Artisan/Practitioners and the Rise of the New Sciences, 1400–1600
by Pamela O. Long

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Pamela Long's latest book, a fleshed-out series of lectures that she gave as the visiting Horning Professor of Humanities at Oregon State University in 2010, comprises yet another impressive collection of scholarship and helps develop our understanding of early modern technology and those who made it. For those who know Long's earlier work, this serves as an updated bookend of her ongoing arguments about the role of books in the transfer of knowledge and the making of authority in the early modern world. It goes farther than her *Openness, Secrecy, Authorship* [2001] in that it begins to get at the relationship of artisans and nature, a relationship enfolded in the changing knowledge of the 15th and 16th centuries, that is, in Humanism and the rise of what we now call Baconian (empirical) science. As she puts it, hers is a clear argument that 'artisans [did] influence the methods of the new sciences' [127] and thus an argument in favor of the Zilsel Thesis (and, incidentally, for the Merton Thesis as well). The book, however, does show its origins as guest lectures for non-specialists in that Long has to rehearse the field in order to engage it. In such a small work, one might wish for greater engagement.

First, it should be said that this is a book modest in size but grand in vision. The main text, which is only 130 pages in length, offers a historiographical survey and chapters on three substantive topics, each chapter being so densely packed and moderately illustrated that it has only about 30 pages to develop its arguments. At times, there is a tension within a chapter, a vacillation between making a strong argument and providing a bibliographic survey (often describing in some great but disproportionate detail neglected treatises that Long wishes to highlight), with the consequence that fascinating insights often seem to pass by almost as asides. At the same time, Long is

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constrained by virtue of her project to 'just getting going' on topics that we know are dear to her (e.g., obelisks) and then truncating the discussion with a pithy conclusion. In the process, if one side of the story is missing, it is that of the non-learned participants whose views are most difficult to unearth. Consequently, while the arguments are reasonably fleshed out, they are not deeply examined. That is certainly acceptable, since the book's stated goal is not to be an exhaustive archival investigation of artisanal practice (more on this concern anon). Still, the need to cover so much ground and the attendant need to cite sources, especially the *printed* treatises of the period, left me with one major concern: though Long wants to argue about artisans' views of nature and production, the body of evidence that she uses is overwhelmingly from non-artisans. To overstate the case: it is like asking the 1% what they think about the 99%—and we know (or think we know) how that would work out. This is not to say that in either situation we fail to get an overall view of the terrain. But, we do not, I think, get down to the real details of artisanal practice.

But this criticism should not obscure the fact that this is an excellent introduction to the field and exactly the book that I would give to graduate students or advanced undergraduates in a survey course of the history of technology of early modern science in order to engage in the current scholarly debate about knowledge, epistemology, and practice. For the key component of *practice*, though, one would certainly need to go further and more subtly to make headway. This is exactly how the book could be useful as a grounding for research papers and projects.

The title of the book holds the key to one element of Long's argument that she herself does not foreground: she uses the term 'artisan/practitioner' to describe a class of skilled artificer in early modern times as a conscious way to move the discussion beyond, for example, E. G. R. Taylor's 'mathematical practitioner'. She extends that category more broadly (beyond just mathematics) and down the ladder as well. Having to use such a clunky locution as 'artisan/practitioner'—so clunky that I am immediately motivated to contract it to an acronym; but 'A/P' would be even worse[1]—highlights what a tough task this is going to be. That there is no word for these people—'artisan' is not enough nor is 'practitioner' or 'crafts(wo)man', 'artist', or even a phrase with some adjective modifying any of these—demonstrates that the

[1] Note that it must have a virgule, not a hyphen

divide that Long is seeking to bridge is apparently an intractable part of our language and an unbridgeable conception of vocational denotation. As she puts it, 'Shoemakers and university professors still lived and worked worlds apart in the late sixteenth century, as they had in the twelfth' [128]—to which I would add that they still do and perhaps never have not.

Long's 'artisan/practitioners' include the breadth of 'men and women who worked with their hands in craft production' such as 'carpenters, weavers, instrument makers', farmers, and navigators [4]. In effect, the artisan/practitioner is almost anyone who works with his or her hands, though perhaps slightly more restricted than that: those who do not maintain autonomous control over their creations (e.g., stable boys, farm hands, and carters) are probably excluded. Long is making an argument about skill, the physical world upon which people ply it, and ultimately to how their understanding of that work fed back into the Scientific Revolution. This might seem like a tall order given that she appeals to Copernicus, Galileo, and Newton in her opening pages. Indeed, one criticism of the book would be that she does not manage to close the gap between those two realms fully. Her arguments, however, help us to see how that gap can at least be narrowed and may in some cases be even bridged by the thin sutures of the diverse understandings of nature held by artisan/practitioners.

In attacking her problem, then, Long resorts to a form of study at which she is so masterful: extracting readings about artisan/practitioners from manuscript and published treatises on the manual arts from the 15th and 16th centuries and tying those to the products made by her artisan/practitioners. She pays especial attention to those who rose in the ranks high enough to leave traces of their work in those treatises (raising that thorny question of how representative the Leonardos, Fillaretes, Fontanas, or Michaels of Rhodes really were). Her argument seems to be that Humanism provided the truss-work to bridge the divide in that it encouraged elite authors to pay attention to the mundane world and practices as well as inspiring her artisan/practitioners to seek discourse above/beyond/outside their sociocultural circles. Long would seem to credit this to the rise of courtly patronage both for the arts, which it had always supported, and for scholarship, which had long been the domain of ecclesiastics, a point that deserves explicit statement and emphasis.

The first chapter is crucial for the understanding of the entire historiography of the scholar-craftsman debate, though for those for whom 'historiography' is a dirty (or at the very least, dry) word, the choice to open the book with this topic may seem odd and/or dangerous. Most academic books bury historiography within topical chapters or append it to their work but Long courageously opens with an extended analysis of where the 'Zilsel thesis' came from, who Edgar Zilsel (1891–1944) was, his influences, where he taught, and later manifestations of the thesis. It is a dense chapter but I found myself thinking throughout this chapter, 'Oh, so that is how they are connected!' and her explication not only of the various scholars' intellectual positions but also of their personal histories and affiliations helped to make sense of the nuances in their theoretical frameworks. To understand, for example, that Zilsel, Hessen, Borkenau, and others were not just Marxist historians (as one might find in any social sciences department today) but rather self-declared Marxists who undertook historical study in order to develop and critique their contemporary society helps one to understand why their focus on the proletariat was not only novel and interesting but also empowering to their program.

Chapters 2–4 are the core of the work's early modern history. They cover, first, the rise of empiricism in the investigation *and* manipulation of nature for purposes of craft; second, the intersection of artisans and humanists by using the very broad case study of the influence of Vitruvius; and finally, harnessing the idea of 'trading zones' to suggest how these influences and attitudes circulated. That last concept—circulation (or 'production and exchange' as it is described in ch. 4)—seems to be the key idea that Long wants us to understand and encourages us to investigate. It is not just how *A* influences *B* but how *B*, having been influenced, affects *A* (and generates *C*, *D*, and *E*) to change the entire culture. Knowledge of nature and the mechanical arts thus become a sort of intellectual currency and the exchange rate tips in its favor as new consumers start 'purchasing' new ideas and artifacts. This circulation may happen on an immediate timescale at an arsenal, for example [see ch. 4], or over time as print editions of treatises circulated and new editions were developed. Daniele Barbaro's edition of Vitruvius' *De architectura* [121–123] is a good example of this latter situation. Long shows how he collaborated with Palladio to generate both his commentary on Vitruvius as well as Palladio's *Four Books of Architecture*. Both men demonstrated a noted attention to the crafts and thus brought the high theory of architecture

more into contact with the building trades. Long, first and foremost a scholar of books, is much more attentive to practitioners who try to raise themselves into the literate sphere, though there is a great deal of work to be done on the inverse process (as, for example, when Emperor Maximilian I proves to be an avid woodturner). Long also misses a great opportunity to 'close the loop' as we say these days in assessment, in that she might well have also noted that a decade before his *M. Vitruvii de architectura* Barbaro had worked on editions of Aristotle and a *Compendium scientiae naturalis* (1545), both by his great uncle Ermolao Barbaro (1453/54–1493), an instance of the full connection between the artisan/practitioner, the humanist, and the Aristotelian *cum* Zilselian natural philosopher. In fact, Ermolao may be more important than usually recognized since he began the active critique of ancient empirical knowledge in his *Castigationes Plinianae* (1492) by pointing out thousands of errors in Pliny's *Natural History* in much the same way that Thomas Browne did later during the Scientific Revolution in his *Pseudodoxia epidemica or Enquries into Very Many Received Tenets and Commonly Presumed Truths* (1646).

The last chapter is the most convincing and relevant to this reviewer. In it, Long does a bit of her own circulation of ideas by borrowing Peter Gallison's idea of 'trading zones',[2] an idea that he developed to talk about microphysics and the researchers working in modern theoretical and experimental physics. (This idea was itself transferred from science and technology studies by people like Bruno Latour and derives from the archaeological literature of *êntrepots* and the history of colonial trading ports like Portuguese Goa in the 15th century or Swedish Birka in the 11th or Danish Hedeby/Haithabu or Ribe in the eighth). As such, it is a fairly straightforward application of an existing concept in the history of science. But Long nicely gives some examples of particular cities or areas within cities (arsenals, for example) which functioned as trading zones where artisans, practitioners, artisan/practitioners, humanists, and princes and rulers—oh, and do not forget the clerks—intersected on specific technical undertakings, thus learning to speak their own and each others' languages.

It would be worth considering, though, what it was about these 15th- and 16th-century trading zones that catalyzed the revolution in empirical science, when similar trading zones (e.g., medieval cathedrals, Roman *fabricae*,

[2] See Gallison 1997 and the extension of this idea in Collins, Evans, and Gorman 2007.

or even Egyptian building yards) had not done so in the past. It is clear, though, that more modern industrial settings such as iron foundries, chemical factories, aircraft assembly plants, and, consistently, military arsenals have indeed served quite admirably as trading zones in the way that Long describes. The one seemingly forced element of the chapter is her attempt to make printed treatises such as the early modern editions of the *De architectura*, *De re metallica*, and the *Pirotechnia* into the pidgin/creole languages of trading zones [125–126]. This is an interesting suggestion but one needing more work.

If there is one general criticism that I would level at *Artisan/Practitioners and the Rise of the New Sciences*, it is that Long relies too much on printed treatises as evidence for the attitudes of the artisan/practitioners, most of whom were most certainly not circulating in the requisite social sphere. She sometimes remains strangely silent on the authors' rhetorical intent in their printed texts, leaving open the implication that the texts all performed similar functions. What is worse is that she sometimes conflates their purposes without proving the case, as when she claims that

> books on mining, ore processing, and metallurgy were written for princes and a far-flung group of investors…[and] set out many technical processes in written form.…The books described with great clarity technical operations and equipment [and included] illustrations…essential for *making complex machinery comprehensible*, but they also made the mechanical arts of mining and metallurgy dramatically *appealing to the unskilled*. [112, emphasis added]

It would be fascinating to find a miner who needed the text or the illustration to make his machinery comprehensible (she is conflating audiences) and it is unclear how gorgeous woodcuts alone make machines themselves more appealing (she is imputing causality). In addition, it is not at all clear that the audiences for 16th-century mining texts would have been 'far-flung groups of investors', as information on specific mines of bodies of ore is rarely evident in these texts.

When one considers the book as a whole, it is very satisfying for a short book. The problem is that at times it tries to satisfy two audiences: one which has very little exposure to early modern technical treatises and another which wants to learn of the deeper connections within the topic. The latter group is clearly the audience for the opening historiographical chapter but the very placement this chapter as the first seems rather strange for a book

whose later chapters are introductory. Whether this was the author's choice, the publisher's idea, or somehow a consequence of the book's being the culmination of a series of lectures is unclear. What is clear, though, is that that initial chapter may, I fear, prevent less invested readers from reaching the much more engaging and important heart of the book, which would be a shame in a survey of the state of the field that shows Long at her best. This work offers a faster entry to the topic than her book of 2001 and one that does not pursue a single argument through more than a millennia of technical treatises. Its tight chronological focus, which still encompasses work on both sides of the Alps, makes it a very useful introduction to the entire field of artisanal labor and products within the humanistic and courtly sphere of early modern Europe.

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