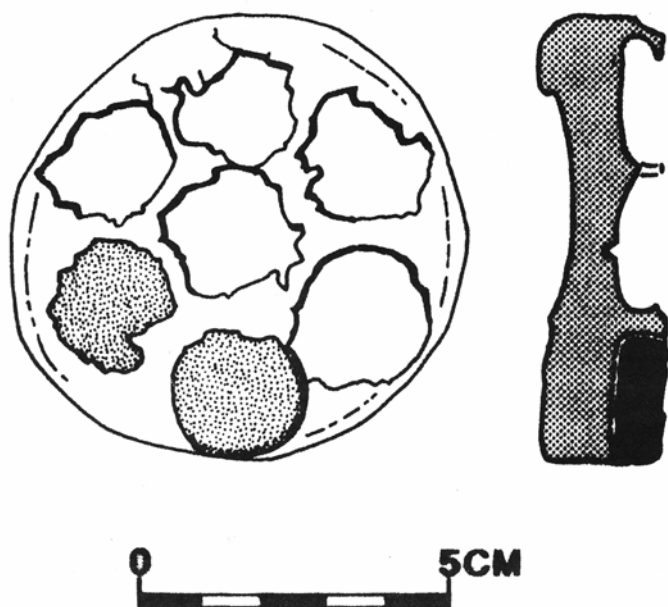
could be simple to beneficiate and would produce a copper concentrate devoid of significant amounts of other metals except for iron.

### Scottish mystery object

**Jenny Shiels** at **The National Museums of Scotland** asks whether any of our readers can help identify a mystery object, found by a metal detectorist near **Castle Stuart, Inverness**. The object appears to be of lead or lead alloy, but is awaiting analysis. It is circular with seven regular, circular disks within, five of which are void, the sixth and seventh (bottom left and bottom of Photo 1) remain embedded. The overall dimensions of object are: Diameter. 73mm Thickness 18mm and weight 582.9g. The disks within are of 10mm diameter and have a depth of depth c 5.5mm. The find site is close to a motte and a few hundred yards from the sea. Culloden battlefield is a couple of miles to the south.

If anyone have any ideas as to what this might be could they please reply to: Jenny Shiels, Treasure Trove Administrator, c/o Dept of Archaeology, National Museums of Scotland, Chambers Street, Edinburgh. Tel: 0131-247-4082

email: j.shiels@nms.ac.uk



### *Mystery Object*

Any contributions to next issue by 1st November to:  
**David Starley**, Royal Armouries, Armouries Drive,  
Leeds LS10 1LT. UK. Tel. (0113) 220 1919,  
Fax (0113) 220 1917,  
email david.starley@annouries.org.uk

### A NEW TIMNA MINING PARK

The Timna Valley, the ancient copper mining and smelting region north of the Gulf of Eilat/Aqabah, is being turned into the 'Timna Mining Park', based upon the extensive research work done at Timna over the decades by Beno Rothenberg, director of the Institute for Archaeo-Metallurgical Studies (IAMS), Institute of Archaeology, University College London, in collaboration with Ronnie Tylecote, HG Bachmann. Tim C. Shaw and, in the 70's. the German Mining Museum, Bochum. The Timna Mining Park' will be a unique combination of open-air museum, real archaeological sites and environment, and educational multimedia and research-oriented exhibitions. At present. Phase One of the Timna Park is close to its completion. This will consist of the first of the planned three buildings of its Visitors Centre, to tell the story of Timna's mining-geological development and its prehistoric beginnings, leading to the life, beliefs and culture of New Kingdom Egypt — as introduction to the huge New Kingdom copper industry at Timna (late 14th to mid-12th centuries BC). As second station of Phase One, underground copper mines of the Chalcolithic period, the 5th–4th millennium BC, as well as mines of the New Kingdom, are being prepared for visitors. In these mines, special exhibits will show miners and their tools 'at work'. As the third station of Phase One, an open air Museum of Rock-Art will be located inside the mining area, and will show 6000 years of rock drawings found in the mining region. Phase One will be opened to the public within several weeks.

Phase Two of the Mining Park, already planned in detail, will include a replica underground mine which will tell the story of the mining technology developed in Timna through many thousands of years, from the Late Neolithic Period to Early Islam.

Phase Three will be dedicated to 'Mining and Cult', with the Egyptian New Kingdom Hathor Temple as its centre. Mine workings and smelting sites of all periods at Timna, the Arabah and Sinai have been found to be related to shrines and rock-altars, presenting a highly inspiring picture of myths, rites and cultic symbols, peculiar to the miners and copper smelters of this extensive mining region.

A regional archaeological museum of a unique museological conception, which will show the numerous archaeological and archaeometallurgical

finds from the excavations at Timna and the Arabah Valley, is also planned for the 'Timna Mining Park'. The 'Timna Mining Park' has been initiated and planned by Beno Rothenberg, who is also the head of the Timna Park project, sponsored by the Jewish National Fund (KKL).

Excavations in the Chalcolithic (5th–4th millennium BC) copper mines at Timna. In the 60's, the 'Arabah Expedition', led by Beno Rothenberg, discovered the ancient copper mines in the Timna Valley, and in the 70's several excavations were undertaken by the 'Arabah Expedition' in collaboration with the German Mining Museum, Bochum (published 1980, in German, by the Bochum Museum). In connection with the new Timna Park Project, further excavations are now taking place in the Chalcolithic and New Kingdom mines, directed by Beno Rothenberg (on behalf of IAMS), with Alexandra Drenka-Sion (as chief supervisor) and Tim Shaw (in charge of mining-technological research). Already now, after working underground for several weeks, the overall picture of the Timna mines has been changing considerably: instead of relatively limited mine workings around one or two shafts, the excavations show large scale, very extensive, interconnected workings with numerous shafts of different functions and many miles of galleries — a unique picture of early prehistoric mining. It is planned to continue these excavations after the summer, if possible during several additional seasons of fieldwork. Considering the scale of this work and its importance for mining history, Beno Rothenberg would like to collaborate in future with a suitable academic and/or mining-history institution (b.rothenberg@ucl.ac.uk).

Beno Rothenberg

### **Historic Forest of Dean mining company records preserved**

The County Record Office in Gloucester has recently received an important collection of records of the Forest of Dean mining company, Henry Crawshay & Co Ltd of Cinderford. The records date from the formation of the company in 1889 until 1947 when the mines were nationalised along with the rest of the British Coal industry. The records contain information about the performance of the company's collieries which included Lightmoor, Eastern and Northern United and Shakemantle.

Accidents in the mines are also recorded. The first two minute books cover the period when the company still owned iron mines and contain a lot of information about the decision to wind down this side of the business. Minutes for the 1930s reveal difficulties with water in Lightmoor Colliery, losses at Northern United and with labour relations. There are also occasional glimpses of the power and influence which the Crawshay family had in the Forest. The company made annual donations to charities and the Gloucester Royal Infirmary, but in 1905 William Crawshay was opposed to the building of a secondary school in Cinderford. "Crawshay's was an important part of the Forest's economy for over 50 years" says Kate Maisey "We are delighted to add this archive to our holdings".

The archive has been passed to the Record Office by local historian David Bick, who is well known for his research on the county's industrial past. It is believed they were previously in the hands of a former director of the company, Frank G Washbourn. Other records from the company were dispersed in the late 1980s, and the Record Office (01452 425294) would be very pleased to hear from anyone who knows their whereabouts.

For further information contact Kate Maisey, Senior Cataloguer, Gloucestershire Record Office (01452 42594) or Nick Kingsley, County Archivist (01452 425299) or David Bick (01531 820650).

### **A LARGE OVAL SHAPED BLAST FURNACE OF THE HAN DYNASTY: EXCAVATED RECENTLY IN HENAN, CHINA.**

At the beginning of 2001, a large blast furnace of the Oval shape from the Han Dynasty (206 BC to 220 AD) had been unearthed at the Nanguan iron-smelting site of the Han Dynasty in Lushan County, Henan Province, China. The remains of the furnace, which is in a good state of preservation with clear structure, mainly includes five parts: the rammed earth base (18m long x 12m wide), the rammed refractory material bed of the hearth (7m long x 5m wide), the hearth, the slag-off ditch (6m long and 0.5m wide and 0.3m deep) and the vestiges of setting up blowing apparatus and charge hoist. The furnace was one of the earliest large iron-smelting blast furnaces in an oval shape. The hearth of the

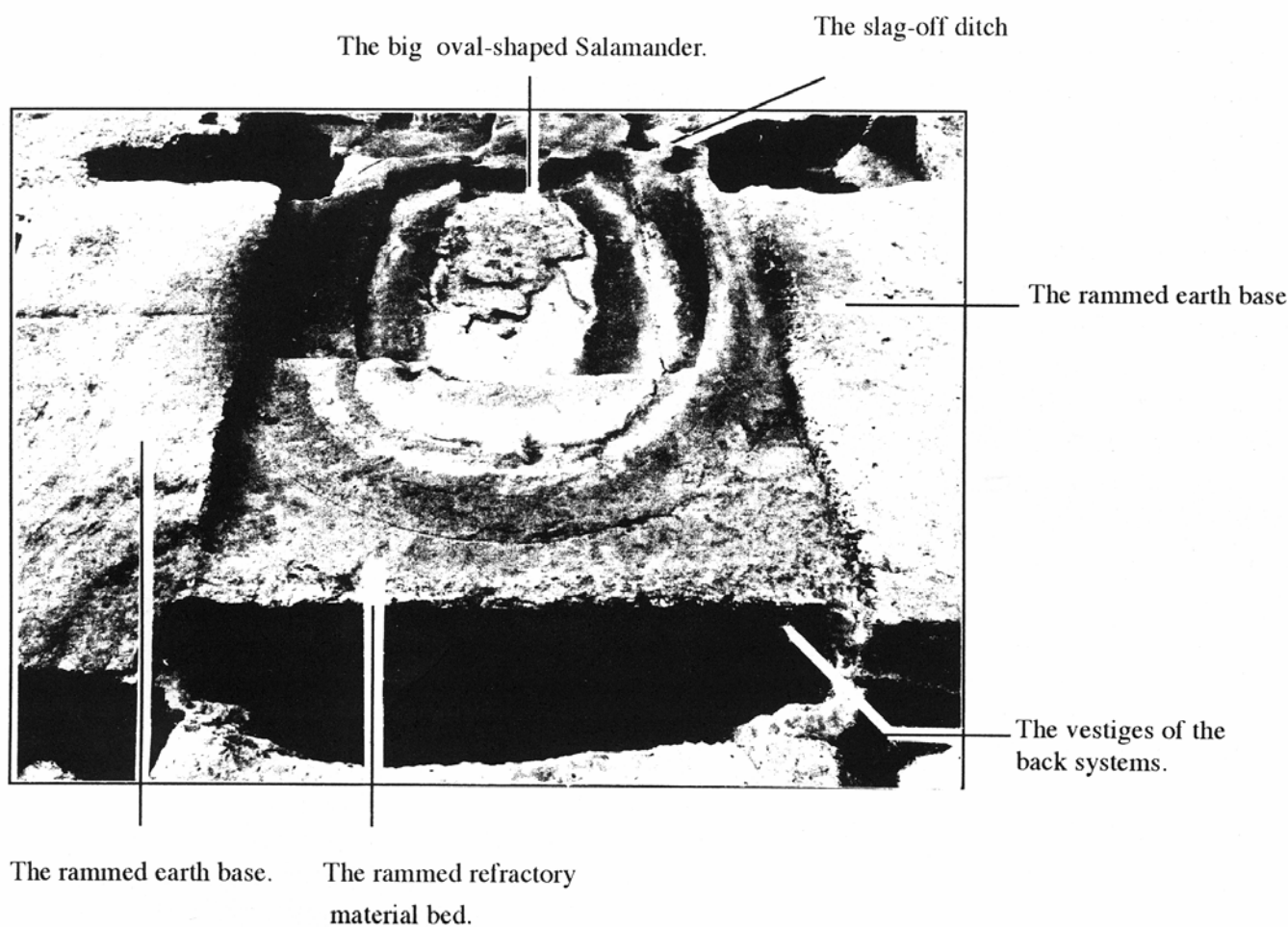
furnace was also the biggest one discovered in ancient China the inner diameter being about 4m of long axis and 2.8m of short axis. The capacity of the furnace is guessed to be about 50m<sup>3</sup>.

The slag-off ditch which is in the right-front of the hearth is the first discovery in ancient iron smelting sites excavated. The vestiges of setting up blowing apparatus and charge hoist, which are in the back or on both sides of the furnace, are also the first discovery and need to be further studied There is a big oval-shaped salamander with about 3.6m long axis and 2.5m short axis and 1m thick and about 30 tons weight unearthed in the front pit. All these will provide new and precious information for the study

of the technical level of iron-smelting in ancient China.

There are only a few ancient metallurgical sites which have been excavated in China, and they are almost all in Henan Province. The area which has been unearthed in each known site is very small, so we should like to do some study in co-operation with scholars from other countries on those iron smelting sites. I hope this will be a good beginning.

*Liu Haiwang, Henan Provincial institute of Archaeology and Cultural relics. No 9 the north third street, Longhai Road, Zhengzhou City, Henan Province, 450000, China.*



*The remains of the furnace and other related systems looking towards the West.*

## **EARLY IRON SMELTING IN THE ROCKINGHAM FOREST AREA**

This survey brings together all the available evidence of early iron smelting in the Rockingham Forest region of Northamptonshire from

Documentary sources, the county SMR and recent fieldwork. The survey looks at the history of the Rockingham Forest woodland together with the underlying iron bearing strata. Documentary evidence for iron smelting within the forest is

discussed, along with the field evidence, furnace groups and furnace types. Early/middle and late Saxon smelting is duly examined as is the importance of the Fineshade Valley as a centre of iron smelting in the forest, finally, the gazetteer sets out the known evidence.

Clearly, one of the most important issues in the study of iron smelting today is the dating of smelting sites. In order to address this problem a number of slag patches and mounds were sampled and charcoal obtained for C14 dating. Work began with the sampling of an undated slag mound in the corner of Bulwick parish, a charcoal sample from this giving an early/middle Saxon date. The success of this investigation prompted similar sampling of three adjacent slag mounds in Gretton parish resulting in three late Saxon dates. Further to this an examination was undertaken of the Fineshade/Laxton Valley, where a large Roman iron production site was excavated by Dennis Jackson in 1985, and a number of undated slag sites were known to exist. Charcoal samples taken from six of these sites produced radio carbon dates ranging from the 5th century AD to the 12th century. In the summer of 2000, a magnetometer survey was carried out over a well preserved example of a smelting site at Cendry Hoime in the Fineshade Valley., followed up by trial trenching to confirm the results, and the planning of a furnace which gave a C14 date of AD890-1030. A smelting site was also investigated in Oudle Wood and given a late Saxon date. In Easton Hornstock Wood, two sites, part of a previously unknown iron working complex, were excavated. One proved to be the remains of a smelting furnace C14 dated to AD440-670, nearby the remains of a smithing site were dated to AD620-880.

A full report of the survey; "Early Iron Smelting in the Rockingham Forest Area: a survey of the evidence" by Burl Bellamy, Gill Johnston and Dennis Jackson will be published in the next issue of *Northamptonshire Archaeology*.

Burl Bellamy

Mr Bellamy was also kind enough to send to HMS a copy of a database of over 200 iron working sites recorded in the survey, for our archives.

## PUBLICATIONS

### **The Diary of Charles Wood of Cyfarthfa Ironworks, Merthyr Tydfil, 1766–1767.**

Edited by Joseph Gross with an introduction by Philip Riden. Illustrated hardback of 288 pages ISBN 1 898397 48 6 published by Merton Priory Press Ltd. 67 Merthyr Road, Whitchurch, Cardiff CF14 1DD.

An important and hitherto little known contemporary account of the building of one of the earliest iron-works in South Wales. Charles Wood whose family had been involved in the West Midlands iron trade for several generations, came from Cumberland in 1766 to supervise the construction of the third coke-blast furnace to be built at Merthyr Tydfil, and to act as resident managing agent for the two partners at Cyfarthfa, the London merchant Anthony Bacon and William Brownrigg, who was Wood's brother-in-law. His account makes it possible to follow the building of first a forge, then a water-powered blast furnace. There are also extensive comments on Dowlais and Plymouth furnaces also in the parish.

### **Microstructurally-induced embrittlement of archaeological silver.**

Russell Wanhill sends a copy of NLR-TP-2001-032, this report, concentrating on silver only, unlike NLR-TP-2000-358 (see HMSNews 40 page 8) is less speculative. Mr Wanhill writes "I have had some input from Mary Cahill (National Museum of Ireland) which casts serious doubts on my ability to interpret fractures in gold artifacts from detailed drawings and macrophotographs. What looks like brittle fractures, e.g. in AU 575 (figure C2 in NLR-TP-2000-358) could very well be ductility exhaustion owing to the object having been folded up. But as I stated in my previous letter, maybe it will be possible to have some 'hands-on' research in future."

*R.J.H. Wanhill National Aerospace Laboratory NLR P.O.Box 90502 1006 BM Amsterdam Netherlands Tel +31 527 24 82 94 Order number 0140187.*

**The Hon. Editor Amina Chatwin**, The Coach House, Parabola Close, Cheltenham GL50 3AN. Tel 01242 525086 welcomes contributions for HMSNews by, the end of February, June 11th, and November 5th. If possible on Apple Mack or ascii.

**Membership Secretary, Mrs Lesley Cowell** "Little Gables" 17a Thorncote, Northill, Beds, SG18 9AQ. Direct e-mail address is: lesley@mcowell.flyer.co.uk.