

Dagmar Schäfer, *The Crafting of the 10,000 Things: Knowledge and Technology in Seventeenth-century China*, Chicago, London: The University of Chicago Press, 2011, 352 pp.

Roslyn Lee Hammers

[Roslyn Lee Hammers is an Associate Professor in the Fine Arts Department at the University of Hong Kong. She received her Ph.D. from the University of Michigan in 2002, and her area of research includes the depiction of labor and technology in the visual culture of China. In 2011 her book entitled *Pictures of Tilling and Weaving: Art, Labor, and Technology in Song and Yuan China* was published. Currently she is working on a manuscript that addresses Qing-era "Pictures of Procedures," imagery that sequentially frames the representations of technology in the production of various commodities. Contact: rhammers@hku.hk]

On page 131 of the book *The Crafting of the 10,000 things: Knowledge and Technology in Seventeenth-century China*, the author Dagmar Schäfer has asserted, "Knowledge contents are only one topic of discussion in the Chinese history of scientific and technological knowledge. A systematic approach addressing the changing rhetoric of knowledge-making in Chinese literature on subjects such as nature and material inventiveness, practices of observation and experiment is still in the nascent stage." In this claim, I believe, Schäfer lays bare one of the goals of her scholarship. She wishes nothing less than to sweep away the older approaches to the history of science which (with noteworthy exceptions) inevitably affirm the primacy of Enlightenment-based histories of modern science that are buttressed by claims to absolute truth. In this publication Schäfer has established a more nuanced and sensitive method to discuss the intellectual environment central to the formation of knowledge, the strategies deployed by various agents through which it is sustained, to then assess how and when it does or does not become canonized.

Her book focuses on the whole of the extant corpus of the late Ming dynasty scientist, Song Yingxing (1587-1666?), combining an analysis of texts that Schäfer has convincingly and deftly unified for the first time in scholarship. Most students and scholars of the history of Chinese science and technology are aware of Song's work titled *Tian Gong Kai Wu*, which in general has been translated as *The Exploitation of the Works of Nature*. Schäfer immediately sets out to reject such an unsatisfactorily static rendering of dynamic paradigm for the creation and revelation of existence that Song sought to articulate. Thus she translates the treatise as *The Works of Heaven and the Inception of Things*, underscoring the transformative process that things undergo in their very formation. The shift in the meaning between the two translations likewise serves to demonstrate Schäfer's thesis that

processes of inception and their interconnectivity within what members of societies construe as reality is a theme consistent in other writings of Song. Thus Schäfer investigates a larger scope of his writing with special emphasis on *Lun Qi* (On Qi), a discussion of the “reverberations” of *qi* in its manifestations of sound, particles, and primordial element among others.

Schäfer’s book serves as an invaluable and articulate example of scholarship that challenges established notions of science and contributes to the advance of the knowledge production in the history of Chinese. It is inevitable (or perhaps predictable) that at least for now and in the near future, new publications on the history of science in China evoke and respond to the expansive accomplishments of Joseph Needham and his collaborators in their monumental work *Science and Civilisation in China*. As other scholars have observed, Needham’s project was motivated by a desire to understand why China, given its rich legacy of the creation of seemingly “modern” technological phenomena (papermaking, printing, gun powder, compass and so on), failed to establish modern science until late in its history. As we gain distance from Needham’s own historical context, we can position his premise as informed by the impact of the Cold War and its vying claims over varying ideologically charged models of modernity (in both science and culture). While Schäfer wisely does not directly address this context, she nonetheless pushes back from imposing modern constructions of science onto Song’s texts and instead she recreates Song’s historical environment in which he invented a new location or system for scientific inquiry. Song and his intellectual approach is thus illuminated as an alternative arena for the inscription of scientific knowledge in seventeenth-century China. While Song’s writings and indeed his era are not easily accommodated in definitions (or teleological narratives) of the development of “modern” scientific thought and technology, Schäfer draws him into the traditional lineage of scientific thinkers by pointing out that his modes of thinking, the strategies he uses to understand things share parallels with Kepler, Galileo, and Descartes albeit shaped by different cultural perceptions (92). Schäfer successfully demonstrates how Song explicated technology in terms of his era in order to recover the complexities of his thinking without exiling him to the periphery of scientific history.

Schäfer’s research is to be commended for its broad exploration into the ideas and intellectual climate of Song Yingxing. As students of Chinese history are aware, the occupations of Chinese society historically were tidily divided into four large groups: the officials/scholars, the farmers, the artisans, and the merchants. In traditional histories of the Ming, we hear about the officials, the scholars and even the merchants, who in spite of their lowly standing parlayed their finances to establish claims to elite

status via officialdom or cultural patronage. The farmers toil in the background of these histories, either ploughing ceaselessly under the best of conditions or rising up in rebellion during the worst. The artisan and his or her relationship to those scholars or officials who wrote on crafts or technology in the Ming are generally absent. Schäfer calls attention to this lacuna and casts light on how the elite who may or may not have written about the labours of the artisans were unable to appreciate their technological skills or specialized knowledge. Schäfer raises such questions as “Who were the artisans? How did they produce the ten thousand things?” and concedes that at present we only know enough to answer such inquiries with rough sketches. These are fascinating issues, and Schäfer’s scholarship will inspire further research.

Not only content to consider Song Yingxing’s textual record alone, Schäfer also investigates the implications of the imagery or *tu* that was included in *The Works of Heaven and the Inception of Things*. Her discussion of the content of the images associated with the production of silk fabric is highly insightful, drawing upon classical theories of government as it intersects with associations of the proper functions of looms and the production of fabric. Schäfer through considered interpretations enlivens the content of the technological-informed images and thankfully does not interrogate them for what many have described as their lack of accuracy. She acknowledges that tensions may exist between the images and text given our expectations for some cohesion or correspondence that arise from our post-Ming perspective (149). Such a sensible re-evaluation of the importance of accuracy in representation is most welcomed by this reviewer.

Schäfer’s handling of the *tu* as a category of imagery incorporates earlier research by Francesca Bray and others. The term *tu* in conjunction with technological content may be defined as a blue print or “template for action” (142). This notion has merit, but *tu* without overt technological or scientific material historically in China has had a much broader domain and may be best translated simply as “image.” For this reviewer it is unclear if the category of *tu* with technological information is a heuristic device, or if historians of science and technology are attempting to define the parameters of technologically-informed *tu* as a period term. If the latter is the case, then what constitutes technological information? The term *tu* has been by applied by its contemporaries to paintings of views of the Qing-era ‘Yuanming Yuan’ or Garden of Perfect Brightness, Song-era illustrations of the *Classic of Filial Piety*, and even to a Song-handscroll of the famous poet Tao Yuanming’s (365-427) poem *Returning Home*. In these instances – and this is not to suggest all – *tus* are often accompanied by text that the images may represent with varying degrees of fidelity to depicting

the contents of their verse. This is to say a *tu* can be a highly imaginative interpretation of its accompanying text. It may or may not have technological information. In many cases the *tu* does not. Nonetheless if we accept images with scientific or technological content as *tus*, as templates for action, does this mean illustrations or diagrams that tell consumers how to connect computers to televisions also constitute *tu*? Are these kinds of technological images, as *tu*, simply visually-based instructions, imagery designed to reveal to us what we need to see and then do if we want the computer, society, or the government to function properly?

My concerns about the nature of *tus* aside, Schäfer's scholarship is outstanding; her writing is lucid. She has a knack for telling stories and for explaining with clarity complex ontological and epistemological concepts that cross cultures. It seems a shame and a disservice to her research that primary Chinese quotes were not reproduced in her publication. I realize this may be a limitation imposed upon by the press, but given Schäfer's innovative approach to the materials, it would have been very satisfying to have the Chinese text along with her translations. Nevertheless, Schäfer's research opens up many avenues for further study, and will serve as the methodological model for scholars who investigate histories of science in all regions, especially if they, like Schäfer, are attuned to the complementary interactions among science and culture and the resulting complexities that collectively consolidate the production of knowledge.