unqualified universal claims. Two slightly different chapters then follow. The first raises the large matter as to whether the notions of 'nature' and 'culture' are themselves universal, and he interestingly concludes that the latter may be but the former certainly is not:

> The evidence seems to me to tell against there being any innate apprehension of the domain of nature as such. The acquisition of some notion of culture or society, on the other hand, would appear to be the inevitable result of any process of social incorporation, and so, on that score, universal. (p. 149)

In this area in particular, however, it is necessary, as Lloyd stresses, to distinguish between words and concepts. Lastly, he tackles reason itself. 'What sense, if any, does it make to say that different human beings reason differently?' (p. 7). Here, the multidimensionality of the question is most obvious, though belief that there is or could be a single form of right reasoning, or for that matter a single thing called intelligence, shows remarkable persistence.

Roger Smith
Moscow

Francesca Bray, Vera Dorofeeva-Lichtmann and Georges Métailié (eds.), **Graphics and Text in the Production of Technical Knowledge in China**. Leiden and Boston, MA: Brill, 2007. Pp. xiii + 772. ISBN 978-90-04-16063-7. $149.00, $199.00 (hardback).
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The major contribution of this pioneering collection is that it describes the many social settings surrounding the ongoing uses and deployment of charts, plans and drawings, or *tu*, in premodern and modern China. Two principal aspects of *tu* come into focus: the ritual, symbolic and representational uses, which highlight the internal historical shifts in their significance; and the external relations between the *tu* and political power, the role of an emerging medium and artisans for inscribing *tu*, the immense impact of woodblock printing and illustration in China long before Gutenberg, and the modernist consequences of later encounters with the West. The eighteen essays successfully reframe the question of how technical knowledge and images using *tu*, when juxtaposed with written texts, jointly influenced the production of technical knowledge. Indeed, it now appears that the presence of *tu* signalled the emergence of a technical field in imperial China.

It is impossible in a short review to do justice to all of the individual contributions. These are organized into three parts. The opening essays in Part One focus on *tu* as forms of symbolic mediation and as magico-religious symbols, with the later essays describing the role of *tu* as textual diagrams. Part Two is concerned with the role of technical illustrations in picturing reality and in showing how the juxtaposition of text and image depended on the rise of print culture. The essays in Part Three address Western influences on the evolution of *tu* in the nineteenth and twentieth centuries. All the authors agree that the shared characteristics of *tu*, *hua* (picture or painting) and *xiang* (image or icon) encoded technical knowledge as 'templates for action' in a 'visual culture' with its own 'epistemological categories'. But one area of disagreement does emerge, reflecting our contemporary historiographical predicament. For over fifty years, following Joseph Needham, scholars have tried to explain why modern science, technology and medicine arrived so late in China. In this volume, for example, Peter Golas interrogates technical drawings to explain why China did not develop a self-consciously structured discipline of technical drawing, as in Europe. Others, as Francesca Bray's lengthy introduction notes, are not interested in why China did not follow the path of the West. Bray suggests that we may be better off asking how far China succeeded in achieving its own goals.

As this disagreement is of general interest, it is worth dwelling on here. Golas concludes that technical drawing never became a specialized skill or critical discipline in China, which he considers an impediment to future technological creativity. Nevertheless, he rejects Craig Clunas's

claim that the illustrated technical descriptions in Song Yingxing's late Ming *Tiangong kaiwu* (Exploitation of the Works of Nature) were for entertainment and not practical instruction. Golas explores who the illustrators were, the economic factors influencing their illustrations, and how their illustrative styles were reflected in the portrayal of technology in the *Tiangong kaiwu*. The precision in the text was not always matched by the illustrations. By contrast, Bray notes that Dagmar Schäffer has elsewhere described the *Tiangong kaiwu* as a moral statement, which had more of an affinity with the congruence of knowledge and action rather than simply representing a technical treatise. Donald Wagner adds to the discussion the fact that *hua* were usually attributed while *tu* were usually anonymous. He believes that the *Tiangong kaiwu* was based on earlier sources, most of which were reliable, but often they were not. Usually the texts and illustrations dealing with iron production, which Wagner focuses on, matched. In some cases, however, the text gave one method while the illustration presented another; in a few cases, the picture had nothing to do with any real methods for producing iron. Here, Wagner and others in the volume perhaps underestimate how tricky the technical drawings used by artisans are to read. Mechanical drawings, as my students keep telling me, are not simply read one way.

Other contributions lead in similar directions. Catherine Despeux's essay traces autopsy reports from 1211 and describes them as highly stylized renderings of the acupuncture channels in coroners' reports. She also shows that there were progressive improvements in these charts over time, driven not by advances in medicine and practice but by the cumulative experiences of forensic doctors. Their representations of the body were diagrams and not pictures; their aim was to avoid judicial error and not therapeutic. Iwo Amelung treats modern maps in China as symbolic enterprises for empire-building in the late nineteenth century. Their accuracy surpassed the Jesuit era when the Western impact on Chinese cartography was significant only within the precincts of the Manchu court. The shock of the Opium War, Amelung maintains, touched off a much greater alarm about the need to master Western knowledge. The large-scale surveys of the 1880s and 1890s enabled the Chinese to master Western surveying techniques and thereby to transform China into a modern nation.

Earlier studies focused on specialized forms of *tu* as maps or drawings of machines using modernist assumptions. In this volume, the premodern *tu* are identified in Chinese terms; that is, as a theoretical category of knowledge production that authorized visual guides for action, and spanned a wide range of material representations, from mandalas to modernist mapping projects. The *tu* were inseparable from writing, but they also transcended writing by invoking a distinctive power of communication made possible by the graphic nature of such representations.

In the 1950s and 1960s, Needham and others singled out Chinese 'technology' as a qualified success story up to 1600. They then took for granted the larger narrative of the decline of scientific thought in China after the precocious industrial success of the Song dynasty (960–1280), documented first by Robert Hartwell. Since then, many others have stressed the priority of artisanal practice in premodern China, but they naively assumed that past Chinese successes in technology were doomed to 'failure' precisely because they were purely practical. The essays here suggest that Chinese interests in technical knowledge were often as much theoretical as practical.

Benjamin A. Elman
Princeton University

Serafina Cuomo, **Technology and Culture in Greek and Roman Antiquity**. Cambridge: Cambridge University Press, 2007. Pp. xi + 212. ISBN 978-0-521-00903-4. £15.99 (paperback).
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In this splendid follow-up to *Ancient Mathematics* (London, 2001), Serafina Cuomo turns her attention to technology, a subject that is often considered to be on the opposite end of the spectrum of the history of ancient science. However, just as Cuomo earlier demonstrated that the