Abstracts

GENERAL

M Haustein, G Roewer, M R Krbetschek and E Pemicka. Dating archaeometallurgical slags using thermoluminescence. *Archaeometry*, 2003, **45**(3), 512–30.

Thermoluminescence has a great potential for dating archaeometallurgical slags because the smelting process leads to a well-defined resetting of the 'luminescence clock'. However, the complex compositions of slags have unpleasant consequences for TL measurements if the bulk slag substance is used. To overcome this problem, quartz has been separated out of slag matrices by chemical and physical procedures. The TL measurements were carried out on this defined mineral phase. This method was tested with seven slag samples from different locations and ages. In most cases, the TL ages determined show good agreement with reference data. Authors

R J H Wanhill. Brittle archaeological silver: a fracture mechanisms and mechanics assessment. *Archaeometry*, 2003, **45**(4), 625–36.

Some archaeological silver objects are found to be brittle as a consequence of long-term corrosion and microstructural changes. The types and mechanisms of embrittlement are defined and explained. The severity of embrittlement is increased by larger grain size and by synergistic action of corrosion-induced and microstructurally-induced embrittlement. Micromechanical models of fracture that incorporate the grain size provide an insight into these effects and help to explain why severely embrittled objects are frangible or even friable. Author

BRITAIN AND IRELAND

R Abdy. A Roman coin hoard from Longhorsley. *Archaeologia Aeliana*, 2003, **32**, 189–91.

Description of sixty-one *sestertii* and nine *dupondii/asses* found with the aid of metal detectors on cultivated land. The coins date from the first and second centuries AD, and were accompanied by evidence of metalworking, the metallurgy of which implied that the coins may have been intended for recycling. The find is compared with other similar hoards from Roman Britain. BIAB (adapted)

R Bailey (ed) The Roman fort at Newcastle upon Tyne. *Archaeol Aeliana*, 2002, **31**, 308pp

The catalogue of coins recovered from the site includes, 'Appendix 1. EXDRF analyses' by **R J Brickstock** and **D B Dungworth** (183–5), with analyses confirmed the status of five counterfeit coins. BIAB (adapted)

N Cooke. Excavations on a late medieval ironworking site at London Road, Crawley, West Sussex, 1997. *Sussex Archaeological Collections*, 2001, **139**, 147–67.

Excavations revealed substantial deposits of smelting and forging slag, several ironworking hearths and associated clay floors. A variety of ironworking processes was suggested by the evidence, including ore roasting, smelting and forging/smithing. The remains of a structure, probably a smithy, was of particular interest. Archaeomagnetic dating indicates that the main period of ironworking was during the late 14th and early 15th centuries, which is broadly supported by the pottery recovered. Author(modified)

G Clay, G McDonnell *et al.* The iron makers of Myers Wood. A medieval enterprise in Kirkburton, Huddersfield: an archaeological summary. *Huddersfield and District Archaeology Society*, 2004, 33pp.

A summary describing the discovery of the site, its topography and geology, geophysical survey, excavation, finds and dating (mainly 13th century AD). JB

F Hammer. Industry in north-west Roman Southwark: excavations 1984–8. Museum of London, MoLAS Monograph 17, 2003, 186pp.

The volume presents evidence from three excavated sites for craft production, mainly ferrous and non-ferrous metalworking. A series of workshops, dating from the later 1st to mid 4th centuries AD, were identified which contained many hearths. There was considerable evidence for iron smithing as well as some evidence for working copper alloys. There is also a discussion of the work of metalsmiths in the ancient world and sections on metalworking techniques and replication experiments. JB

J McKinley The Early Saxon cemetery at Park Lane, Croydon. *Surrey Archaeological Collections*, 2003, **90**, 1–116.

Report on the excavation in 1999 and 2000 of a cemetery from which material had previously been removed during the late 19th century. All or parts of 46 Saxon inhumations and two cremations were recovered. A high proportion (72%) of graves contained finds which indicated a predominantly sixth-century

date. Reports include: 'Weaponry and associated material' by P Hill and L Thompson (60–75) description and discussion of four swords, one seax, 12 spearheads and 11 shield bosses with associated fittings; 'Metallurgical analysis of the swords' by B Gilmour (97–100) their pattern-welded structure and original appearance are discussed; 'White metal analysis' by P Northover (100) analysis and discussion of two copper-alloy brooches, one with a tinned surface and one with plating. Author (modified)

C Morris. Under Blorenge Mountain: Blaenavon Industrial Landscape World Heritage Site. Tanner's Yard Press, 2003, 72 pp

Blaenavon is a relic of the Industrial Revolution. The 33 square kilometres of its landscape is explored with many colour photos of buildings, structures and debris of this late 18th and 19th century iron-making centre. JB

J Pine. The excavation of a Late Iron Age/Roman settlement and iron production site at Whitehall Brick and Tile Works, Arborfield Garrison, Berkshire. *Berkshire Archaeol J, 1998–2003* , 2003, **76**, 37–67.

Excavation revealed evidence to suggest continuous occupation from the late Iron Age through to the mid-third century AD. The evidence, mainly pottery, suggests a low status farmstead but the large quantity of iron slag found on the site suggests that iron smelting was also taking place. There was also some evidence of pottery manufacture. BIAB

K Robbins. Metalworking debris. In C Evans, Power and island communities: excavations at the Wardy Hill Ringwork, Coveney, Ely. Dereham: Cambridge Archaeological Unit, *East Anglian Archaeology*, 2003, **103**, 145.

Analysis of 145 fragments recovered from the site which indicates blacksmithing and other small-scale metalworking . BIAB

B Roberts and B Ottaway. The use and significance of socketed axes during the Late Bronze Age. *European J Archaeology*, 2003, **6**(2), 119–40.

The article explores the potential and problems of use-wear analysis in archaeometallurgy through the investigation of socketed axes in eastern Yorkshire and south-east Scotland during the Late Bronze Age. Experimental work on modern replicas of the axes was compared with wear traces on prehistoric socketed axes. The results indicate that prehistoric socketed axes had been used as multi-purpose tools, but that the nature and extent of their uses before deposition varied considerably. By combining use-wear analysis with contextual information on socketed axes, ideas concerning their significance can be explored. BIAB

G Taylor *et al.* An Early to Middle Saxon settlement at Quarrington, Lincolnshire. *Antiquaries Journal*, 2003, **83**, 231–80.

Excavations revealed part of an Early and Middle Saxon settlement with associated fields or enclosures. Several timber buildings were identified. Early Saxon finds include 11 fragments of clay piece moulds and two crucible fragments from pits near a post-built structure that may have been a metalworker's hut. XRF analysis of the finds failed to identify the metal being worked. Just over 2kg of iron smelting and smithing slags of atypical forms were also found; they came from both Early and Middle Saxon contexts. JB

T Umpleby. Water mills and furnaces on the Yorkshire Dearne and its tributaries. Wakefield: Wakefield Historical Publications, 2000, 260pp.

A survey and catalogue of former water-powered sites, including locations; historical periods of operation; industrial uses; and current topographical evidence. The author looks at the historical perspective, including the influence of the monasteries; corn mills; including sites associated with different aspects of iron smelting and processing. BIAB (modified)

A White. Two Bronze Age axes by the same founder? *Trans Cumberland Westmorland Antiquarian and Archaeological Soc*, 2003, **3**(Third Ser), 215–17.

Description of two Early Bronze Age axes found in 2002 and 1999, about ten to twelve miles apart, which bear remarkable similarities to each other. BIAB

EUROPE

M S Balmuth and R H Tykot. Recipes for Sardinian Bronzes. *Journal of Roman Archaeology* Supp Ser, 2002, **39**(2), 19–26.

The chronology of bronze figurines of the Nuragic culture is problematic. They are found in burials and shrines, and depict warriors, women, animals, boats,etc. The results of elemental analyses of figurines in Sardinian and American museums is discussed in the light of the alloy composition of an increasing corpus of analysed Sardinian figurines. Indigenous production is now attested by lead isotope analyses matching Nuragic objects to Sardinian copper ores, and the excavation of a Nuragic metal workshop where fragments of the clay moulds used to cast the bronzetti by the lost-wax process have been found. This metallurgical production is discussed in the context of other evidence for Nuragic economic organization, and contrasted with contemporary Mediterranean metalworking practices. Authors (adapted)

A Giumlia-Mair and F Lo Schiavo (eds). The problem of early tin. Archaeopress (BAR S1199), 2003, 170pp.

The 16 papers were presented at the 14th UISPP meeting in Liège in 2001 and are printed in both French and English. They deal with geology and sedimentology; archaeometallurgy in Europe; archaeometallurgy on Cyprus, Sardinia and Sicily; metrology and metal trade. JB

J K Harrison. Ayresome Ironworks, Middlesborough, and Klenshyttan Ironworks, Sweden; evidence of the divergent careers of the brothers John and Samuel Gjers. *Cleveland Industrial Archaeologist*, 2003, **28**, 43–54.

John Gjers was born and educated in Gothenburg in Sweden and made a highly successful career in the Cleveland iron industry as an engineer and then as an ironmaster. He was most famous for Ayresome Ironworks, which was demolished in 1966. His half-brother, Samuel, remained in Sweden and also built a successful career as a partner in the Qvist and Gjers engineering works at Arboga. The Klenshyttan Ironworks, which still survives, was designed by Qvist and Gjers. A comparison between the two ironworks is presented, with comments on the contrast between more or less contemporary blast furnace practice in Cleveland and the Bergslagen district in Sweden.

Author (adapted)

L Orengo. Forges et forgerons dans les habitats latèniens de la Grande Limagne d'Auvergne [Forges and smiths in the La Tène settlements of the Grande Limagne in Auvergne]. Monique Mergoil: Monographie Instrumentum 26, 2003, 325pp.

Based on the author's thesis, the text focuses on four sites, discussing evidence for industrial activities, the nature of the objects manufactured, the place of the smith in Iron Age society and the deposition of iron objects from 8th–1st centuries BC

JB

M Mangin (ed). Le fer. Collection Archèologiques, Errance, 2004, 239pp.

This French text provides a detailed study of iron from the 2nd century BC to the medieval period, drawing on evidence from across France. There are sections on the nature of iron and its mineral composition, the production of tools and weapons, evidence for mining and metal production, and its role in past societies. Technical details are given in boxed sections and a glossary is provided. JB

L C Norbach (ed). Prehistoric and medieval direct iron smelting in Scandinavia and Europe: aspects of technology and science. Aarhus UP, 2003, 335pp.

The majority of the 35 papers deal with Scandinavia. They discuss particular types of iron production and settlement, regional studies, metallurgical investigations of artefacts and sites, geophysical prospection and magnetic dating. JB

B Nouyon, G Depeyrot and J-L Desnier. Systèmes et technologie des monnaies de bronze (4e av JC—3e ap JC). *Collection Moneta* , 2000, **19**, 208pp.

A detailed discussion of the techniques, alloys and technologies of producing coins under the Ptolemies is followed by an analysis of coins from Gaul, Italy, Sardinia, Sicily, Thrace, Crete, Asia, Syria, Egypt and central Africa, Armenia and Parthia. JB

E Paparazzo. Organic substances at metal surfaces: archaeological evidence and the Elder Pliny's account *Archaeometry*, 2003, **45**(4), 615–24.

This paper discusses the implications of X-ray photoelectron spectroscopy (XPS) and scanning Auger microscopy (SAM) results that revealed the presence of sizable amounts of carbon-bearing species at the joint of a Roman lead pipe (fistula) and at the surface of a Roman bronze statue. The detailed description in Pliny's *Naturalis Historia* on the use of oil, pitch and bitumen in metallurgical contexts offers convincing grounds for an interpretation that the experimental findings arise from deliberate addition of these substances to lead and bronze. The surface of ancient metals is in itself a source of archaeological evidence, and XPS/SAM techniques are ideally suited to bringing them to light.

Author

M Ponting, J A Evans and V Pashley. Fingerprinting of Roman mints using laser-ablation MC-ICP-MS lead isotope analysis. *Archaeometry*, 2003, **45**(4), 591–7.

This paper presents data demonstrating the applicability of laser-ablation MC-ICP-MS isotope analysis to archaeological artefacts, in this case Roman silver coins. The technique requires no chemical preparation, does minimal damage to the sample and yields external reproducibility that is better than conventional TIMS analysis; $^{207}Pb/^{206}Pb = \pm 0.015\%\ 2\sigma$ in comparison with $^{207}Pb/^{206}Pb = \pm 0.04\%\ 2\sigma$, respectively. Shows that lead isotope compositions give isotope fingerprints to mints despite the likely reworking of the metal during coin production.

Authors

R H Tykot, L Prados-Torreira and M S Balmuth. Iberian bronze figurines: technological and stylistic analysis. *Journal of Roman Archaeology* Supp Ser, 2002, **39**(2), 27–30.

17 Iberian bronzes were analysed for eight major and seven trace elements using ICP-MS. The votive statuettes, of Iron Age date (*c.*8–6th centuries BC), come from the sanctuary of Castellar de Santisteban, Jaen, Spain. They were presumably cast by the lost-wax technique in clay moulds. The figurines contain about 5% tin and nearly 8% lead, although there is considerable individual variability; these results are consistent with other analyses of Iberian bronze figurines. The extent of eastern Mediterranean influence on both the casting technology and artistic style of these figurines is assessed through a comparison with earlier, indigenous Bronze Age production.

Authors (adapted)

MIDDLE EAST

T Stöllner and G Weisgerber with M Momenzadeh, E Pernicka and A S Shirazi. The lead-silver mines of Nakhlak and their importance in times gone by. *Der Anschnitt,* 2004, **56**(2–3), 76–97.

The recent find of a mine cage in the Nakhlak mines has been taken as an opportunity to discuss them and prehistoric mining. The significance of the lead-silver mines for mining archaeology can hardly be overestimated but has so far not been adequately researched. The use of these lead ores in Central Iran can be traced back to the 4th millennium BC: new isotope data from the settlement of Arisman, several hundred kilometres away, would make this appear likely. The archaeological finds made so far indicate that production was at its height in the Sassanian and Early Islamic periods from which the very small mine cage dates. Well-preserved ruins are proof of an extensive mining

settlement under military protection and state control. Whether production continued into more recent times is however only one of the unanswered questions. The observations are based on local field work by the authors in 1976, 1978 and 2000. Authors

AFRICA

C M and S B Kusimba (eds). East African Archaeology: Foragers, potters, smiths and traders. University of Pennsylvania Museum, 2003, 226pp.

These papers from the 95th meeting of the American Anthropological Association deal with the last 2000 years, in an area running from Mozambique to Ethiopia. Metallurgical topics include Fipa iron technologies, and early ironworking communities on the Tanzanian and Kenyan coasts. JB

D Miller. Indigenous iron production in southern Africa: archaeological observations and interpretation. *Mediterranean Archaeology*, 2001, **14,** 229–234.

The analysis of the microstructure of finished artefacts and smithing waste can provide considerable insight into the sets of chemical and physical operations that indigenous smiths employed in producing the metal and fabricating the finished artefact. This paper deals with the iron fabrication technology practised by pre-colonial indigenous blacksmiths in southern Africa. Author (modified)

D Miller. Archaeological bronze processing in Botswana. *Proceedings Microscopy Society of Southern Africa*, 2003, **33,** 18.

Examination of a nodule of dross from an early bronze working site at Bosutswe. Author

D Miller. Gold mysteries of Mapungubwe. *SAJN*, 2004, 3–5.

In the 1930s, adventurers discovered a spectacular gold treasure at Mapungubwe, an Iron Age site in Limpopo Province of South Africa. Three graves yielded thousands of gold beads, hundreds of helically wound bangles, and various objects made out of gold sheet which had been attached to wooden forms with small gold tacks. Metallographic study has revealed the gold working techniques used. The gold fabrication technology was clearly indigenous because it was derived from that employed earlier in copper. No finished objects were cast. The origins of the gold and the tools used were also discussed. Author (modified)

D Miller and N Desai. The Fabrication Technology of Southern African Archaeological Gold. *Annals of the South African Museum*, 2004, **111**(2), 79–102.

Gold has been produced in southern Africa for nearly 1000 years. This paper records the study of gold assemblages from the South African sites of Mapungubwe and Thulamela, and from sites in modern Zimbabwe. The gold fabrication technology was indigenous, and derived from that employed in copper working. Sub-spherical gold prills, probably formed by pouring molten gold into water, were punched using a four-sided tapered punch to make solid gold beads without a join. Some of these were decorated by regularly spaced indentations in the outer margins. Other beads were made from wrapped strip or short lengths of wire, which was hammered rather than drawn. Hammered gold sheet was attached to presumably wooden forms using square section tacks cut from tapered rod and hammered in cold, forming a flattened head. The sheets and tack heads were scratch burnished to create a sheen on the exposed surfaces. Gold sheet was also cut into narrow strips for helical wound bangles, which were also made from hammered wire. There was no evidence of soldering or heat treatment other than annealing. Authors

ASIA

Quanyu Wang. Metalworking technology and deterioration of Jin bronzes from the Tianma-Qucun site, Shanxi, China. Archaeopress (BAR S1023), 416pp.

A detailed technical study of 47 bronze fragments excavated from this early capital of the Jin state (1027–650 BC). Includes discussions of conservation, metallurgical techniques and the social differences within the assemblage. JB

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