

Bronze Age smelting technology probed at Chessington

Copper ingots and slag, comparable to those recovered from furnaces operated in the 13th — 12th century BC in the Timna Valley in southernmost Israel, have recently been produced in experiments in the Geomet Laboratories of Borax Limited, at Chessington, just outside London.

The experiments, carried out under a planned IAMS programme as a post-graduate study by John Merkel, of Minnesota, USA, are designed to ascertain precisely how copper was smelted in the Late Bronze Age.

Earlier experiments by Professor R.F. Tylecote at Newcastle University have thrown much light on the primitive hole-in-the-ground smelting of the Chalcolithic Period (IAMS Monograph No. 1.). Merkel's experiments are concerned with shaft furnaces of a more advanced type, used by Egyptians of the New Kingdom some 2,000 years later when they operated a major copper-producing industry at Timna.

Using materials from the ancient Timna sites, Merkel built at Chessington a smelting furnace on the Bronze Age pattern from which slag is tapped and run out in liquid form, leaving an ingot to be recovered from the bottom of the furnace. Copper ore from the Timna mines is fed into the charcoal-fired furnace and iron oxide is added as a flux, as determined by analysis of ancient slag.

Members of the IAMS Board of Trustees — including Professor Tylecote, under whose supervision Merkel is working — watched the first "tap" being made before they assembled for their autumn meeting.

Haifa experiments

Meanwhile, parallel experiments are being carried out at the Haifa Technion, based on a mathematical model of the ancient smelting processes, aimed to narrow down the many variables and unknown factors involved. Here, the investigations are being made by a young engineer, Dr. M. Bamberger, working under the supervision of Professors Peter Wincierz, H.G. Bachmann and Beno Rothenberg.

So far, Merkel and Bamberger have worked independently, approaching the problem in entirely different ways. Eventually they will meet and it is hoped that the final result of their experiments will be the production of a complete computer programme which can be applied to any stage in the history of smelting operations, from the primitive processes of the prehistoric metallurgists to the most sophisticated furnaces of the Classical periods.

When the present experiments are concluded it is planned to build smelting furnaces in the Timna Valley, using identical materials and methods as employed by the ancients in order to demonstrate Chalcolithic-to-Late Bronze Age copper smelting during the International Symposium on Archaeo-Metallurgy in September, 1981 (see page 2).



Reconstruction of a copper smelting furnace as used in Timna in the 12th century BC

Degree Course Planned

Archaeo-metallurgy courses at London University, a collective undertaking between IAMS and the Institute of Archaeology since 1976, are to be enlarged with a view to introducing a full degree-awarding course on the subject.

The present course covers mining geology and mineralogy, the archaeology of metallurgical sites, archaeo-metallurgical extraction processes, methods of archaeo-metallurgical research, laboratory practice and exercises. It is now planned to extend the course and include lectures on metal-working, archaeology of metal objects and the history and impact of metal trade.

Expedition to Jordan

An expedition to explore the remains of ancient mining and metallurgy in Jordan is to be undertaken next year by Professor H.-G. Bachmann, of the J.W. Goethe-Universität, Frankfurt, a member of IAMS Scientific Committee and a senior lecturer in archaeo-metallurgy at the Institute of Archaeology, London University.