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Pamela O. Long. *Artisan/Practitioners and the Rise of the New Sciences, 1400-1600.* Corvallis: Oregon State University Press, 2011. xii + 196 pp. \$22.95 (paper), ISBN 978-0-87071-609-6; ISBN 978-0-87071-647-8.

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The Scholar/Craftsman Debate Renewed

In the middle years of the twentieth century, historians and sociologists began a discussion of the role of craftsmen and craft knowledge in the creation of the new sciences, or the scientific revolution. Marxist scholars such as Boris Hessen, Edgar Zilsel, and members of both the Vienna Circle and the Frankfurt school argued that the transformation in natural knowledge in the sixteenth and seventeenth centuries was caused by the new skills and knowledge of superior artisans, and the interaction between artisans and humanists. This is often called the Zilsel thesis, although many other thinkers contributed to its articulation. Pamela Long, in *Artisan/Practitioners and the Rise of the New Sciences, 1400-1600*, helps to revitalize this thesis for a new generation and argues effectively that these artisans or practitioners were a necessary component in changing attitudes towards nature, evidence, and experimentation. In other words, according to Long, the superior artisans she investigates influenced the methodology of the new sciences and acted as a meeting place (a trading zone) for both practical and scholarly knowledge.

Long begins with a nice introduction to the historical debate. She takes us through the Marxist tradition of Hessen and Zilsel, which began with an emphasis on the materialism of scientific change and moved to a sociological explanation over time. For Hessen, the machines of the early modern period (and the steam power of the industrial revolution) led to particular scientific theories,

while for the Frankfurt school and Zilsel, the social interaction of those who understood and used machines (the superior artisans) was the trigger for scientific change. Long then examines the critiques of this position, from Robert Merton to Alexandre Koyré and Rupert Hall, who saw scientific change as philosophical and intellectual, rather than instrumental. Finally, Long argues that Thomas Kuhn began the new emphasis on the social (although I believe Kuhn is more of an internalist than Long supposes) and sees the constructivism of the Edinburgh school leading to a modern reemergence of theories of the connections between scholar and craftsman.

Long moves from historiography to an overview of changing attitudes towards art and nature in the late Middle Ages and early modern period. Long traces the changing attitudes towards the arts, from low-status trades to artisanal crafts with high prestige. Aristotle, influential throughout the Middle Ages, had seen art as having two different and somewhat contradictory attributes: first, inferior to nature and imitative; second, completing or improving on nature. This latter characteristic allowed, for example, the study of alchemy. By the period 1400-1600, Long argues, the second emphasis of completing nature was gaining popularity. At the same time, attitudes towards nature itself were changing, as natural philosophers began to argue that nature could be understood and controlled through experimentation or manipulation. In other words, Long suggests, art and

nature were becoming more similar and connected and empirical values were becoming generally adopted in this early modern period.

In her strongest chapter, Long investigates scholars and practitioners influenced by the Vitruvian tradition. She argues that an interest in Vitruvius brought together people interested in the theory and practice of design, building, and antiquity. Scholars achieved skill, craftsmen achieved scholarship as they studied and discussed design. In fact, she argues, the labels "scholar" and "craftsman" do not really work in this context. Rather, both existed in the same person. Long claims this differentiates her argument from Zilsel's. That is, while Zilsel argued that scholars and artisans met as individuals engaged in a conversation or collaboration, Long maintains that it was the interaction of artisanal and humanist culture itself that changed interpretations of nature. I disagree with this representation of Zilsel; he emphasized the role of the "superior artisan" who often combined practical skill and humanistic theory in the same person (think of William Gilbert). With that small criticism, however, this is a wonderful chapter. Long has made a great contribution through her discovery of the importance of Vitruvius to a wide group of scholars, artisans, and patrons and makes an effective argument that this tradition served as a catalyst for communication and exchange between scholarship and skill.

Long then uses the concept of "trading zones," first developed for history of science by Peter Galison, in order to understand how the interaction between handwork and headwork might have worked. She points to arsenals, mines, and the Renaissance city (in her case, Rome) as sites for these trading zones. Earlier work in

this area has looked instead at coffee houses, book sellers, and instrument-makers' shops, so Long introduces some very interesting alternatives. The problem is that evidence is hard to come by, so there is more assertion than proof in this chapter. She also puts this together with several examples that look more like patronage. For example, she has a very interesting section on the work of the architect Palladio, who made friends with many important and rich patrons. On the flip side, she examines the scientific and craft interests of two important aristocrats, Julius, duke of Braunschweig-Wolfenbüttel, and Alphonso d'Este of Ferrara. Unquestionably all three examples show us important communities of knowledge and interest around skilled craft work and theoretical constructs. But were all contacts between experts and non-experts "trading zones"? Or does this fit into the more common notion of patronage?

Long has produced a lively and engaging book. Her thesis, that "artisans influenced the methodology of the new sciences that developed from the mid-sixteenth century" is persuasive, if not always fully proven (p. 127). But this is a book for non-specialists, based on her lectures as Horning Visiting Scholar in the Humanities at Oregon State University, and it works well as an accessible introduction to these issues. She shows that there was substantial interchange between scholarly and craft ideas, sometimes within a single individual, sometimes within communities of knowledge and practice. Practitioners gained humanistic knowledge; humanists and natural philosophers gained empirical and practical skill. For Long, it was this interaction that facilitated the development of the new sciences, a hypothesis with much merit.

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