

On the trail of early iron metallurgy in the Caucasus mountains

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The origins of iron metallurgy and the sources of late second- and early first-millennium BC metallurgical innovation are topics of major discussion in the archaeology of the ancient Near East. Current evidence, deriving from texts and a small number of objects, suggests that the extraction of iron metal from ores began on a small scale in Anatolia in the early second millennium BC, but direct evidence for Bronze Age and Early Iron Age iron production sites is almost entirely lacking in this area. Just a few sites have documented evidence of iron smithing (i.e. the shaping of raw iron), and none has produced clear evidence for iron smelting (i.e. the production of raw metal from ores). Compounding the challenges for understanding early iron innovation is the fact that Late Bronze Age copper and bronze production sites are similarly underexplored. Consequently, scholars have a poor understanding of the organisation of metallurgical economies and the various factors driving metallurgical innovation in Anatolia and the adjacent region of the Caucasus.

With the support of a study grant from the British Institute at Ankara, I travelled to Georgia and Armenia to study and sample objects from metallurgical sites dating to the Late Bronze and Early Iron Ages. Research in Georgia focused on two sites – Kvemo Bolnisi and Mtsvane Gora. The former was excavated in the Soviet period and published as an Early Iron Age iron smelting site (Gzelishvili 1964), while the latter was excavated by myself and colleagues from the Georgian National Museum in 2015 and 2017, when traces of iron and copper-alloy metallurgy were discovered. While it has not yet been possible to locate the materials from the original 1950s excavations of Kvemo Bolnisi, a visit to the site identified pieces of slag present in the same area as the workshop described in the original publication of the site. Although a full understanding of the metallurgical processes that took place at the site must await more intensive laboratory analysis of the slag samples collected, the presence of significant copper ore mineralisation at the site casts into doubt earlier claims of iron smelting. The 2015 and 2017 excavations at Mtsvane Gora yielded traces of iron and copper metallurgy, roughly dating to the eighth to the sixth century BC, and Institute support has facilitated further study of artefacts recovered during these excavations and provided the opportunity to discuss and write up the results of the ongoing programme of scientific analysis.

Research in Armenia, undertaken in collaboration with colleagues at the Geological Institute of the National Academy of Sciences, the Agency for Cultural Heritage and the Preservation of Monuments, and the Metsamor Museum,

has focused on the ancient metallurgical centre at the site of Metsamor. The site has a long history of research, which began in earnest in the 1960s, when geologists and archaeologists uncovered a fortified site with furnaces, slags and other traces of metal production (Mkrtchyan et al. 1967; Khanzadyan et al. 1973). A news article about the site, published in the *New York Times* (31 October 1971), hailing it as the ‘Pittsburgh of the ancient world’, attracted the interest of the American archaeometallurgist Robert Maddin, who went on to write extensively about iron metallurgy in Anatolia and the wider Near East. However, Maddin’s visit to the site did not develop into more sustained collaboration, and little further analytical research was undertaken.

The aims of the renewed collaborative research programme are to identify the types of metals produced (for example copper, iron, tin) and the stage of production (smelting, smithing, casting, etc.), and to reassess the context and chronology of production remains. supported by my Institute grant, I was able to photograph metallurgical slags and other production debris from the site, take samples for analysis and examine the ceramics from the corresponding contexts. A wide variety of production debris was identified at the site, including crucibles, casting moulds, ladles, tuyères and a range of different types of slag. Preliminary research suggests that much of the metallurgical debris dates to the Early Iron Age (ca 12th to ninth century BC), but broad similarities in ceramic styles in the period ca 1500–500 BC complicate precise dating. Subsequent laboratory analysis of metallurgical samples will determine the types and stages of metal production that took place at the site.

The research programme initiated with the BIAA study grant will illuminate the regional landscape of iron- and copper-based metallurgy during the Late Bronze and Early Iron Ages. It is only through the (re)analysis of workshop sites that an accurate picture of metal economies will emerge, enabling archaeologists to build robust models of metallurgical innovation.

References

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