IAMS

Newsletter
Number 1, 1980

Institute for
Archaeo-Metallurgical
Studies

Institute of Archaeology, University of London, 31-34 Gordon Square, London WC1H 0PY Telephone: 01-387 6052

Ingots from wrecked ship may help to solve ancient mystery

The Institute for Archaeo-Metallurgical Studies (IAMS) was formed as a charitable organization in 1973 to provide support for, and co-ordinate the work of, international research into the development of mining and metallurgy from earliest times.

Its formation was a direct consequence of successful expeditions made in the Near East during the previous 15-20 years by teams of archaeologists, metallurgists and other scientists, who explored the deserts which stretch from the Mediterranean to the Red Sea, under the leadership of Professor Beno Rothenberg who is now director of IAMS. Their continuing work has already made a considerable contribution to the understanding of the mining and smelting technology of the ancients in this vast area, and of the impact that the growth of the metals industry made on the progress of civilization.

Since then, researches have expanded into Western Europe and, working from a centre at Rio Tinto in southern Spain, site of some of the world's oldest and most famous mines, project teams have been making discoveries which are not only significant in mining and metallurgical history, but are also providing new and interesting information for others concerned in the study of early cultures and the development of industry and international trade in ancient times.

It is perhaps this widening horizon of investigations that has been the major feature of the Institute's activities during the past year or two. Specific studies are now being made of the environmental aspects of mining development in early periods of history, and the effects that such development had not only upon communities, but on the aspirations and potential of the individual. Wadi Arabah, alongside the Negev Desert in present-day Israel, provides a particularly challenging opportunity to study the impact the discovery and working of metals had on an empty landscape many thousands of years ago.

Other extensions to IAMS's work have been made in the field of education and, in particular, the courses begun in archaeo-metallurgy a few years ago at the University of London in co-operation with the Institute of Archaeology, are now firmly established. The close co-operation that has always existed between IAMS and the Institute of Archaeology, and which was formalized by an agreement in 1978, has proved of great benefit to both Institutions.

Co-operation between IAMS and the British Museum Research Laboratories may this year help to solve one of the big mysteries of ancient times; the source of the supplies of tin which, when first alloyed with copper to produce bronze, not only represented a major metallurgical break-through, but had a profound effect on the development of civilization.

The Museum is conducting analytical research into tin and copper ingots recovered from the wreakage of a trading ship which foundered off the coast of Palestine more than 2500 years ago. This is the first time that ingots of the two metals produced in this period have been found together, and if their origin can be identified a clearer picture will be obtained of the earliest trading routes and, more particularly, establish where the tin which was used to make the ancient bronze really came from.

The Max Planck Institute of Atomic Research at Heidelberg is also helping in these investigations by carrying out "finger-printing" by isotopic analysis of any lead content in the tin ingots.

Sold for scrap

Interest in this project began a year or two ago when tin and copper ingots of an ancient period began turning up mysteriously in scrap-metal shops in Haifa. After long and patient enquiries, Professor Rothenberg traced the source of the metal to an Arab fisherman who recovered the ingots from the wreckage of a ship, buried beneath sand off the ancient port of Dor, between Haifa and Tel Aviv. Over a period of years the fisherman raised about seven tons of the metal, most of which he sold to scrap dealers in Haifa for re-melting. However, two tin ingots found their way to the Haifa Museum, and since then Professor Rothenberg has succeeded in rescuing several more ingots, both copper and tin, from the fisherman and from souvenir shops in Haifa and Tel Aviv.

The copper ingots are bun-shaped from the furnace in which they were smelted; the tin, which are brick-shaped and weigh between 11 and 22 kilos, bear

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Silver smelting at Rio Tinto 2500 years ago

It has long been accepted that mining at Rio Tinto goes back to Phoenician times and that in later years the district was a principal source of the metal wealth of the Roman empire. Nevertheless, the greater part of the early history of the area is unknown. The exploration being carried out by the Huelva Project is concerned in investigating the earliest mining development and in building up a picture of the communities which in ancient times clustered around the mines. The teams include representatives of Spanish universities, the Institute of Archaeology in London, and the British Museum Research Laboratories.

Last summer, most work again took place on the northern slope of Cerro Salomon — the mountain that dominates the Rio Tinto complex — where a huge build-up of slag was cut by open-cast workings of the modern Corta Lago mine. In the 1978 season of exploration, the area had been cleared and investigated in order to sample and date the many layers of waste material which were believed to hold the secrets of the metallurgical history of the area. Last year the expedition's main endeavour was to determine when, and by whom, the earliest metal was produced. Altogether, 110 different layers were separated and identified, of which 16 were excavated over an area of about 100 square metres.

From these investigations it is apparent that the area of Corta Lago was originally an open-air smelting site for ores that were mined from higher up on the mountain. Here, silver was already being produced in the Late Bronze Age, probably as early as the 8th-7th century BC. The smelting technique was of a surprisingly high standard and included the use of large, stone-built furnaces with tapping facilities; technologically, such operations had apparently reached their optimum in this period, and were certainly not improved upon during the Roman occupation.

Other finds support the expedition's contention that this early silver-producing industry was developed by local Iberian people. It is possible that their industry was the source of much of the silver which enriched the Tartessians, whose culture was based on tilling the rich soils of the river plains of the surrounding countryside and extracting minerals from the hills. It was the Tartessians' prosperity that first drew the Phoenicians to trade with this part of the world at the time the Bronze Age was beginning to be replaced by the Iron Age, and their commerce was financed with ever-increasing quantities of this locally-produced silver. Whether the Phoenicians subsequently participated in the production operations, or whether they merely continued as traders, is not yet known, but it is hoped that further investigations, planned to be made in 1980-81, will provide the answer.

More than 8 metres of stratification on top of the Iberian workings, showing many layers of slag and architectural remains, testify to a large-scale mining and smelting enterprise under the Roman occupation. During this period, from the 1st century BC to the 2nd century AD, in addition to large quantities of silver, some copper and iron were also produced in the Corta Lago district. However, it is presently assumed that the main copper-producing area of this, and perhaps an earlier, period was along the banks of the Rio Tinto to the north and west of the modern mining area, and this too will come under investigation in 1980-81.

Western Europe's Earliest Mine

Chinflon, a small but highly significant copper-producing site, was discovered in 1974 west of El Pozuelo, which is well known for its megalithic remains. In 1978, clearance of one of the mining systems was begun and work continued last year.

The excavated mine was evidently opened up in the Chalcolithic-Early Copper Age and not developed in any other period, though a similar system nearby has a typical Late Bronze Age shaft with footholds carved into the sides by metal chisels; it is however considered that this shaft was used for prospecting, rather than for copper production which came from primitive shafts following the rich malachite vein. Numerous grooved mining picks of the earliest known type were discovered inside and around the shafts.

Slag nodules, scattered over a wide area, represent the earliest copper smelting technology known to date, the process being carried out with intentional fluxing with iron-oxide. The exact smelting site has not yet been located, but it is assumed that the furnaces used were of the bowl-shaped, hole-in-the-ground type which was common elsewhere in this period.

Whilst there is still much work to be done at Chinflon, the discoveries are already of great importance in that

Ingots from the sea

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Cypro-Minoan markings which were apparently carved into them as the metal cooled after casting.

"Such markings", explains Professor Rotherberg, "are known from the late 2nd millennuum BC, but they are also known in Iberia down to around the 7th-6th century BC. Our present thinking is that the copper and tin were shipped together from Spain sometime in the Phoenician period, perhaps between 700 and 600 BC. But we cannot prejudge the issue and must await the results of the research".

Meanwhile, an underwater team from the Marine Department of Haifa University has been out over the area of the wreck with metal detectors and it appears that there are more ingots still beneath the sea and the sand. How much is not known, but it is hoped to mount a major expedition with the University in the not-too-distant future.