ESSAY REVIEWS

Science in Late Imperial China

By Fa-ti Fan*

Benjamin A. Elman. *On Their Own Terms: Science in China, 1550–1900*. xxxviii + 567 pp., illus., tables, apps., bibl., index. Cambridge, Mass.: Harvard University Press, 2005. $55 (cloth).

The history of Chinese science has not received much attention from historians of Western science. Everybody has heard of Joseph Needham; few have explored his monumental *Science and Civilisation in China.* Fewer still have tried to keep up with the more recent literature on the history of Chinese science. One main problem is that much of the existing literature is either specialized studies or topical volumes. There are no works of synthesis. Benjamin Elman's massive new book changes that. *On Their Own Terms* examines Chinese science from 1550 to 1900, with an emphasis on how the imperial courts and Chinese scholars appropriated European natural learning transmitted by Jesuit missionaries in the early modern period and by Protestant missionaries in the nineteenth century. It thus provides a unified narrative that helps explain the development of science in China over the three centuries. With this thematic focus, and with its many strengths, the book marks a new phase in the writing of the history of Chinese science.

Elman is an eminent historian of late imperial China who has written extensively on the social and intellectual history of the Chinese literati. All of his books are distinguished by ambition and originality. Characteristically, in this new book Elman goes after big historiographic issues. One of his principal foils is the narrative of modernization, which maintains that modernity, defined in part by science, first originated in Europe and spread from there to other parts of the world. The narrative of modernization further suggests that what subsequently came out in those places were for the most part inferior or incomplete copies of the European original. The problem with this narrative is that it ignores the agency and creativity of non-European societies in the generation and circulation of scientific knowledge across the world. Elman, in contrast, contends that the Chinese, though benefiting from Western learning, developed scientific scholarship on their own terms (hence the title of the book). They weren't trying to imitate European science; they produced their own science. The task for the historian is, then, to "explore Chinese interests in natural studies as they articulated and practiced them on their own terms rather than speculate about why they did not accomplish what the Europeans did" (p. xxvi). In a related argument, Elman attacks another historiographic idol—the "failure" narrative of the history of Chinese science. He

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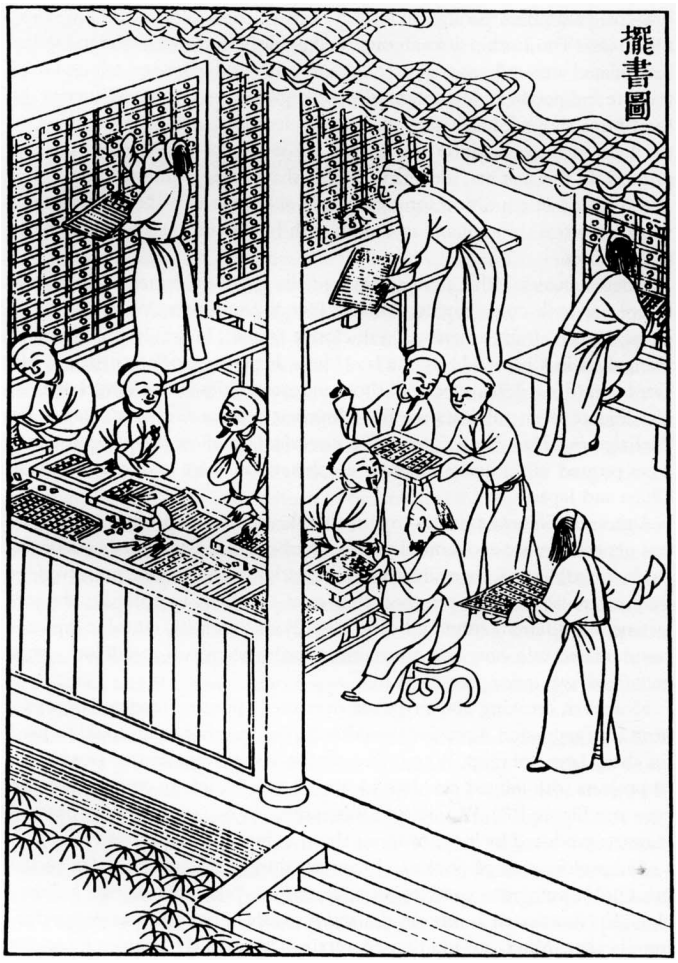

Setting movable type in the Qianlong Imperial Printing Office (from Elman, On Their Own Terms: Science in China, 1550–1900).

does this by showing, first, that, contrary to the common notion that the Chinese literati during the late imperial period were not interested in science, they actually elevated science, or at least certain branches of it (such as mathematics, geography, and astronomy), to be major areas of inquiry; and, second, that Chinese reform movements in the second half of the nineteenth century, which aimed to introduce Western science and technology into China, did not fail badly, as conventional wisdom has it, but worked just as well as their counterparts in Japan, at least until the Chinese defeat in the Sino-Japanese War in 1895. In pursuing these historiographic issues, Elman intends to discredit both "the alleged failed history of science in China and the alleged victorious history of science in Europe and Japan" (p. 420).

The book therefore is not a straightforward survey of the history of Chinese science during the late Ming and the Qing periods, though it is quite comprehensive in coverage. Mainly, it pursues particular themes and arguments. Among the sciences, the book deals

most extensively with astronomy and mathematics. Other areas, such as physics, medicine, and technology, are introduced when relevant. The book is organized thematically and chronologically. It starts with an account of traditional Chinese natural studies, classification of knowledge, printing culture, and the social and institutional environments of Chinese literati culture around the sixteenth century. It goes on to discuss the arrival of the Jesuits in the late sixteenth century and the science and technology they brought with them. Later, the Jesuits impressed the Qing court, which succeeded the Ming, with their learning, their expertise in astronomy and cartography, and their multiple talents in making telescopes, clocks, and cannons. Thus the Jesuits gained official positions in the Qing government, including heading the Astro-calendric Bureau from 1645 to 1775 with only a brief interruption. Court patronage was essential to their position in China. Yet neither the Jesuits nor the Qing court were free to collaborate with each other. The Jesuits were under attack in Europe, and the Manchu emperors, still seen by some as alien rulers, had to manage the factional politics of the Chinese elite. The relationship finally ended in the 1770s (when the Society of Jesus was suppressed by the pope). By then, the Jesuits had long since introduced geometry, cartography, Tycho Brahe's astronomy, and Aristotelian physics into China. But they had also fallen out of touch with developments in European science. For religious reasons, they had generally misrepresented Copernicanism to the Chinese, and they had left out calculus and Newtonian physics, neither of which made a meaningful appearance in China before the mid-nineteenth century.

Although Chinese scholars were not in contact with new developments in European science from the early eighteenth to the mid-nineteenth century, they made important advances along the scholarly path they carved out for themselves. Stimulated by Western learning, the Chinese literati had attempted to accommodate, appropriate, refute, or reinterpret European science since the late sixteenth century. Their approaches and efforts varied. One of their more significant interpretive strategies was the so-called Chinese origins theory, which asserted that Western learning had originated in ancient China and had been transmitted to the West only later. This interpretive strategy functioned as a double-edged sword. It was used, on the one hand, by conservatives to belittle Western learning by arguing that ancient Chinese sages had attributed no great value to such lesser knowledge and had contentedly let it pass into oblivion. On the other hand, many Chinese intellectuals wielded the theory to domesticate an alien knowledge system. According to this view, if European science had originally come from China, it should be possible to discover elements of this knowledge in ancient Chinese texts. This assumption led to a surge of interest among Chinese scholars in recovering and restoring ancient knowledge. They developed powerful scholarly tools for reading ancient texts, combining history, philology, antiquarianism, and textual criticism. Their achievements are impressive. Employing the new scholarship, they reconstructed and expanded on lost traditions in mathematics, geography, and astronomy; they also nurtured a new attitude toward experiential research. The Chinese intellectuals thus developed their own discipline of science or natural studies, and they brought certain branches of Chinese science to a new height in the late eighteenth century.

The role of Protestant missionaries in introducing Western science to China in the nineteenth century is less studied than that of the Jesuits, though the literature on the topic in Chinese is rapidly increasing. Elman emphasizes the Protestant missionaries' contributions. In the second half of the nineteenth century, British and American Protestant missionaries played a significant role in translating (or co-translating, as it was always a collaboration between them and their Chinese associates) Western books in science and engineering.

They were also active in publishing periodicals that regularly carried articles on scientific subjects. A few of them even switched careers and joined the translation offices established by the Qing government. As in the Jesuit era, however, there were notable gaps in the knowledge filtered through the Protestant missionaries. One obvious gap was Darwinism. The missionaries never translated major texts in Darwinism and rarely mentioned Darwin's theory in their own writings. They adhered to natural theology. When Chinese intellectuals learned about Darwinism (broadly defined) in the 1890s, chiefly through translations by a Chinese educated in Britain, they embraced it with fervor.

The introduction of Western learning into nineteenth-century China was not simply a foreign and missionary effort. Starting in the 1850s, the Qing government and Chinese intellectuals launched their own initiatives. The government opened arsenals, shipyards, mining industries, and Western-style schools. Local elites organized associations for studying Western learning. Modern historians have tended to underestimate the achievements of these efforts, especially the reform enterprises of the Qing government. Elman attributes this tendency to the long-lasting influence of the "failure" narrative of Chinese science, which arose as a response to the Chinese defeat in the Sino-Japanese War in 1895. By reexamining the famous naval battle in that war, Elman challenges the conventional view that Japan had succeeded in modernizing itself while China had failed. He insists that Qing reformism had been as successful as that of Japan in introducing Western science and technology. What ruined China in the Sino-Japanese War, according to Elman, was its dysfunctional military organization. The defeat shocked Chinese intellectuals and many foreign observers, and it prompted them to read the outcome back onto prewar developments. The history of Chinese industrialization and of Chinese science and technology in the Qing became a teleological narrative of failure.

One suspects that Elman's bold reinterpretation will spur scholars to reappraise Qing reformism. Perhaps, however, there is also an increasing possibility that a new, and equally misleading, triumphalist narrative of Chinese science will emerge in the near future. As China and other East Asian nations gain prominence in many areas of scientific research, there might be a nationalistic or Sino-centric drive to chart a trajectory from past glories to present successes. Elman is aware of this possibility, and he indicates that what we ultimately need is, perhaps, a global narrative of science across cultures and societies that also takes full account of local variations and differences.

On Their Own Terms is without question a magnificent achievement. Elman masterfully synthesizes a wide range of sources and recent scholarship as well as presenting much original research. Given the enormous erudition displayed in the book, it might seem ungrateful to ask for more. But I wish Elman had said more about natural history. The Chinese produced an immense amount of literature about their natural environment, including plants and animals, during this period. It would be interesting to learn how this intellectual tradition fits into the picture that Elman has so admirably reconstructed.

The book reads well for its extraordinary scope and depth; readers will require no prior knowledge of the history of Chinese science to follow the narrative.