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.

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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

history of Graeco-Roman mathematics was far richer and far more socially embedded than traditional accounts have presented it, here she shows that ancient technology is similarly susceptible to contextual analysis, and that the results are rewarding and often surprising.

Like *Ancient Mathematics*, this book is organized chronologically, with a short historiographical introduction and a reflective conclusion flanking the five main chapters. It concludes with an invaluable bibliographical essay as well as a traditional bibliography and a brief index. It is not a comprehensive survey of the current state of the field – that can be found in the magisterial *Oxford Handbook of Engineering and Technology in the Classical World* (ed. John Peter Oleson, Oxford, 2008). Whereas Oleson exhaustively divides the subject technology by technology (so, tunnels and canals, coinage, information technologies and so on), Cuomo uses five very different case studies to play with different historiographical approaches and to consider 'how technical knowledge, activities and products were perceived and represented by the people involved', because 'any evidence we have comes through the filter of [ancient and modern] perceptions and representations – attitudes – to technology' (p. 3).

The introduction criticizes two hitherto prevalent attitudes to Graeco-Roman technology: the *blocage* assumption, which bemoans the ancients' apparent inability to fulfil the potential of their technological innovations, and the 'mainstream' view, which legitimates the marginalization of technology in ancient history by claiming that the ancients denigrated it too. The rest of the book brilliantly demonstrates the inadequacies and fallacies inherent in both.

Chapter 1, 'The definition of *techne* in classical Athens', looks at attitudes to medicine as technical knowledge in the fifth and fourth centuries BC. Cuomo persuasively shows that 'the main characteristics associated with *techne* and technicians – the ability to precipitate change and the ability to produce the useful and necessary – were by some perceived as dangerous and threatening to what we could call an aristocratic social order' (p. 39). In Chapter 2, 'The Hellenistic military revolution', she examines technological innovation in antiquity by looking at the newly invented catapult and the concomitant realignment of knowledge, training and ethics of warfare in the last four centuries BC. She concludes, 'as well as the military leaders taking on characteristics associated with *techne*, there are indications that the professional soldier and even the military technician absorbed virtues typically associated with the noble warrior' (p. 74).

The first two chapters listen carefully to the voices in a wide variety of written sources. By contrast, Chapter 3, 'Death and the craftsman', focuses on material evidence to access the mental and social worlds of non-literate practitioners. Here Cuomo examines the self-images of carpenters and their instruments on 'increasingly expensive and visible' Roman funerary monuments from the first century BC to the second century AD. In a conclusion that has important repercussions far beyond her immediate concerns, she reminds us that 'ancient technicians were not invisible to themselves or to their immediate peers' but their apparent invisibility is 'a consequence of selective blindness on the part of some observers, both ancient and modern' (p. 102). Chapter 4, 'Boundary disputes in the Roman Empire', contrasts self-presentations of land-surveyors in their technical writings and inscriptions with their portrayals by literary writers such as Seneca and Livy. For the latter, surveyors were 'guilty participants in the decline of humankind', while the practitioners themselves believed they were 'agents of rationality, in tune with the *cosmos*, but also bound by the necessities of negotiating diverse customers and masters' (p. 130).

Finally, in Chapter 5, 'Architects of late antiquity', Cuomo addresses the changing role and status of technicians arising from the spread of Christianity in the Mediterranean world from the third century AD. Christianity brought new power structures and hierarchies into conflict with traditional political power, so that the financing, location, appearance and management of religious building became 'a potential battleground' between Church and state (p. 161). Architects

became central figures in that spiritual warfare, designing churches as 'an image of the ordered universe created by God' (p. 155).

My Islamic art-historian partner snatched this book away from me mid-review, initially interested in the late antique architects, but then refused to give it back until he had devoured it all. This is not a common event in our household; it speaks volumes for Cuomo's ability to communicate far beyond her intended audience. She writes with an assured grasp of an enormous array of primary sources, and an evident fascination for and engagement with the people, objects and ideas she is discussing. She is also skilled in bringing out the complexities and complications of her material while never despairing of finding a clear route through. Like the ancient technicians, Cuomo has amply demonstrated 'the ability to precipitate change and the ability to produce the useful and necessary'. But even if you are an Athenian aristocrat, there is no need to feel threatened by this book and every reason to enjoy the new ways of thinking about past technologies that Cuomo so engagingly offers.

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David Sedley, **Creationism and Its Critics in Antiquity**. Berkeley and London: University of California Press, 2007. Pp. xvii + 269. ISBN 978-0-520-25364-3. £17.95 (hardback).
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Dazzled by Darwin, we tend to think of creationism as the opposite of evolution rather than of materialism more properly. This highlights how thoroughly creationism has become rooted in a biological context in the contemporary world. But it has not always been that way. Paley's watchmaker was no anti-evolutionary argument (how could it have been, in 1802?), and for most of its history, the argument from design was significantly broader than it is now generally taken to be, applying to weather, numbers or planets as readily as to platypus. And although many of the modern arguments go back in some form or other a long way indeed, David Sedley shows how the philosophical contexts of antiquity shaped the original versions of these arguments in ways that will be both refreshing and challenging to anyone with an interest in the modern debates.

Ancient philosophy and early Greek science emerge, in Sedley's compelling account, as deeply theological projects. One of only a handful of recent accounts to examine directly the theological aspects of ancient natural philosophy, this book interprets everyone from the Presocratics through Socrates, Plato and Aristotle, and then on to the Stoics and even (briefly) Galen. Although it is not unusual to see Empedocles acknowledged as a theological innovator, it is rather rarer to see the theological commitments at the heart of Socratic, Platonic and Aristotelian accounts of the natural world given full play. In Sedley's version of things, the ancient creationists were the side to beat, and he does a wonderful job of laying out the complex logical, ontological and teleological roots from which the ancient debates grew. When we do see strong anti-creationist arguments, as with the Atomists, Sedley goes to some length to undermine the modern reader's rather easy tendency to sympathize with their purely naturalistic account of causation, by showing how counterintuitive many of Atomism's core ideas were and are. The effect can sometimes be unnerving, as when the fundamental building blocks of the Atomist universe are shown – by an argument from first principles – to be identical in number and kind to the pieces in *Tetris* (my analogy, not Sedley's). To be sure, the point is only one step in a larger argument for a finite typology of atoms, but it does succeed in reminding us how foreign the reasoning behind Atomism could be. The particular point at issue in this instance is to show how Epicurean Atomism avoided one of the problems that plagued Democritus – a version of the old infinite-monkeys-on-infinite-typewriters puzzle, and one of the cornerstones of the argument for intelligent design. How on earth could something as spectacularly unlikely as this particular beneficial