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REVIEW

Robert Temple, *The Genius of China. 3,000 Years of Science, Discovery, and Invention.* New York: Simon and Schuster, 1986.

This book is rather like a birthday present that fails to live up to the promise of its elaborate wrapping. One picks it up for the first time with great anticipation. It is beautifully printed, with an attractive layout that creatively interweaves text, illustrations and captions. The abundant illustrations, many in color, are well reproduced. Even the size of the book feels right: large enough to accomodate the illustrations but not so large or so heavy as to prevent its being held open comfortably in one hand. Very little else about the book measures up to these first impressions.

The introduction, entitled "The West's Debt to China," promises with a breathlessness that recurs all too frequently to let us in on "one of the greatest untold secrets of history," namely that "possibly more than half of the basic inventions and discoveries upon which the 'modern world' rests come from China." Westerners should not feel too bad about having been unaware of this, however. "It is just as much a surprise for the Chinese as for Westerners to realize that *modern* agriculture, *modern* shipping, the *modern* oil industry, *modern* astronomical observatories, *modern* music, . . . and even the essential design of the steam engine, all came from China." (p. 9, italics in original.)

In assessing those claims, the crux of the matter is of course how one interprets "all came from China." With some very careful qualifying, a case, if not always a very good one, can probably be made for most of them. But Temple is not very good at qualifying. He seizes with unabashed enthusiasm on any Chinese advance that might be seen to prefigure a later development in the west. In doing so, he all too often overstates or misstates the facts. Thus he mistakenly suggests, for example, that the Chinese had earlier invented mechanical clocks of the kind shown them by the Jesuits in the sixteenth and seventeenth centuries (p. 9), that modern Western navies came about "only by adapting [Chinese] inventions in one way or another" (p. 186); or that the fact that seven artisans worked on a lacquer cup of the Han can establish the existence of "something very like the modern industrial production-line" (p. 76).

What Temple fails to realize is that China's scientific and technological tradition, with its failures as well as its achievements, can command the respect of any unbiased observer, without uncritical cheerleading. Indeed, such an approach, especially when accompanied by an equally uncritical denigration of pre-modern Western efforts in science and technology (often referred to with adjectives such as "absurd," "pathetic," "embarrassing,") can easily become counter-productive, exasperating the reader.

Moreover, as historians of technology in particular have come to realize, the "who did it first?" theme is of limited intrinsic interest and can be seriously misleading, emphasizing a non-existent competition instead of highlighting what is distinctive and original about any particular technological tradition. In this case, it is clearly inadequate to provide the author with a sound integrating principle for this book.

The organization of the book is the first clue that the author may not have an adequate grasp of his large and complicated subject. One notes with some surprise that about the only rationale to be found for the arrangement of the major topics is that they appear in something close to alphabetical order: "Agriculture," "Astronomy and Cartography," "Engineering," "Domestic and Industrial Technology," "Medicine and Health," "Mathematics," "Magnetism," "The Physical Sciences," "Transportation and Exploration," "Sound and Music," and "Warfare"! Then, within these topics, individual inventions and discoveries are treated very mechanically in chronological sequence. This leads to an unfortunate scattering of topics that are best understood in connection with one another. For example, three unrelated topics intervene between the discussion of "Cast iron" and "Manufacture of steel from cast iron." Another seven topics separate "Manufacture of steel from cast iron" and "The 'Siemens' steel process." But then one suddenly wonders why these three topics appear under "Engineering." Or why "The mechanical clock" appears under "Domestic and Industrial Technology" and *not* under "Engineering" or, perhaps, "Astronomy and Cartography." Such anomalies abound and lead one to regret all the more the lack of an index.

To his credit, Temple makes clear his almost exclusive dependance on work done by Joseph Needham and on the contributions of his collaborators to the *Science and Civilisation in China* project. This is perhaps a case where the reviewer is justified in criticizing an author for not having written a different book. Because of its broad range of coverage, this book will almost inevitably be seen by the non-specialist readers for whom it was mainly intended as something of a history, presumably up-to-date and reasonably balanced, of the major developments in pre-modern Chinese science and technology. Yet that it most certainly is not. In part, this may be the result of Temple's arbitrary limitation of the materials he would draw on to write the book. Since the volumes of *SCC* began to appear in 1954, a great deal has been published on Chinese science and technology, much of it rendering their pathbreaking treatments obsolete. Temple's decision to ignore this more recent research makes many of his discussions already out of date.

This ignorance of current research, however, cannot fully explain the lack of balance that also characterizes this book. To take an egregious example: the reader wishing to learn about Chinese achievements in agricul-

ture is introduced only to some half-a-dozen advances between 600 and 100 B.C.E. (row cultivation, the iron plow, the rotary winnowing fan, etc.) It is as if there is nothing worth saying about the millennia preceding or following this admittedly crucial period. Yet the superb work of Francesca Bray, to which Temple presumably had access (it has since been published as *SCC* Volume VI.2), should have quickly disabused him of any such notion. One can only surmise that the absence of easy points to be scored for Chinese technology *vis-a-vis* the west, or perhaps a general lack of interest in agriculture despite its enormous importance in Chinese life and technology, led the author to ignore such crucially important topics as the original emergence in China of a self-sustaining agriculture and the rise of wet-rice agriculture.

Many other shortcomings limit this book's usefulness. Its illustrations (some in print for the first time) are striking, but in many cases one feels they were chosen more for their pictorial quality than for their ability to elucidate a technological point (e.g. the photograph of fireworks on p. 227). Many discussions that cry out for an illustration do not receive one (e.g. the reference to various kinds of wheelbarrows that appear in the *Ch'ing-ming shang-ho t'u* handscroll painting of 1125 [p. 85] or the description of composite inked squeezes [p. 111]). There are virtually no diagrams to explain the working of machines; some of the explanations, such as the discussion of the flamethrower (p. 231), are incomprehensible without them. The section on gunpowder and gunpowder weapons, with its mass of detail, will overwhelm all but the most assiduous of readers; it would have profited enormously from a chart similar to that found in *SCC* V.7, p. 4. Finally, much of the writing cries out for the efforts of a good editor. Anyone reasonably familiar with Chinese science and technology could easily have weeded out many technical errors, most minor, some not.

In conclusion, let me introduce something of a dissenting voice to these negative comments. I have just finished using this book as a text in my "History of Chinese Technology" course. I was happy to find that my students reacted more positively to it than I had expected. My conclusion is that, especially given the complete lack of any similar volume to be used in a course on Chinese technology, this book can be a useful tool provided the instructor is prepared to employ its materials selectively (rearranging and supplementing where necessary), and to provide the students in lectures and discussion with a broader framework for understanding the interrelationships of these discoveries and inventions in the context of Chinese society and history.

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