

justice to the details without getting bogged down in them. She has a knack for bringing excitement to topics such as the method for finding lunars to determine longitude, or the correction of computational errors in nautical tables (an important plot point).

Many early American corporations were characterized by haphazard business procedures, ad-hoc record-keeping, and lax oversight. As the mode of business evolved from flexible, informal and personal relationships towards more impersonal transactions, it became necessary to systematize business practices and to keep careful and standardized records. At the MHL, Bowditch implemented a vision of the corporation as an impartial, impersonal bureaucratic “machine,” introducing clear administrative structures, systematic record-keeping, and the use of blank printed forms to record transactions. As a trustee at the Boston Athenaeum, he greatly improved the organization of the book collection, and he also engaged in rather ruthless political maneuvering to remove those he considered guilty of sloppy management, both at the Athenaeum, and as a fellow of Harvard’s governing board, where he forced the resignations of several faculty and administrators, including a president.

From this aspect of Bowditch’s activities, Thornton draws out the overarching theme of the book: that the mathematical prodigy Bowditch was driven to apply the methodical principles of mathematics and science to the world of corporate organization, and in the process, “transformed the world of practical affairs” and “changed American life.” While this serves as an interesting device for binding the narrative together, it is neither wholly convincing, nor really necessary to make the book interesting. Many early corporations struggled to deal with a variety of agency problems, and similar modernizing organizational changes were implemented in both public and private institutions on both sides of the Atlantic. Bowditch was certainly an early leader in this effort in Boston, but it is not clear that approach to corporate organization was truly unique, or that his influence spread beyond the few organizations with which he was involved. Moreover, although he is at times represented as insisting on iron adherence to rigid, impersonal rules, the book also makes clear that in practice, the rules were often applied flexibly—even by Bowditch—and that the use of personal relationships, and privileged treatment for the well-connected, remained the norm throughout this period. Ultimately, it is not clear to what extent Bowditch should be viewed as a visionary innovator rather than as an interesting exemplar of a broader trend.

Either way, however, any reader interested in early American life in general, and particularly the development of early American corporations, will find this engaging and deeply researched biography an enjoyable and rewarding read.

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ASIA

The Age of Gunpowder, China, Military Innovation, and the Rise of the West in World History. By Tonio Andrade. Princeton and Oxford: Princeton University Press, 2016. Pp. IX, 432. \$39.95, hardcover.
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This is a well-written and well-edited book. Its author evidently is familiar with the specifics of his topic as well as with the broader debates for which it can be made relevant. He provides a balanced mix of small facts and large issues and has clear

theses without being too combative or dismissive. He himself suggests that the book's "unifying theme" would be "gunpowder warfare" (p. 2), but its scope actually is broader.

The book consists of four parts. In Part I Andrade shows that the Chinese not only invented gunpowder, as is widely known, but also successfully used it for warfare, which is often ignored. In Part II he shows how Europe got the gun and why and how Western Europe and not China developed gunpowder artillery. This led to a brief "small divergence" to the advantage of Europe over the fifteenth century and the first two decades of the sixteenth century, after which China quickly caught up in its conflicts with Portuguese forces.

I have no comments with regard to the content of the first two parts of the book, which deal with topics far outside my expertise. The focus of my review is on its second half in which the link between military innovation and the rise of the West is explicitly discussed. In Part III, which focuses on the seventeenth century, Andrade presents his thesis that Chinese military forces were on a par with forces from the West, and he substantiates it by pointing at the outcomes of direct confrontations between them. Actually, he only discusses Chinese and Korean confrontations with Dutch and Russian military forces, which he then describes as "Sino-European infantry battles" (p. 195) or even "Sino-Dutch" and "Russo-Qing" wars (p. 311). In fact they were just skirmishes in which the number of "Europeans" involved never surpassed a couple hundred, and who, in all but one of the four cases discussed, confronted a larger number of Chinese and Koreans. I doubt whether analysing such skirmishes provides a good basis for general conclusions about Chinese or Western military power and efficiency. Even more so as on two occasions it was Korean musketeers who played a central role in defeating the Western opponent, not the Chinese. What Andrade does show is that the Chinese had an unbroken tradition of drilling, including the volley technique applied to gunpowder weapons, since at least the 1300s. This technique in the early modern era thus was not typically and exclusively Western.

What in any case is hard to square with Andrade's parity thesis is the fact that all exchange between the West and China, from the seventeenth century onwards, was one-directional, that is, from the West to China. Andrade's claim that "Everyone was adopting and adapting from everyone" (p. 301) in this case simply doesn't seem to apply. He moreover admits certain Western advantages: for the Dutch in shipbuilding techniques and sailing against the wind, and for the Dutch and the Russians in the way they constructed fortifications.

As do many China scholars, Andrade regards Qing China till the 1760s as militarily very successful. Here too some qualification is in order. Their successful campaigns against the Zunghars (1755–1759) are usually regarded as the major feat illustrating Qing China's military strength. The entire Zunghar population, however, numbered an estimated 600,000 people and their weapons were not very advanced. It would have been very strange if the Qing hadn't won. The logistics involved in the campaigns were certainly not beyond Western capabilities. According to Andrade a military gap between China and the West only opened from the mid-1700s. By the First Opium War Britain's military edge was overwhelming. That gap and what China's rulers did or did not do against it, is the subject of Part IV of the book.

China's backwardness clearly showed in military hardware. Here Andrade attributes a key role to developments in Western science that had no equivalent in China, in particular in the field of ballistics. But China's disadvantage was not confined to hardware. According to Andrade, the country also wasn't prepared for any serious conflict for lack of practice. There simply were no conflicts threatening enough to trigger major

innovation. Here again some qualification is in order. There were some real wars in this period that did not go well for the Qing. Emperor Qianlong's four expeditions into Burma (1765–1769) were a disaster, and his Vietnam expeditions (1788–1789) were not exactly successful. The results of the second invasion in Nepal (1791–1792) militarily speaking were also unimpressive. None of this led to any reforms. In 1809–1810, the Qing government had to ask the British and the Portuguese to help them suppress piracy in the Southern China Seas. Over the entire period from the 1760s until the 1840s, government hardly did anything to modernise their army or navy. It was not just a matter of money. Military expenditure in China over the first half of the nineteenth century *decreased* and was only a fraction, in real terms per capita and as a percentage of GDP, of that of Great Britain. Negligence, arrogance, and unwillingness also played their part.

Even the First Opium War, at least initially, failed to function as a wake-up call. By the second half of the century though, a broader movement of self-strengthening emerged. As Andrade shows, that movement was certainly not unsuccessful when it came to military hardware. The Chinese lost the war against Japan because they fought poorly and had no unified military command. Their fundamental problem was not technical or ideological but institutional. Resources often were scarce but I would want to emphasize, more than Andrade does, that this was not because China's government spent so much but because it had so little revenue, much less as a percentage of GDP than Western states or Japan. The Qing state had *always* been weak in terms of revenue, number of officials, or soldiers. As long as it had no strong opponent that was not a big problem: now it was. Andrade shows that efforts at reform became increasingly ad-hoc and de-centered, and that policies were often changed. No fundamental transformation took place. Of its army, for example, hundreds of thousands banner troops had become nearly useless but China's government kept on paying or at least supporting them. When at the end of the nineteenth century the Gunpowder Era was over, Qing China still was not reformed but had, as the New York Times claimed, become "an anachronism" (p. 296).

Andrade's book may at some instances be somewhat too revisionist in discussing China's military innovations and strength, but it will certainly and deservedly become a landmark in debates about military divergence and convergence in world history.

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The Economic History of China: From Antiquity to the Nineteenth Century. By Richard von Glahn. Cambridge: Cambridge University Press, 2016. Pp. vii, 461. \$99.99, hardcover; \$39.99, paper.
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As Richard von Glahn points out in the "Introduction" to *The Economic History of China: From Antiquity to the Nineteenth Century*, there is currently no other comprehensive English-language survey of China's economic history. For more than 40 years, Mark Elvin's *The Pattern of the Chinese Past* (Stanford: Stanford University Press, 1973) has effectively served as the point of entry despite never being intended to play that role (pp. 3, 7). *The Economic History of China* is intended to serve as just this type