

Donald B. Wagner: *Iron and Steel in Ancient China*. Leiden: E. J. Brill, Leiden, 1993. 573 pp.

If the present reviewer could start anew in a life of leisure, he would happily spend his days monitoring the developments in Chinese archaeology. The most obvious reasons for this are of course the incredibly thick cultural layers, the unique working situation of using the archaeologist's tools in your right hand while holding relevant historical sources in your left hand for immediate consultation, and finally, the thrill of never reaching a conclusive answer, because you are guaranteed unending strings of new discoveries which will keep you busy and marvelling. (The standard work on Chinese archaeology by K. C. Chang is already in its fourth edition, the latest edition having to make a cut-off point around 1000 B.C. because of the rapid increase in source material).

We can also use K.C. Chang as the starting point of the less romanticizing part of this review. When characterizing the Bronze Age of China, Chang says that it "was not accompanied, insofar as our available archaeological record suggests, by a significant use of metal farming implements, irrigation networks, and use of draft animals, or the use of the plow. For a breakthrough in agricultural technology in China, we will have to wait until about 500 or 600 B.C., when cast iron began to be used widely and for agricultural implements." (Chang 1986: *The Archaeology of Ancient China*, p. 364).

Donald B. Wagner, of the Department of Asian Studies, University of Copenhagen, has, in his study on iron and steel in ancient China, given us an eloquent and impressive statement about this major shift in Chinese technological history. He maps out the beginnings of this development, surveys early iron artifacts,

ironworks and ironmasters, and presents metallographic studies on wrought iron, steel and cast iron, all in a lavishly illustrated volume. But also at a price which makes one wonder if the publisher still counts Dutch guilders in terms of golden coins.

The magnificent early Chinese bronzes were used primarily for ritual and martial purposes, to some extent as tools, but very little as agricultural implements. The dominance of the social and ritual order of ancient Chinese core regions thus tallies well with the fact that the earliest evidence of the use of iron is found *outside* this core area, mainly in Qin in the northwest, in Shu in the south and in Wu in the southeast. Wagner settles for the Wu region as the most likely place of origin of iron production in ancient China.

The arguments for that run - very simplified - on following lines: the highly sophisticated northern technology of copper-smelting furnaces and bronze production was taken over by the emerging state of Wu. Wu was not as rigidly organized socially and politically as their northern neighbours, and this "semi-barbarian" environment encouraged a more widespread, small-scale and diversified technological transfer which also made room for technological innovation: metallic iron was a well-known "undesirable" by-product of copper production, which could be easily exploited if a need for such a relatively cheap product arose.

The main evidence for pointing his arrow towards the Wu region is both textual and archaeological. The textual material is based on the *Yuejue Shu* and related materials and the archaeological on the fact that it is only in the Wu region that significant numbers of locally produced bronze agricultural implements have been found. This may, as indicated above, have been caused by a different social structure, or by a different natural environment for agriculture. Dependence on bronze agricultural implements could thus easily lead to experiments of replacing this expensive product with a cheaper product. Furthermore, the earliest reliably dated specimens of iron in China have been found in two graves in Luhe, Jiangsu province: one piece of wrought iron and one piece of cast iron, the functions of which have not been determined. These graves are reliably dated to around 500 B.C.

As for early evidence of iron in other parts of China, Wagner especially discusses the states of Chu and Qin. Chu iron appears

from the 4th century on. The evidence from Qin is possibly much earlier, but not conclusively determined. The map of early iron-making in China that seems to emerge takes the form of a Wu-Chu-Qin continuum, but the internal ranking among these regions is still rather open. One reason why Wagner settles for Wu is that the archaeology of ancient Qin and Chu should have yielded more conclusive evidence of early iron artifacts, since the archaeology of these two regions is much more advanced than that of the Wu region. The present reviewer is in no way able to give a well-founded critique of Wagner's hypothesis, but he would have liked the author to have undertaken a more thorough search for early iron in the ancient Ba-Shu region (Sichuan), where archaeological activity, like in the Wu region, has been rather limited. The Shu region is clearly an important component of the continuum outlined above, with a distinct early regional culture, as the spectacular early bronzes unearthed some years ago in Guanghan illustrate.

This review has only given some "fragments" of an impressive study on ancient iron and steel in China. A chapter of almost a full hundred pages gives an exposee of practically all types of pre-Han iron artifacts unearthed in China. Two chapters on metallographic studies about the specificities of ancient wrought iron, steel and cast iron reduce the present reviewer to a mere curious but ignorant observer. At this point, Wagner made a drastic departure from the common sinologist: in order to be able to write this study, he decided to get his hands dirty by enrolling as a student of metallurgy at the Technical University of Denmark in the beginning of the 1980s.

As a historian, I specially appreciate Wagner's way of dealing with the problem of "the source's source", something the pedagogically worded footnotes and the 67 pages of bibliography in small print illustrate. This study is by no means the first word that has been said about iron in ancient China, and certainly not the last, but we have been given a veritable "mine" of critical, clear-cut and sober words.

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