
Review

Reviewed Work(s): Iron and Steel in Ancient China by Donald B. Wagner

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of science at the turn of the century from this angle. Moreover, it may be worth their while to ponder why mathematics has had such a lasting fascination for seekers of spiritual exaltation and clarity. It is too easy to write off such attempts as mere mysticism: it is necessary to confront these tangled issues with an open mind. As an incitement to such broad cultural investigations, this book is recommended.

SKÚLI SIGURDSSON

Richard H. Grove. *Green Imperialism: Colonial Expansion, Tropical Island Edens, and the Origins of Environmentalism, 1600–1860.* (Studies in Environment and History.) xiv + 540 pp., illus., bibl., index. Cambridge/New York: Cambridge University Press, 1995. \$64.95.

Richard Grove's book is a comparative work on the intellectual history of colonial conservationist ideologies. In particular, it focuses on the role of the "colonial periphery" in shaping colonial science, especially in the sphere of medicine through the establishment of new botanical gardens and in forest conservation policy. The book concentrates, in the main, on two themes. It shows how the colonists' conservationist ideas were initially born out of their desire to reconstruct "lost edens." Second, it concentrates on the ideas of the major actors who were instrumental in forging programs and ideologies for "global environmentalism" in the colonial periphery. Focusing on Mauritius, the East Indies, India, and St. Helena, the book argues that scientists and experts, especially in the fields of medicine and climatology, played an important part in framing the policy of forest conservation from the first quarter of the nineteenth century. Of the role of the "colonial periphery" in the framing of the ideas of the major figures, Grove concludes that the excursions of the experts broadened their mental horizons and forced them to think beyond the narrow concerns of colonial economic contingencies. Further, he asserts that these experts were, indeed, faced with a real problem of making the metropole sensitive to environmental risks in the colonies. Thus colonial environmental policies between 1650 and 1850 were, as Grove argues, a result of the highly structured tensions between the "colonial periphery and the metropolitan centre and between the insecure colonial state and the environmentalism of new scientific conservation elites" (p. 485).

Grove describes the major aim of his book as

the reconsideration of the relationship between the interests of capitalism and colonialism. He also opines that the discourses on the philosophical and geographical origins of environmentalism need to be seriously reconsidered. In an effort to do this Grove makes his contribution to both the history of colonial expansion and the history of science. But he fails to recognize the full potential of his voluminous empirical data because of some serious theoretical flaws in his framework. For one, Grove's notion of "environmentalism" and his subsequent discussions of the origins of present-day environmentalism are teleological in character. On the very first page Grove links the origins of present-day conservationist and environmental discourse to environmentalist ideas of the seventeenth, eighteenth, or nineteenth centuries. In doing this he simply assumes that the discourses of desiccation and deforestation are environmentalist in character and form the basis of present-day concerns. Grove simply bypasses the question of what constitutes "environmentalist" in the early colonial periods and takes the "environmentalism" of early thinkers for granted.

The book's second major flaw concerns the absence of the integration of an analysis of capitalism and imperialism in the history of colonial conservationism. Though the narrative refers sporadically to the commercial objectives of the early colonists, the author fails to integrate these sections into the wider narrative systematically. Perhaps the main reason for this is his focus on individuals and their impact on colonial science rather than the processes of the development of conservationist ideologies. And even though Grove tries hard to redefine the relationship between the metropole and the periphery—terms he borrows from world systems analysis—he fails in his attempt. The crucial question relating to the transfer of surplus between the periphery and the metropole and its relationship with the role of the scientists in colonial agendas and regimes remains unanswered.

ARCHANA PRASAD

■ Antiquity

Donald B. Wagner. *Iron and Steel in Ancient China.* (Handbuch der Orientalistik/Handbook of Oriental Studies, 4[9].) xvi + 573 pp., illus., figs., tables, app., bibl., index. Leiden/New York: E. J. Brill, 1993. Dfl 270, \$154.50.

The price of this volume is the first detail mentioned when it is discussed among Sinologists.

Given the book's size and high-quality paper, the price is not out of line with current standards, but those standards signal a crisis: the vital book medium is not being subsidized as heavily as the volatile electronic medium. An information gap between scholarly haves and have-nots thus impends.

The book is a review and synthesis of archaeological evidence on iron and steel in early China. It benefits from the author's technical expertise, which enables him to read and interpret the original archaeological and metallographic reports at the requisite level of sophistication. The primary data are lavishly presented, with drawings, photographs, and micrographs of objects, summary tables of artifact types, and translations from metallographic studies. Donald Wagner judiciously distinguishes between sound and shaky stratigraphy and sequencing in the original Chinese reports. All this is most exemplary. One does, however, sense in his conclusions the presence of controlling assumptions not strictly required by the tendency of the evidence.

Wagner speaks of the "invention" of iron in Wú (southeast China; p. 407) and demands that diffusionists "provide positive empirical evidence" (p. 33), but he also finds (p. 406) that early Chinese iron shows compression rather than evolution of technical stages (the first white cast iron and the first wrought iron are equally old), a configuration typical of adapted rather than invented technologies. Iron smelting is older in India than in China; Indian artifacts recovered near the thinly-populated head of the Yángdǔ River are from the period of the earliest Chinese iron; the Yángdǔ (Pinyin romanization "Yangzi"; I here use a spelling less counterintuitive for English readers) flows eastward; and where it meets the sea is Wú, the site of the first Chinese production as Wagner reads the evidence. As Wagner says (p. 406), the data are incomplete. Historical data are *by definition* incomplete. But they are far less incomplete than they were before the work that Wagner here reports, and surely the likelier inference from them is not the one he draws.

Sekino Takeshi's theory, that the possession of iron weapons allowed northwestern Chín to conquer the rival states, finally unifying China in 0221 (221 B.C.), still permeates scholarly thinking. Wagner's finding that iron first emerged in southeastern Wú presents problems for this theory. A further difficulty (pp. 255–256) is that Chín seems to have organized its iron industry only *after* its conquests. The verdict from Wagner's data, despite his reluctance, seems to be that victory was achieved not by better weap-

ons but by better food production and faster population growth (advocated by the Legalist text *Shāng-jyǔn Shū*, supposedly associated with Chín), by a cunning long-term geopolitical strategy of successive territorial enlargement, and, finally, as suggested by the work of Herrlee G. Creel and others, by innovations in the political administration of the newly conquered territories.

On the evolution of iron and steel technology between its emergence and the 0221 Chín unification, Wagner is ill served by the scholars on whose conclusions he relies for the dating of the textual evidence. From Mencius 3A5, he concludes that iron vessels were widely used in the time of Mencius (public career from 0320), and from Sywǎndǔ 15, that Chǔ used steel weapons at roughly the same period. I have elsewhere argued (*Sino-Platonic Papers*, no. 46, p. 55) that Mencius 3 is from after the death of Mencius, when his followers had split into northern and southern factions; it is likely later than 0286, and probably not long before the final conquest of Lǔ by Chǔ in 0249. So also with Sywǎndǔ 15, in whose main dialogue Sywǎndǔ appears on a Chǔ military mission to Jǎu. Sywǎndǔ, previously in Chǐ, entered the service of Chǔ as director (*líng*) of Lán-líng. Lán-líng, in southern Lǔ, was not Chǔ territory until the partial conquest of Lǔ in 0255–0254. As to the mission, Jǎu had been besieged by Yēn in 0251 and survived only with Chǔ aid; it successfully attacked Yēn in 0249. The Chǔ mission was thus probably in 0250. Both these sources, dated by Wagner to before 0300, are thus instead from about 0250, a scant thirty years before the final Chín unification. This dating of the texts brings them into closer agreement with archaeological evidence and sharpens their incompatibility with the Sekino theory; it confirms that the cultural *impact* of iron was late within the Warring States and that even toward the end of that period, Chǔ was still ahead of Chín in the military use of steel. The crucial advantage in this epic struggle was thus, Wagner notwithstanding, most likely not in the minor technology of arms, but in the major technology of government.

E. BRUCE BROOKS

Gianni Micheli. *Le origini del concetto di macchina.* (Biblioteca di Physis, 4.) 181 pp., figs., indexes. Florence: Leo S. Olschki, 1995. L 37,000.

The science of mechanics, however abstract and mathematical it has now become, presupposes