In a series of recent articles, and in his co-authored book *The Texture of Industry* (Oxford University Press, 1994), Robert Gordon has advanced the view that industrialization must be understood in its material context, and not just in the social, economic, and technological contexts fashionable among historians. This view animates this present book, which gives close attention to archeological evidence and presents clear and detailed descriptions of all the major processes for producing iron across three centuries. Gordon (who teaches geophysics and applied mechanics at Yale) uses clear prose, well-chosen illustrations, and an admirable certainty about complex technical matters to write a definitive book about iron smelting, refining, and rolling. His description of American ironmaking techniques clearly supersedes earlier accounts by Arthur Bining, Peter Temin, and others. Yet Gordon’s close focus on specific sites, even specific artifacts, and his relative inattention to nation-wide trends and market patterns, will frustrate historians seeking to place ironmaking into its larger economic and social context, or to analyze the industry systematically.

The first step of smelting iron ore into metallic iron passed through three distinct periods based on fuel supply, with varying consequences for the industry’s location, scale, and environmental impact. Using charcoal derived from the continent’s plentiful forests, the colonial iron industry grew quickly in the 18th century to rival that of England. Gordon describes not only the Pennsylvania “iron plantations,” which he argues were less self-contained than historians have thought, but also the ironmaking districts ranging from New England to New Jersey and westward as far as Ohio and Kentucky. Ironmaking in the South and upper Midwest grew mostly after 1840. While ironmakers in these districts increasingly in the 19th century specialized in certain products, one common theme was the location-specific nature of the charcoal-based industry. Poor transportation meant that ironmakers located their blast furnaces at rural sites close to ore deposits and trees. An ecological balance of sorts was possible: so-called bog iron deposits were actually replenished by rivers, while tree lots could be sustainably harvested for charcoal.

Anthracite coal from northeastern Pennsylvania defined the second phase. From 1855 to 1875 Americans made more iron with this fuel than any other. With coal, ironmakers located blast furnaces where rail transportation could bring raw materials; among the results were the breakdown of ecological balance, with ironmakers largely oblivious of the social and environmental consequences of coal mining, and the rise of urban ironmaking. After 1875 soft bituminous coal, baked into coke, from western Pennsylvania fueled blast furnaces of ever-increasing size.

The crude iron from smelting could be directly cast into iron pots, stove plates, and the like but most industrial uses needed iron to be malleable or weldable. Gordon carefully describes the classic industrial-era technique of “puddling” crude iron to produce malleable wrought iron, and briefly notes seven other earlier or rival process for making malleable iron. Especially in his treatment of puddling Gordon’s attention to technical details, artisanal skills, and the gritty reality of the shop floor movingly conveys the “texture” of...
the industry. I found his treatments of crucible steelmaking and iron rolling notably satisfying as well.

Historians interested in the application of science in industry will appreciate Gordon’s attention to how ironmakers used and occasionally misused chemical and metallurgical knowledge. Gordon uses his own metallographic investigations helpfully to shed light on the mechanical or chemical properties of historical iron samples. For the most part, he successfully portrays how ironmakers themselves understood their enterprise and appropriately refrains from simply contrasting their knowledge with modern metallurgical theory. His chapter on “iron quality” is a concise discussion of the leading investigations into iron quality by the Franklin Institute, the U.S. Army Ordnance Department, and the Watertown Arsenal. He concludes, however, that an inattention to scientific insights led Americans to persist in “inadequate specifications and tests of product quality” (p. 219). One dimension of science Gordon does not explore is the employment by iron- and steelworks of numerous chemists in the late 19th century.

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