

HMSNEWS

Historical Metallurgy Society

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Winter 2001/02

Forthcoming events

HMS Annual General Meeting 2002 will be held on **Saturday 11th May at Ironbridge**. Subject *Structural Metalwork*. Two day event with presentations on the Saturday and field trips on the Sunday.

Anyone wishing to present a paper, contact Paul Bedford, Ironbridge Gorge Museum Trust. (Tel. 01952 432141)

HMS Annual Conference 2002 13–15 September (starting Friday evening) in the Sussex and Kent Weald.

West Virginia University Institute for the History of Technology and the Society for Industrial Archaeology Three Rivers Chapter will be held on the Campus of Ohio University at Athens, Ohio, April 26-28 2002. Will feature Ironton area charcoal industry, tour of Buckeye and Vinton furnaces. Papers sought related to industry and life in the Hanging Rock Iron Region and to Historic Ironmaking, iron Mining and related topics. For more information contact Lee Madox by phone (304)293-3829 or by email: Lmaddex@wwu.edu; or by mail at the Institute for the History of Technology 1535 Mileground, Morgantown, WV 26505.

International seminar on the Conservation and restoration, care and technology of arms and armour. Organised by the Royal Armouries, Leeds and the Malta Centre for Restoration, Malta, in collaboration with The Palace Armoury, Valetta.

Aim — to provide a forum for discussion and the exchange of ideas. Will be held in the newly created Malta Centre for Restoration, Malta.

Papers and posters on any aspect of the field invited. Abstracts (up to 250 words) should be submitted by 31st Dec.2001. Further information contact Robert Smith, Royal Armouries, Armouries Drive, Leeds, England, LS10 1LT.

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ARCHAEOLOGICAL METALLURGY

Massive silver hoard throws light on medieval jewellery making

Birgit Bnhler of the Vienna Institute for Archaeological Science has provided the following note on the **Fuchsenhof** hoard, found in 1997 near Freistadt (**Upper Austria**) and currently the topic of interdisciplinary research. It includes

more than 6000 silver coins, which date the hoard approximately to the 1270's AD. The assemblage provides a unique opportunity to study a wide range of late medieval silver-smithing techniques, including casting, hammering, chasing, punching, chiselling, engraving, polishing, soldering, wire production, granulation, mercury-gilding and niello. It includes objects from different stages of Jewellery production including raw materials, semi-finished and finished pieces of Jewellery, predominantly silver finger rings and brooches.



Fig 1. Ring brooch from Fuchsenhof hoard.

The ring brooch depicted in fig. 1 is one of the smallest but most elaborate specimens of a type, that occur in various sizes and stages of production. The basic shape was obtained by hammering, verified by examining the metal structure. After fixing the pin and adding other decorative elements, an inscription or ornament was chiselled or — as in this case — engraved with very fine tools. However, most of the grooves produced by either technique have a surprisingly rough appearance. At least in some cases, the roughness may have been to help fix the niello, which was presumably pressed into the groove in a semi-molten state. Traces of niello of this type have been determined by chemical analysis even on specimens where there were no visible remains. It seems to have contained mainly silver-sulphide together with a small amount of copper-sulphide.

Most of the thick, round wires in the hoard have clearly been hammered and/or drawn. However, it is not yet clear how the extremely fine and very regular round wires, such as that used to form the chain attached to the small ring brooch depicted here, were made. The surface of these wires is usually extremely smooth, but two fragments may shed light on the means of manufacture. In one case, fine, parallel scratches in a longitudinal direction suggest the use of a draw-plate. Alternatively, these marks could also have been produced by drawing a strip of metal repeatedly through a series of holes of successively smaller diameter, until it rolls up to form a hollow round wire with a very regular diameter ("strip-drawing"). Characteristic features of this method are longitudinal "seams" on the wire surface. These are often removed by smoothing or polishing, but can still be seen on wire from a second fragment of a chain.

Contact addresses:

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- Archaeology: Thomas Knhtreiber M.A., Osterr. Akademie d. Wissenschaften/Inst. f. Realienkunde des Mittelalters u.

d. fm-hen Neuzeit, K-mermarkt 13, A-3500 Krems, AUSTRIA. email: thomas.kuehtreiber@oeaw.ac.at

- Numismatics: Dr. Bernhard Prokisch, OÖ Landesmuseum, Tummelplatz 10, A-4010 Linz, AUSTRIA, email: b.prokisch@landesmuseum-linz.ac.at

The earliest alloy steel?

Microprobe analysis by **Chris Salter** at **Oxford University**, of a steel insert in a 12th to 13th century AD flint striker has provided unexpected results. The artefact, sampled during a pilot study of similar objects, of 11th to 15th century date, from the **Tanavoli Collection** of Persian iron at the **Ashmolean Museum** (Department of Eastern Art), proved have a significant chromium content. This averaged 1.2 wt%, together with 0.3 wt% nick-el and manganese. Its structure, as seen in section, consisted of large blocky cementite particles dispersed in a steely back-ground of much smaller, approximately rectangular, cementite particles in an optically irresolvable pearlitic matrix. The carbon content varied between 1.5 and 2 by wt%, which, taking into account the overall structure, indicated that the material was likely to be a crucible steel. In the larger cementite particles the chromium content was found to be as high as 3.2 wt%, with up to 0.2 wt% vanadium. It could be argued that this is the earliest alloy steel so far discovered, predating the work of Faraday and the Mushets by around 600 years! The initial metallographic study of the material from the collection has been published (Gilmour 2000) and shows some remarkable and unusual structures for ancient iron. However, the subsequent, more detailed analytical study carried out by the University of Oxford, Materials Science-Based Archaeology Group has shown that some of the initial interpretations will have to be revised, as many of the structures are more complex than first thought, with both cementite and graphite being present in a number of the microstructures. The latter was only revealed by the light element capability of the new microprobe in the Department of Materials, Oxford University After the work on the flint strikers has been completed, it is planned that this project will carry on with the examination of other groups of artefacts from the collection and possibly other comparable objects of Islamic steel. Ref: Gilmour B.J.J., 2000. Technological investigations of objects, in Allan J. and Gilmour BJJ, 2000. Persian Steel: The Tanavoli Collection. OUP, Oxford. pp 475-511.

A real sword in the stone in Tuscany

Since February 2001, Luigi **Garlaschelli** at the **Dipart. Chimica Organica, Pavia, Italy** has been directing a series of scientific investigations to shed light on the sword of St Galgano, an apparently genuine 12th century sword allegedly thrust into the rock when the saint abandoned his life of war and violence to become a hermit. It was known that the hilt of the blade had been broken off, then replaced in 1960. After drilling into the rock, it was found that the upper surface was a recent concrete capping, this was removed so that the broken hilt of this word could be released and about one inch of the embedded blade revealed, protruding from the stone.

Small rusty iron scales from the lower part of the blade were sent to archaeometrist Prof. Ramous at the Dept. Innovazione Meccanica e Gestionale, University of Padua for SEM analysis.

The samples were actually composed of magnetic iron oxide, not of metal iron; one of these samples was analysed by Atomic Absorption

Spectroscopy by Prof. Gallorini at the University of Padua, to look for trace elements. The results quoted are:

Cd ca 0.104 ppm
Cu ca 80.4 ppm
Ni ca 70.5 ppm
Pb ca 39.2 ppm



Fig 2 The sword of St Galgano, before investigation.

The samples are now being analysed by Neutron Activation Analysis at the Physics Dept. of the University of Pavia, and by ICP-MS techniques looking for other elements. Sampling of the surviving metallic portion of the blade will possibly be performed in the next months in co-operation with the Tuscany Archaeology Office. This will allow metallographic examination of the alloy may be performed. X-radiography will be used to look for inscriptions on the blade. Trace elements pattern will be compared with that of other Tuscan iron artefacts, with the aim of determining the provenance of the iron. Similar analysis was performed in 1999 on the sword of El Cid Campeador [3]. It is hoped that the database of Tuscan iron mines created at the Archaeology Dept at the University of Sienna [4] will provide useful comparative data. In another approach, ground penetrating radar analysis revealed that beneath the floor near the sword there is an artificial structure (2 m by 1m), possibly a burial recess.

[1] <http://flint.mater.unimib.it>

[2] Oakeshott, E. 1988, Records of the Medieval Sword - The Boydell Press

[3] Garcia Alonso J. I., Ruiz Encinar J., Martinez J. A. e Criado, A. J. Origin of El Cid's Sword revealed by ICP-MS metal analysis" Spectroscopy Europe, 11 (4), 1999, pp 10-14

[4] <http://www.archeo.unisi.it/archeologia-medievale/welcome.html>

New research into metallurgical activity in SW Bulgaria

George Ajdanlijsky, at the **University of Mining and Geology, Sofia, Bulgaria**, who is involved in the investigation of a potentially important metalworking site, would like to hear from any others interested in discussing or participating in the proposed project.

Initial investigations of the site at Koprivlen about 14 km from the Bulgarian-Greek frontier (the archaeological team is lead by Dr Anelia Bozkova from the Archaeological Institute in Sofia) have demonstrated the exceptional character of a settlement dating from the Late Bronze Age, through to the 11th century AD.

One possible explanation for the evident prosperity and active trade relations of the settlement of Koprivlen, especially in the 1st millennium BC, is the production of metals. The site has produced a considerable quantity of metal objects, and abundant and diverse types of slag. Modern geological surveys show Pb-Zn-Ag and Sb ore deposits in the vicinity and the research team's pilot geological studies point to the existence of Fe and Au nearby, which could have provided the potential for mining and metal extraction activities.

Initial work has also been carried out on ceramics from the site, with mineralogical studies having been used to compare them to local clay deposits, differentiating local products from imported wares, and also to try to establish the possible firing technology. Slags have been subjected to semi-quantitative and quantitative chemical analyses and microscopic examination. A start has been made on gathering information about the type, metal content and scale of known ore deposits in the area. A furnace site has been identified and awaits excavation.

The study of ancient metallurgy at Koprivlen will be fully integrated with the general archaeological investigation of the site. The study aims to determine:

- The scale and range of metalworking on the site;
- The methods and technological capability of the ancient metal-workers ;
- The organisation of production and distribution, together with any socio-economic inferences about the activities.

It is intended that the project will provide a base for further studies of ancient mining and metallurgy in the whole Middle Nestos area. To achieve this, a comprehensive programme of visual recording, chemical analysis and microscopic examination will be carried out on the many materials associated with metal extraction and working found on the site, as well as metalliferous geological samples from the region. For those willing to offer advice or interested in participating in the project, these are the E-mail addresses of Ajdamijsky and Bozkova: George Krastev Ajdanlijsky email: ajdansky@staff.mgu.bg, ajdansky@yahoo.com
Anelia Bozkova email: aim-bas@techno-link.com

Pre-Hispanic metallurgy in Argentina

Carlos Angiorama at the **Universidad Nacional de Tucumán** has written to report on research into the metallurgy of the Quebrada de Humahuaca, located in Jujuy in north-west Argentina. This is an area where metallurgy reached a remarkable level of development during pre-Hispanic times (900-1535AD), both in the quality and quantity of objects made. The range of metals and alloys worked includes copper, bronze, silver, gold and electrum (an alloy of gold and silver). Until recently little was known about the organisation of the production, distribution and use of these goods. To remedy this, three years ago a research project was started which combined archaeological, metallurgical, ethnographical and geological investigation.

The results of the research show the existence of a very complex production process, with people who organised and controlled directly and indirectly the supply of metalliferous minerals, metallurgical production and the distribution of finished artefacts.

The researchers concluded that different groups (from Puna and Quebrada de Humahuaca) would have participated in a unique production process, with different stages of production being carried out in different locations. The largest settlements during this period included casting workshops, where metallic objects for consumption beyond the needs of the local community were manufactured, to be traded.

For any further information, please contact: Carlos I. Angiorama. Instituto de Arqueología y Museo, Universidad Nacional de Tucumán. Casilla de Correo 8. Yerba Buena. Tucumán. Argentina, email: horcomolle@yahoo.com.ar

Geevor Mine and Museum, Pendeen, West Cornwall

The following message, which originally appeared on the britarch mail list, is re-printed for the interest of Newsletter readers.

A new organisation has taken over the management of Geevor Mine and Museum in Pendeen, West Cornwall from today. **Pendeen Community Heritage (PCH)** has been granted the management of the site by Cornwall County Council. The trustees of PCH are people from the locality who are passionately concerned with the future of the mine site and are seeking to increase the number of visitors to the site and hence the area. The chairman of the trustees, **Bill Lakin**, is a mining historian.

PCH itself was born in February 2001, so it has been some task to get an organisation up and running in that time. Importantly, all current employees on the site have been retained and the plan is to increase employment as resources permit.

Geevor closed as a working mine in 1990. The site has been left with all the equipment of mining and is a superb resource. Considerable effort is being expended in making this worthy of the area's hoped for World Heritage Site status. Plans include the greater realisation of the educational and research potential of the site and includes interpretation of the archaeological and industrial archaeological artefacts.

A website has been built, <http://www.geevor.com> and is under continual development. There is a great potential for contribution of knowledge to the effort so assistance from any speciality will be welcomed.

Iron metallurgy in the Sudan

Sudanese iron metallurgy is generally equated to Meroitic iron metallurgy, as for many centuries, Meroe has dominated research and discussion of iron smelting in NE Africa. There is evidence, however, for more diverse and complex iron metallurgy in the Sudan. Recently, evidence reported by a colleague from the University of Berlin indicates that there are a number of furnace installations very similar to those that Gill Juleff discovered some years ago in Sri Lanka. The Sudanese furnaces are reportedly of an open-fronted, elongated layout, and positioned just under the brow of hills facing the local winds. Although there has been no investigation of the remains yet, it appears from local place name tradition that these furnaces were used for iron smelting.

This report contributes to the increasing number of wind-powered furnaces identified now from wide areas in the Near East, such as the early copper furnaces in Feinan/Jordan and the Wadi Dara in Egypt. It would be interesting to learn whether these furnaces in the Sudan now form part of a link, both geo-graphically and chronologically, between the otherwise unconnected occurrences of wind-powered furnaces in the Levant and Sri Lanka.

Thilo Rehren, Institute of Archaeology, London

Excavation of an historic leadmill, Sheffield

This summer, archaeologists led by **Andy Lines** of **Sheffield University's Archaeological Research Consultancy (ARCUS)**, investigated this important industrial site. No white lead works survive above the ground in Britain and few have been recorded archaeologically. The work was carried out in advance of site development by Downing Developments, as part of the conditions for planning consent imposed by the City Council. The Sheffield Leadmill was built in 1759 and produced pigments for paint and pottery glazes. By 1865 the mill had expanded to carry out lead refining, white lead production, red lead production, paint grinding and cooperage. The site also contained the Marriott Wheel, a scissor-grinding workshop, which operated from 1732 until the 1780s. Both operations were powered by water from the rivers Porter and Sheaf. Records exist for a waterwheel that was 17ft 7in in diameter and 6ft 6in wide. Remains of the buildings associated with the Leadmill were badly damaged by building work in the twentieth century. A tram depot was constructed from 1910, and in the 1930s large underground oil and diesel tanks were constructed to service the Council bus depot.

Due to Health & Safety law the archaeologists had to wear protective clothing and submit to blood tests during the investigation. The excavation uncovered part of a long, twisting flue, choked with soot, which was probably part of the lead refining process. A deep, stone-lined pit was also unearthed. Notches in the stonework on the sides of the pit indicated the likely position of a wooden 'shuttle'. This will have been used to regulate the flow of water in and out of the feature from the go it. Finds include large ceramic pots containing a white residue which is suspected to be lead carbonate or white lead, clay pipes, pottery and glass.

At the time of writing, another ARCUS team, headed by **Richard O'Neill** is completing work on the site of Thomas Turner & Sons Suffolk Works which includes remains from the nineteenth century cutlery industry. It is hoped to obtain details of this for the Spring edition of the newsletter.

Tin isotopes in archaeometallurgy

Robin Clayton at **Birkbeck College**, London, who received funds from the **Coghlan Bequest** earlier this year, has provided an update his ongoing research into the use of tin isotopes in archaeology. The funds were used for a visit to the Archaeometallurgy Laboratories (TU Bergakademie, Freiberg) in summer 2001 with the objective of setting up ion exchange and mass spectrometry protocols for the measurement of tin isotopes using a VG Axiom multicollector ICPMS (inductively coupled plasma mass spectrometer). Subsistence and

laboratory costs during the visit were provided by Professor E. Pemicka. Although the visit was beset by instrumental failure that seriously affected the analytical side of the work, considerable progress in understanding the behaviour of tin on various ion exchange media was made.

The involvement in tin isotope research using multicollector ICPMS began in RLAHA (Research Laboratory for Archaeology and the History of Art, Oxford) under a Leverhuime grant held by N.H. Gale and Z.A. Stos-Gale, the results of which (using a VG Plasma 54 instrument) are currently in press(1). Since then, financial support by C. Gillis (Crafoord, Royal Swedish Academy of Sciences, Lund University, Sweden) has made possible the development of a method for tin isotope measurement using the Micromass IsoProbe multicollector ICPMS at the Swedish Museum of Natural History. Most recently, the Axiom (successor to the Plasma 54) has been used at TU Bergakademie, Freiberg. The researchers are now in position to increase the number of tin isotope measurements but have yet to complete the experiments on ion exchange.

What is the potential application for tin isotopes in archaeology, and how large might be the isotopic differences? The most obvious application is the provenance of tin artefacts, and in particular, the outstanding problem of the source for Bronze Age tin. Tin has 10 stable isotopes which cover a mass range of 112-124, more than any other element. Mass dependant isotopic fractionation in this mass range may yet yield insight into geo-chemical or anthropological processes, including provenance. Although the isotopic composition of tin is generally believed to vary only slightly in nature, the extent of isotopic fractionation in natural and anthropogenic processes is still largely unknown. High precision isotopic analysis of tin is attainable using multi-collector ICPMS, and the possibility that isotopic fractionation might now be routinely measurable prompted the most recent investigations. Amongst these, the Leverhulme funded work included measurements of four samples of cassiterite from various locations and three tin ingots from Israel, that have shown isotopic fractionation up to 0.13‰/amu (cassiterite, Malaysia) (1).

In previous studies, isotopic fractionation by non-equilibrium evaporation of up to 0.4‰/amu at 10% SnO loss were predicted(2) but could not be detected in recycled (remelted) bronzes from the archaeological record (3). This prediction was also tested empirically by measurements of experimental charges in which tin was evaporated from bronze artefacts (4, 5). Both studies failed to show the predicted fractionation. Instead, a much smaller systematic fractionation of 0.082‰/amu was measured using a double spike TIMS (thermal ionisation mass spectrometry) method (5) and a non-systematic effect was measured using multicollector ICPMS (4). Fractionation by metallurgical processes or isotopic differences in the raw materials used to make tin objects are also suggested by the occurrence of isotopically light tin in four Mediterranean objects and isotopically heavy tin in five objects from central Europe(5). Anthropogenic effects might be due to kinetic fractionation but it is uncertain what the relative roles are for equilibrium and kinetic fractionation in nature and which may impart the greatest influence.

To date researchers have a workable mass spectrometric protocol for two different instruments, measured isotopic fractionation up to 0.13e/amu, but only a few isotopic results test the validity of using tin isotopes to provenance objects to ores. Also, little is known about the mechanisms of tin isotope fractionation and what drives them. More isotopic measurements including cassiterite and tin sulphides from different geological environments as well as studies of archaeological objects are required. The effect of anthropological disturbances of tin isotopic composition, using experimental systems needs further investigation. This work is continuing under funding from Crafoord.

- (1) Gale et al. (2001) In: Bartelheim et al (eds) *The Beginnings of Metallurgy in the Old World*, Freiburger Forschungshefte, Reihe D, in press.
- (2) Budd et al. (1995) *Israel J Arch.*, 35, 125-130.
- (3) Gale (1997) *Archaeometry*, 39, 71-82.
- (4) Yi et al. (1999) In: Hauptmann et al. (eds) *The Beginnings of Metallurgy*, *Der Anschnitt Beiheft*, 9, 211-216.
- (5) Begemann et al. (1999) In: Hauptmann et al. (eds) *The Beginnings of Metallurgy*, *Der Anschnitt Beiheft*, 9, 277-284.

**Any contributions to next issue by 23rd February to:
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A History of the Wide Strip Mill in Europe

Manchester 27-28 of April 2001.

The Conference was organised by Ruggero Ranieri, University of Manchester, Department of History and member of the Council of HMS and Jonathan Aylen, UMIST, centre for Manufacture. The aim of the conference was to put on record the development of the wide strip mill in Europe, from an historical and technological perspective. Continuous steel coil production was a technology that unlocked growth in a range of user industries. Construction of a strip mill and its associated cold strip and finishing units were the key to a wide range of downstream consumer industries. In particular, construction of wide strip mills in Western Europe after WW2, encouraged by the Marshall Plan, fostered the growth of car and consumer durable industries of the 1950's and 1960's.

Contributors came from all over Europe, including the UK, France, Italy and The Netherlands. The Conference attracted a mixture of academics, senior steel executives, retired metallurgists, consultants, engineers and bankers. There were 14 papers followed by discussion sessions, a show of historic films together with a display of archive material.

Among the key papers were two papers on French wide strip mills by Eric Godelier (University of Poitiers) and Jacques Leclerc (Fonner Metallurgical Vice-President, Usinor). The Italian strip mills were covered by Luciano Freeza (Italsider, Geneva) and Giuseppe Cerritelli (Steel consulting, Temi). Collaboration between Corus and the University of Utrecht resulted in the paper *Breedband: the wide strip mill that changed Hoogoven's destination*, by Dr. Joost Dankers and prof. Rob Boom. A notable contribution came from Dr. Manfred Rasch, Thyssen Archive, who discussed the first

German strip mill, installed in 1936 at Dinslaken AG, by Vereinigte Stahlwerke. Our own president Dr. Geoff Lucas, covered the development of roll technology for wide strip mills. There were also papers on Ebbw Vale and on the first Soviet wide strip mills as well as on a range of technical topics. The importance of strip for automobiles was covered by Peter Wells (Cardiff Business School). Proceedings of the Conference will be published in early 2003 by Merton Prior Press.

Ruggero Ranieri
Further details with R.Ranieri@man.ac.uk.

WEALDEN IRON RESEARCH GROUP

In the latest volume of the Group's annual Bulletin, *Wealden Iron* (2nd series, 21, 2001), there is an article on the Office of Ordnance's *Debenture Books*. Those dating intermittently from 1593 to 1610 are among the earliest records of that department, which deal with the Wealden iron industry. By contrast, among the last were the dealings over the casting of some iron mortars for Gibraltar in the early 1770s, which are the subject of another article. A survival of these pieces of ordnance stands in a churchyard in Portsmouth.

The involvement of Wealden ironmasters in other parts of the country began early, but the hitherto unknown occupancy of several furnaces and forges in the Midlands is the subject of an article. The Middleton family had been involved in several iron-works in Sussex, but one of the family, in company with partners, acquired the twelve works of Thomas Parkes, and ran them for a few years, though ultimately unsuccessfully. Early newspapers have often been found to be a source of interesting detail in local studies, and no less so in connection with iron making. A small collection of such notices from the *Sussex Weekly Advertiser* of the 1750s and 60s, recently rediscovered, includes the wholesale of iron from local fineries. Among the archaeological notes are records of several recently discovered Iron Age and Roman sites in Kent and East Sussex, together with undated sites in Surrey and West Sussex. There is the account of a foray to the Romano-British site at Oaklands, Sedlescombe, and of a watching brief during public utility excavation at Mill Place furnace, near East Grinstead, which was active in the late 16th and early 17th centuries.

Jeremy Hodgkinson

Historical copper mining and its impact on the environment of the Keeweenaw Peninsula, Upper Michigan, U.S.A.

T.M. Mighall D.B. Landon

The Keeweenaw Peninsula, a region just to the south of Lake Superior in Upper Michigan, was a centre for copper mining from around the 1840s up until the 1930s. However, according to Young Jr (1984) despite the fact that 'it is quite possible that the Keeweenaw was in the long run the most profitable of any American nonferrous mining district' it has received little historical or academic attention until recently; 'perhaps the

reason for its lack of fame outside Michigan itself is that its annals, like those of happy peoples, are relatively dull! Because the region was so profitable it is not surprising that it provides one of the richest sources of archaeological and historical evidence of mining practices in the USA. It has now become a major research area for a team of archaeologists based at Michigan Technological University and Ottawa National Park.

A principal focus of this research has been to reconstruct the mining process through archaeological excavation and historical data sources of a mine and stamp mill known locally as the Ohio Rock Trap mine. The Ohio Rock Trap mine is located in the Ottawa National Forest, Ontonagon County. The mine is situated on top of a rock mass known as the Norwich Bluff characterised by basaltic, Precambrian bedrock. The bluff forms part of the West branch of the Ontonagon river catchment. This area is part of a zone of mineralised bedrock that extends across the Keweenaw Peninsula located on the southern shores of Lake Superior. The discovery of copper deposits in the 1830s stimulated a copper rush and the region became a key worldwide supplier of copper. Mining on top of the Norwich Bluff began in earnest in 1847, by the Ohio Rock Trap Company until mining was suspended in 1858, although other companies continued to work the area. Thus, the chosen study site is at the heart of the nineteenth century mining zone. Interestingly the excavation has revealed technology imported by Cornish miners.

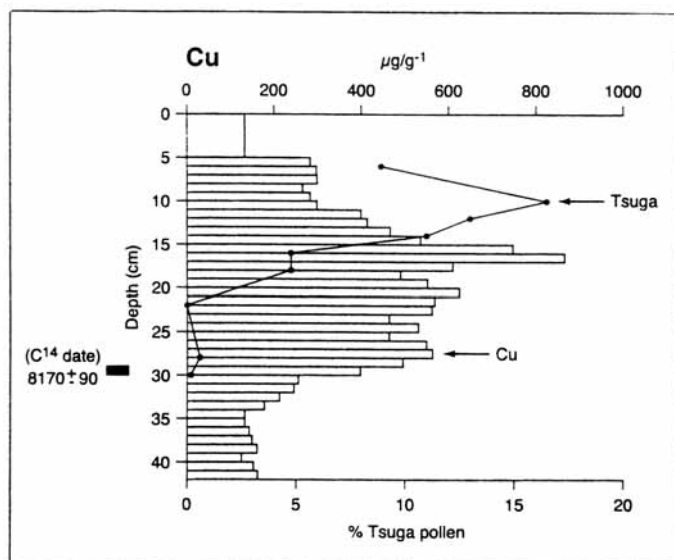
assumed that this copper peak was defining the period of copper mining so we proceeded to obtain a radiocarbon date for the sedimentary sequence. To our amazement a sample taken from the base of the sediment core (38–44cm) was dated to 8930±100 years BP. The 42cm of sediment had taken virtually the whole of the Holocene to collect in the pond! Pollen analysis and a second radiocarbon date verified the chronology. The profile for *Tsuga* (Hemlock) pollen shows it to much higher values at 18cm. *Tsuga* is known to have spread across this part of N.E. America about between 4000 and 3000 years ago and a second radiocarbon date of 8170±90 years BP at 29–30cm dates the rise in copper. It appears likely that the copper has been translocated down the sediment and any impact of mining on local vegetation would be recorded in the uppermost section of the core. Because the sediment accumulation rate in the pond is extremely slow we are now undertaking fine resolution pollen analysis on contiguous 2mm thick samples in order to examine the impact the copper mining and processing at the Ohio Rock Trap mine had on local forest.

T.M. Mighall

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D.B. Landon

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With the help of funding from the HMS, an investigation of the environmental impact of the mine and stamp mill was initiated in 1966. Sediment cores from a local pond and a valley bog further afield were taken in order to reconstruct the vegetational history of the area surrounding mine and stamp mill and the pollution history of copper mining. The results from the small pond close to the stamp mill have proved to be anything but dull! The figure shows some of the results. Most noticeable is the profile of copper which reveals a cluster of high concentrations between 30 and 15cm. At first, we

Charcoal Pits in County Durham

Recent evaluation of medieval and prehistoric settlement sites in Upper Teesdale for the English Heritage Monuments Protection Programme has drawn attention to the existence of a large number of charcoal pits in association with bloomery sites. Both the pits and the bloomeries were first recognised by Dennis Coggins and Ken Fairless. The pits occur in an area which is particularly rich in bloomery sites, but many appear to be spread more widely across the landscape, and probably reflect the distribution of medieval woodland.

The pits are visible as slight hollows about 2m in diameter and up to 0.4m deep. There is often a slight ring of spoil visible around them. They are identifiable as charcoal pits because of the charcoal-rich soil brought up by animal disturbance. I am informed by Peter Crew that these are the first charcoal pits to be found in the UK, although they are well known in association with bloomery sites in Scandinavia. At the time of writing more than 30 pits have been identified.

Dr Tom Gledhill

1 Hylton Terrace, Rookhope, Co. Durham DL13 2BB

News of Cornish Mines

South Crofty was mentioned in HMSNews 46. Now Michael Kirby, former managing director of R.E. & C Marshall and Marshall Metalworkers Cheltenham writes from Cornwall to say that Baseresult have recently received planning permission to re-open South Crofty. There was some

opposition from local people who “didn’t want nasty dirty Tin Mining in Cornwall now”. He also enclosed cuttings from *The West Briton*.

It appears that mining could restart, possibly before the end of the year, as the mine has been declared unabandoned by the Inspectorate of Mines. Work will centre around the Tuckingmill decline which is to be the primary access to the lode-bearing ore. On September 24th a group of staff, ex-employees and supporters walked down the 1:6 gradient of the decline. Inside, despite electric fans the air was musty and the ground slippery. One hundred metres inside the man-made arches gave way to solid granite and after some 200 metres the way was blocked by a stagnant pool of ochrous water. Some 60 metres below ground Mr Kevin Williams, Baseresults managing director said, “This is the beginning of an exciting time for us. Work will begin shortly on extending this decline by 1.2 km, having first commenced pumping out the mine. The decline will then reach the Cook’s Shaft at the 195-fathom level, where we will commence mining for tin”.

At the same time there was trouble at Wheal Jane when sludge from the mine water treatment plant discharged into the River Camon. This is being investigated by the Environment Agency. Around two and a half kilometres of the river has been discoloured orange and red following the failure at the plant. The plant treats the contaminated water from the former Wheal Jane tin mine, settling out the heavy metals and clarify-ing the water before the sludge is removed. The water is then released back into the Camon River.

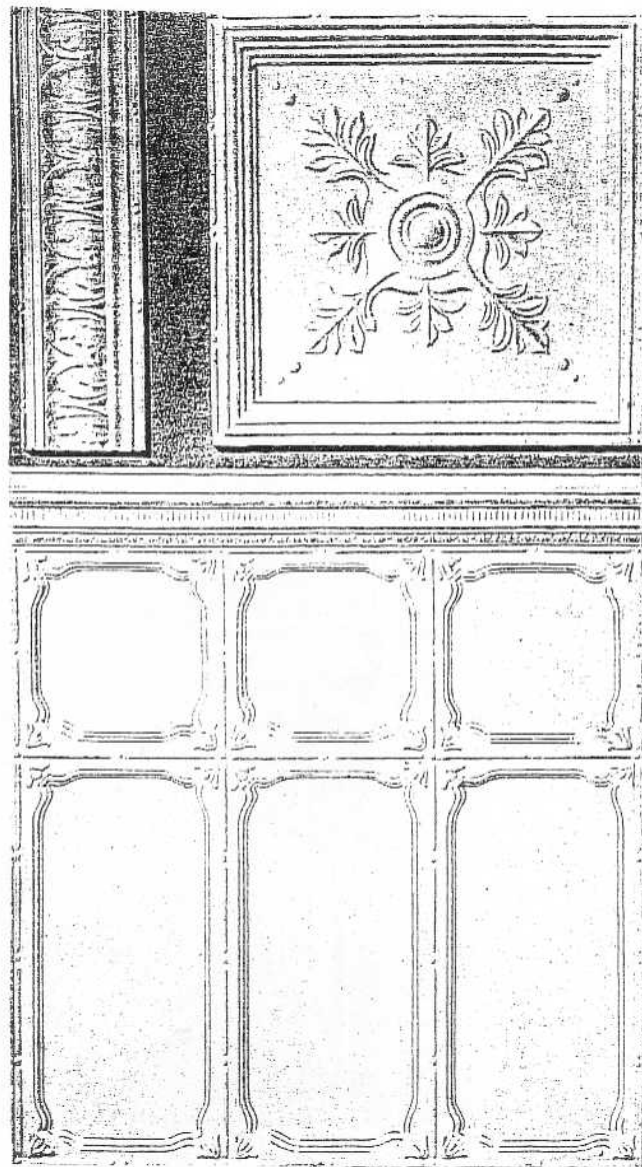
Editor

Research into Embossed Metal Mouldings, Ceilings, Panels, etc.

I am currently researching the application of Embossed Metal Mouldings, Ceilings, Panels, etc and would be both pleased and grateful for any assistance that you or your colleagues might be able to give me in this respect.

The Embossed Metal Mouldings, etc. were manufactured from steel processed through the tinsplate works, but not actually coated with tin. This metal is called Blackplate and has all the same processed qualities of tinsplate except that of a final tin surface —viz. it was rolled, pickled and annealed as it was going to be tin plated for walls and ceilings. Paint or varnish being applied once the metal was in its installed position.

Examples of Embossed Metal exist in this country in the Swansea Industrial and Maritime Museum and in the Curzon Cinema, Clevedon. I also understand from my fellow Curator at Swansea’s Industrial and Maritime Museum, Michael Lewis, that there is a row of houses somewhere in London that were built



Examples of stamped Welsh Plate from a catalogue

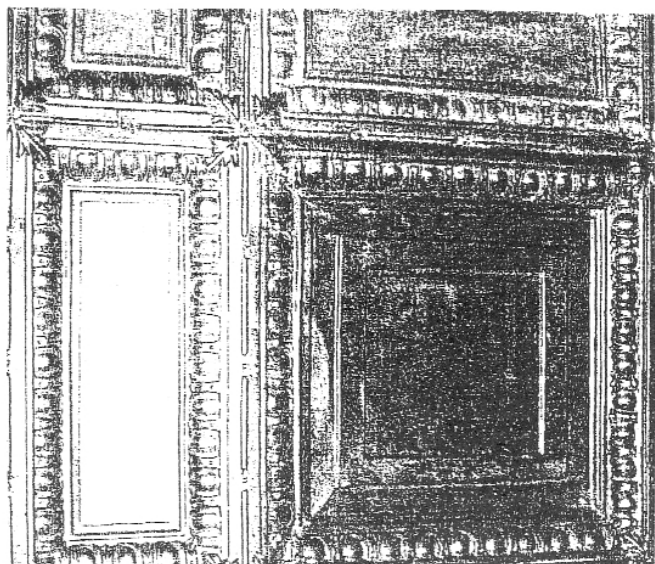
in the 1920s where the mouldings are still extant. Additionally, Michael has advised me of a conversation that he had with a visitor from Canada on this subject matter. This visitor quoted that embossed metal was a popular choice for the decorative work onboard passenger ships (saloons and restaurants) and he had seen many examples of such ships being bro-ken up on Vancouver Island.

“Orncastle” Embossed Metal Ceilings, etc. were manufactured by The Grovesend Steel and TinsplateCo.Ltd., of Gorseinion Swansea. The ceiling at the Swansea Industrial & Maritime Museum was produced by the same company. Comparing the Swansea example with the photographs and video

that I have of the Curzin Cinema, I am convinced that the same Embossed Metal was also used at this later location. I am making arrangements to visit Clevedon in the very near future to establish this once and for all.

I should appreciate any information that any member could give me on the application of Embossed Metalwork for use as an interior decoration, or the whereabouts of any company brochures, trade directories or copies of advertisements, etc. on Embossed Metal

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Coffered ceiling with borders in embossed metal

REVIEW

Hand rolling of Steel — the Video

Red hot metal snaking across the mill floor to be grabbed and fed back into the rollers is no longer considered a safe procedure by today's Health and Safety Executive. We must thus thank IA Recordings and the late Keith Gale for recording the last days of operation of the John Bradley sections mill in the English West Midlands — the so called 'Blackcountry', the name derived from its long past days of smoke and smog when this region was the birthplace of the Industrial Revolution. John Bradley was established in 1798 at Stourbridge as a forge and engineering works, one of its major products being fish-bellied rail for Britain's first passenger railway, and it even built locomotives. The company survived until 1982 as re-roller, the last of 300 hand mills in the district.

This short video records the full operations from cropping cold billet to length, reheating it and rolling it in a 1927 vintage cross country mill, still driven by its original 350HP GEC electric motor. The commentary, prepared and narrated by the late Keith Gale — a former regular contributor to Steel Times — describes and shows the complete process in detail starting from cutting the 2" square (50mm) billet to 3'6" length (~1m) lengths weighing 501b (22.7kg) for "ease" of handling, through charging these to the reheat furnace — a concession to the workforce being its modernisation from coal firing to oil and mechanical charging rather than muscle power. Hot billet at 1200°C is then extracted and fed manually using tongs through the first mill pass. The millman on the far side catches the part rolled section and feeds it back through the next groove over the middle roll of the three high stand to be caught again and fed back under the roll in the third groove, and so on. Nine passes are typically required, the number always being odd to eventually deliver the section into the cooling bed. Ends are cropped — with the commentary emphasising that these go back to the steelmaker for recycling — the sections cold straightened and cut to length ready for shipping. My only regret regarding this excellent recording and commentary is that it is all too brief, lasting just 12 minutes. 'Hand Rolling of Steel — The last Black Country hand steel rolling mill' Video available in VHS PAL* or NTSC format price £9.95 IA Recordings, PO Box 476, Telford, Shropshire, TF7 4RB, UK www.iarecordtngs.org e-mail imb@iarecordings.org [Footnote]

*The tape is recorded in the UK standard PAL 1 format. It can be played on any PAL recorder but to hear the commentary it may be necessary to make a direct audio link with cable rather than the RF (Aerial) connection.

Tim Smith

APPLICATIONS FOR GRANTS INVITED.

Applications are invited to the R.F. Tylecote Travel Fund and the Coghlan Fund.

Application forms may be obtained from Michael Cowell, Hon. Treasurer, Little Gables, 17a Thomcote Road, Northill, Beds SG18 9AQ. **Forms should be submitted by February 12th 2002.** E-mail mcowell@britishmuseum.ac.uk. Forms are also on the HMS web site. Please note the Web site for HMS has been changed and is now hist-met.org.

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.