

Archaeo-metallurgy in China

Professor R.F. Tylecote, IAMS trustee and member of the Scientific Committee, reports on a recent visit to China.

China has a long metallurgical tradition and from the Shang dynasty (1600 BC) has astounded the world by the scale of its operations. The casting of bronze 3-legged or 4-legged cauldrons weighing 875 kg should have raised a few eyebrows. The sheer size and weight exceeded anything in the Western World. By the Han Dynasty (200 BC-AD 200) they were having blast-furnace explosions and producing 'bears' weighing 20 tons.

Those in China interested in the history of metallurgy have been aware of what has been going on in the West by reading the relevant literature and attending conferences on the history of science and technology in various parts of the world. But the same cannot be said of the West which, perhaps because of the language problem, has not been keeping abreast of the work being done in China. We have relied on certain specialists such as Joseph Needham at Cambridge and Donald Wagner in Copenhagen to keep us informed.

It was exhilarating to find so much work going on and to see that it had developed in much the same way as our own — by metallurgists being presented with interesting problems by archaeologists, which could only be solved by experimentation and laboratory work.

Han Dynasty Furnaces

The leading institution in China responsible for archaeometallurgy is the Institute for the History of Natural Sciences which comes under the Academy of Sciences. So metallurgy finds itself in good company with astronomy, mathematics, nautics, architecture, etc. But China is a big country with a lot of regional autonomy — after all, one province alone has a population greater than that of the British Isles. Thus, the province of Henan, which straddles the Yellow River and has Shang sites such as Loyang and Anyang, has an archaeological service with many personnel who could be considered archaeometallurgists. This province contained most of the Han Dynasty blast furnaces and the sites of many of these are known.

The Beijing University of Iron and Steel Technology also has an archaeometallurgical group under Professor Ko, and this group is not only working on ferrous problems such as the structure of edge tools and weapons, but non-ferrous problems as well.

Since the Institute for the History of Natural Sciences has no laboratory accommodation it is necessary for them to make use of university and industrial facilities such as engineering research institutes and the factories themselves. In many areas such as the malleabilization of cast iron and repetition casting.

China has led the world. It is not surprising that appropriate modern industry has been co-opted to lend a hand in sorting out the problems of the archaeo-metallurgist.

Similar to work in the UK, China has been doing experiments on early copper smelting, based on the discovery of a Warring States (500 BC) copper smelting furnace in a copper mine at Tonglushan to the south of Wuhan. Extensive workings were uncovered during open pit mining and these are being preserved as an open-air mining museum.

China still has 40 open-hearth steel-making furnaces in operation and since we in Britain have now lost the battle to keep one as a museum piece, there is still a possibility that China may do so when the time comes.

Sleigh bell-Chinese style!

Early Chinese expertise in casting is widely recognized and large bronzes, especially bells, are particularly interesting (writes R.B. Wood in a recent issue of *Metals Society World*).

The Da Zhong Si (Great Bell Temple) on the west side of Beijing, in Peking, houses a particularly impressive specimen. The *Guinness Book of Records* does not give much detail on bells except to say that the never-functional Tsar Kolokol in Moscow is the biggest ever. At over 46 tons and 4.5 metres high by 3.3 metres maximum outer diameter, the Peking specimen must be among the world's largest half dozen. Moreover, it is in superb condition and is sound. The entire surface, inner and outer, is covered in Buddhist script (the Lotus and other sutras) involving 227,000 characters.

The bell was cast during the reign of the Ming emperor Yong Le, therefore some time between 1403 and 1424. The Qing (Ch'ing) emperor Yong Zheng (1678-1735) ordered it to be removed from its original site, also on the west side of Beijing, to its present home — hardly a simple task.

Apparently, the move was effected by flooding the road between the two temples and sliding the bell along the ice!

In the last year or so a number of other Buddhist temple bells have been collected to form a bell museum in the courtyard. The oldest is the Sung Dynasty specimen, cast about 1069, two centuries before Beijing fell to the Mongols under Kubilai. Another interesting exhibit is an iron bell cast during the Ming dynasty.