

Donald B. Wagner, *The Traditional Chinese Iron Industry and Its Modern Fate*, Richmond: Curzon Press, 1997. 106 pp.

Western scholars know best the iron industry developed during modern industrialization of the nations of the North Atlantic community, and later adopted throughout the world. As Western engineers discovered the most productive methods of converting ore to metal, ironmasters quickly learned about the new techniques through visits and publications. Rapid exchange of information allowed everyone to adopt the methods that minimized costs and maximized product quality. Ironmakers then achieved economies of scale with large capital investments in plant and equipment. Generally accepted methods allowed them to respond to a market that demanded uniform, reproducible products with properties that engineers could count on in their designs of machinery and structures. Schooled as they were in the successes of the modern iron industry, Western historians and economists usually thought of alternative

methods of iron making as primitive techniques practised by backward, unenlightened people. They neglected to temper their judgements with consideration of the social, economic and cultural contexts in which the practitioners of alternative techniques worked. Recent research by anthropologists on African ironmelting changed this view by showing how traditional smelting methods inherited from ancient times served economics as well as cultural needs for African people through the early 20th century. Now students of archaeological metallurgy are gleaning information about aspects of culture not otherwise easily discovered from their studies of smelting and smithing techniques.

Studies in non-European archaeometallurgy led historical metallurgists to look more closely at Western ironmaking. They soon found that ironmasters in the industrialized West continued to use old techniques such as bloom smelting, fining and smelting with charcoal fuel for particular applications where they performed better than the newer large-scale processes.

Donald Wagner's book expands these studies to China by showing how practitioners in four regions of China (Dabieshan, Sichuan, Shanxi and Guangdong) continued to use antique smelting methods through nearly two-thirds of the 20th century. Wagner argues that progress in the history of metallurgical technology depends on understanding how the techniques artisans used actually worked. He devotes most of his book to an exposition of the smelting methods practised in these four regions.

Readers will be struck with the paucity of data Wagner had to work with. Students of Chinese metallurgy have nothing like the extensive archaeological studies and reconstruction experiments done in the last several decades by scholars studying African ironmaking. Working primarily from descriptions written by 19th-century travellers, Wagner has been able to discover the broad outlines of the traditional methods practised in the four regions he studied. They were remarkably different from one another as well as from modern methods. From a Western perspective all were almost unbelievably wasteful of fuel and labour. Wagner found one case in which Sichuan ironmakers replaced water-powered blast engines by hand-operated blowing machines, a surprising regression in the country that first applied water power to blast furnace operation. A satisfactory explanation (other than that for unknown reasons the

cost of manual labour declined dramatically relative to that of capital) remains elusive.

Readers today are often interested in the environmental consequences of past industrial practices. We can infer from Wagner's descriptions that the inefficient use of fuel in the traditional Chinese smelting methods must have degraded the environment both through fuel production and furnace emissions. A further exploration here may lead us to a better understanding of Chinese attitudes towards stewardship of natural resources.

Wagner makes it clear that the traditional ironmaking methods often produced products of poor quality. As China established more sophisticated engineering industries, the market for this metal must have diminished. Wagner ascribes abandonment of the long-established techniques to the availability of imported iron and steel at lower cost than the traditional producers could match. Often the imported material was of better quality. This accords with the experience elsewhere since we know of few (if any) examples of people practising traditional ironmaking techniques for very long once they could get better metal at lower cost from Europe. In Africa, for example, smiths found that scrap from damaged or discarded motor vehicles served their needs better than metal made by traditional bloom smelting.

Wagner's data may lead the reader to wonder why the indigenous Chinese metallurgical techniques were so diverse. Several factors may have contributed. The different techniques may have originally represented adaptations to particular combinations of resources and demands. Poor communication of technological information may have left the regions he studies isolated, and their metallurgical practitioners unable to profit from the experience of others. Alternatively, the choices of technique may have reflected particular cultural values in the different regions studied. The Chinese reliance on human labour for tasks that in the West would have been done by draft animals or machinery suggests attitudes towards health and the work environment worthy of further study. We look forward to another, larger volume in which Wagner addresses these issues.

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