

References

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IAMS Workshop Series: Archaeo-metallurgy in the Ancient Near East

In the Arabah, the geological rift valley from the Dead Sea south to the Gulf of Aqaba/Elat, copper mining and smelting has taken place since early prehistoric times. The two most investigated archaeo-metallurgical areas in the region are Timna and Feinan. The remains at Timna have been the focus of interdisciplinary study for almost thirty years under the direction of Professor Beno Rothenberg. Feinan, to the north-east, has large scale remains of prehistoric mining and smelting which have been intensively investigated since 1984 by a team of archaeologists and scientists from the Jordanian Department of Antiquities and the Deutsches Bergbau-Museum directed by Dr Andreas Hauptmann.

The role of copper production at Timna and Feinan for the ancient history of the southern Levant, however, is not yet fully understood. Recent publications of the results of these investigations have caused lively debate in scholarly journals, especially relating to the chronology of the sites and proposed reconstructions of the metallurgical processes and installations. There are a number of other critical issues which have not yet been resolved concerning trade in ores and copper for different archaeological periods. Unfortunately, since the modern border between Jordan and Israel separates these two ancient metallurgical centres in the Arabah, it has not been possible before to approach the problems by detailed comparative studies.

Therefore, this first in a planned series of specialist workshops addressed **Archaeo-Metallurgy in the Arabah, The Negev and Sinai**. The main purpose for this workshop was to provide an informal forum for discussion of the archaeo-metallurgical evidence from these contiguous regions. It was co-organized by the authors and took place on 23-24 October 1992 at the Institute of Archaeology, University College London. Archaeologists and scientists actively engaged in archaeo-metallurgical research in the Wadi Arabah attended from Germany, Great Britain, Jordan and Israel.

The workshop was divided into three parts. The first was dedicated to dating archaeo-metallurgical activities and culture historical problems in the Arabah. B. Rothenberg and J. Glass proposed a developmental sequence for copper metallurgy based upon three technological stages. Evidence for this division was extensive study of the mineralogical and chemical composition of pottery both from Timna and Sinai. Rothenberg especially stressed the enigma of the Ghassulian and Beer Sheba cultures relative to the developments in the Chalcolithic

of the Arabah and Sinai. He proposed a Late Neolithic date for the earliest copper smelting site (F2) at Timna. The development of mining technology at Feinan from the Chalcolithic up to the Roman period was explained by G. Weisgerber. He was able to set up a chronology both by archaeological evidence and 41 radiocarbon dates derived from charcoal samples from different archaeo-metallurgical sites. At Feinan it was not possible, even by extensive archaeological excavation at Tell Feinan by M. Al-Najjar, to find evidence of smelting activities earlier than the middle of the fourth millennium B.C. During the fourth millennium, the copper ore itself was traded to settlements in the Negev and had been smelted there. Very interesting are changes presented by S. Shalev in copper metallurgy from the Chalcolithic period to the Early Bronze Age. During the EBA, copper ore was smelted near the mines and the metal traded. Early Bronze Age smelting sites have been reported from both Timna (EB IV) and Feinan (EB II). W. Fritz reported on the excavation of an EB II and Iron Age site at Barqa al-Hetiye in Feinan. Midianite pottery is present at this site.

The second major topic dealt with the evaluation of provenance studies based upon lead isotope analyses and geochemical data from Timna and Feinan. Z. Stos-Gale voiced concern regarding sample numbers used for characterization of ores and slags. It was agreed that it is necessary to compare artefacts with both the ore deposit itself and slags at the smelting sites. This contribution was followed by a lecture on the most recent measurements on lead isotope composition of ores from Timna by N. Gale in comparison with the data available from Feinan. So far, more than 50 ore samples have lead isotope results at Timna. Generally, the Timna ores have a similar pattern as the ores from the Dolomite-Limestone-Shale Unit at Feinan, but overall reveal a larger range. As emphasized by E. Pernicka, not only lead isotope analyses, but also the geochemical characteristics of the ores, slags and metal are necessary to study provenance. Slags are particularly important to provide a direct link between ores and metals. The increasing number of isotope and chemical data for Timna and Feinan provide an excellent basis for future research on the provenance of metal artefacts from the region.

In the third session, aspects of extractive metallurgy were discussed. It could be demonstrated by the investigation of slags and metals from Feinan (A. Hauptmann) that very pure copper ores have been smelted during the

middle of the fourth millennium B.C. Only very small amounts of slag have been discovered from this period. The smelting during the Early Bronze Age was done on a larger scale and under relatively low reducing conditions. These models could be supported by results of recent smelting experiments by J. Merkel with pure malachite ore to produce a plano-convex ingot in a primitive bowl furnace. A lively discussion among the participants focused on the reconstruction of EBA smelting furnaces from Feinan that were proposed to have been natural draught furnaces. The contribution by G. Philip compared stylistic and technical characterisations between metal artefacts from Jericho and Tell el-Dab'a. H-G. Bachmann outlined the recognition and smelting of high-grade copper ores and presented the concept of a 'reaction vessel' relative to increasing scales of production. In particular, he emphasised the importance of distinguish-

ing between small-scale 'workshop metallurgy' for artefact manufacture versus 'plant metallurgy', i.e. production centres, where metals (ingots, etc.) for trading were the essential output. In his closing remarks for the workshop, he considered the abilities and organization of the metalworkers as well as variations in the archaeo-metallurgical evidence between Timna and Feinan.

This workshop offered a fruitful opportunity to discuss problems and new finds from the region. Materials and metallurgical processes were discussed and still outstanding problems of dating could be clarified and defined. The discussions will be of great value for future research. At the end of the workshop it was suggested to organize, perhaps in Bochum, a larger international archaeo-metallurgical symposium, leading to a comprehensive publication.

Andreas Hauptmann and John Merkel

From the Director's Desk

Welcome to two new Trustees and new members of The Scientific Committee

The Trustees of IAMS and its Director are very pleased to welcome Milton H. Ward, Chairman, President, and Chief Executive Officer of Cyprus Minerals Company, as a new USA trustee of IAMS.

The Director is particularly pleased to announce that Dr John Merkel, our first IAMS sponsored American PhD research student (1978-82), has now been invited to join the Board of Trustees of IAMS. Dr Merkel, whose archaeo-metallurgical investigations - Experimental Reconstruction of Bronze Age Copper Smelting, based on the IAMS excavations in the Timna Valley, Israel, published in B. Rothenberg (ed.) *The Ancient Metallurgy of Copper*, Vol. 2 of *Researches in the Arabah*, IAMS 1990 - created a landmark in our understanding of the ancient extractive processes, was invited in 1988 to take up a

teaching and researching post at the Institute of Archaeology, University College London and became a member of IAMS' Scientific Committee. In 1991 he was appointed chairman of this central IAMS Research Committee.

The Director also welcomes four new members to the IAMS' Scientific Committee: Dr J. A. Charles (Cambridge University), Dr R. Harrison (Bristol University), Professor I. Shimada (Harvard University), and Ms Z. Stos-Gale (University of Oxford).

IAMS sponsored first report in Europe on the discovery of a Sicán Lord's tomb in Peru

On May 11, 1992, Professor Izumi Shimada, Peabody Museum, Harvard University, delivered a IAMS invited lecture on the important discovery of a Sicán Lord's



At the IAMS sponsored lecture, left to right: Dr John Merkel, Mr Gilbert Channy, Sir Sigmund Sternberg, Professor Izumi Shimada, and Professor David Harris, Director of the Institute of Archaeology.