

Matteo Valleriani (Editor). *The Structures of Practical Knowledge*. xii + 491 pp., figs., illus., indexes. Cham, Switzerland: Springer, 2017. €119.59 (cloth). ISBN 9783319456706.

Some sixty years ago, A. Rupert Hall introduced us to “The Scholar and the Craftsman in the Scientific Revolution” (in *Critical Problems in the History of Science*, ed. Marshall Clagett [Wisconsin, 1959]), arguing that each played a distinct role. Artisans were concerned with hands-on, mechanical, chemical, trade processes, which provided particular technical fodder that scholars might digest and transform into more generalized conceptions about nature. Hall viewed craftsmen as peripheral, passive providers of data and experiential methods; the scholars were learned, active philosophers who performed experiments, mathematically analyzed nature, and expounded theories. Implicit in this view were distinctions in social class, education, and “high” and “low” culture. Since Hall’s essay appeared, historians of science have shown that his boundaries between scholar and craftsman are hard to maintain in the development of early modern science. For instance, scholarship since the 1980s on mathematical practitioners illustrates how scientific instruments have bridged the gap between abstractions and utility as well as elite and popular producers and consumers. *The Structures of Practical Knowledge* carries on in this tradition but deepens the reader’s understanding of the false dichotomy between practical knowledge and theoretical knowledge.

Matteo Valleriani opens the book with a discussion of the epistemology of practical knowledge. He defines practical knowledge as knowledge that follows a defined workflow in order to achieve a certain outcome. The workflow might be a construction procedure, a recipe, or an algorithm, and its product might be an artistic or mechanical artifact, a healing practice, or a mathematical result. From a formal point of view, Valleriani considers all workflows to be equivalent to one another. His thesis is that all practical activities are characterized by a structure of knowledge that developed over time from new habits and workflows to make a product more efficiently. This practical knowledge is also socially structured, because it arises in the context of economic organizations, labor rules, and social environments. The social and product-driven structures of practical knowledge ultimately become codified in drawings, descriptions of workflows, models, workshop manuals, and sometimes published treatises. Once codified, different areas of knowledge can be compared, traded, and integrated. This leads to knowledge systems becoming more abstract, from which follow new conceptual structures of knowledge. The rest of the chapter continues in this dense vein with further discussion of structures of practical knowledge, forms of codification in their social context, the economy of codification, and the rise of more general, conceptual structures of knowledge.

Readers might ask why they should care. The answer is this: If we are to accept the entanglement of the work of the craftsman and the scholar in the development of early modern science, we need to explain how practical knowledge became relevant to and was blended into natural philosophy and why it happened when it did. According to Valleriani, the codification of practical activities in the form of texts, drawings, and models increased during the early modern period. Their circulation enabled the creation of shared conceptual structures of knowledge that linked heterogeneous theoretical and applied fields together, so as to build the new knowledge systems of modern science.

Even if the first chapter is too jargony and abstract for some readers, they will likely enjoy the fifteen case studies that follow. These stretch from early modern Europe to eighteenth-century China, covering topics as diverse as architecture, brewing, theater design, gunnery, mining, glass production, cartography, printing woodblocks, and applied astronomy. The other contributors are Elizabeth M. Merrill, Elaine Leong, Viktoria Tkaczyk, Jochen Büttner, Sven Dupré, Eileen Reeves, Pamela O. Long, Wolfgang Lefèvre, Dagmar Schäfer, Ursula Klein, Pietro D. Omodeo, Richard L. Kremer, Pamela H. Smith, and Bruce T. Moran. Deploying original research, each author introduces the reader to a remarkable cast of lesser-known actors (many “amphibious” between spheres of theory and practice) as they investigate how, why, when, and by whom a type of practical knowledge was codified and structured. Valleriani, the volume editor as well as a

contributor, has arranged the essays in accordance with the epistemology of practical knowledge that he presented in the opening chapter, but each essay can stand alone.

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Guillaume Carnino; Liliane Hilaire-Pérez; Aleksandra Kobiljski (Editors). *Histoire des techniques: Mondes, sociétés, cultures (XVIe–XVIIIe siècle)*. 604 pp., bibl., index. Paris: Presses Universitaires de France, 2016. €32 (paper). ISBN 9782130736431.

Liliane Hilaire-Pérez; Fabien Simon; Marie Thébaud-Sorger (Editors). *L'Europe des sciences et des techniques: Un dialogue des savoirs, Xve–XVIIIe siècle*. 553 pp., illus., figs., indexes. Rennes: Presses Universitaires de Rennes, 2016. €22 (cloth). ISBN 9782753551732.

L'Europe des sciences et des techniques: Un dialogue des savoirs, Xve–XVIIIe siècle aims to propose a history of knowledge that allows a dialogue between science and technology, whereas they used to coexist either, at best, in ignorance of each other or, at worst, in mutual disdain. This lack of dialogue says more, indeed, about conceptions of knowledge, viewed as conflictual, than about the reality of scientific work. This important book addresses a major problem. What would a history of knowledge look like if it had to do without what constitutes it: the materiality of science and techniques or, on the other hand, abstract theory of science (including its heuristic potential in experimental contexts)? The book answers by highlighting the reality and the fruitfulness of these exchanges in history.

The introduction reminds us of the steps of the integration of the history of techniques into the general history of knowledge (i.e., its inscription in science studies, its cultural turn, and the material history of knowledge), and the book is built around four axes, punctuated by a thematic focus.

The first part is devoted to analysis of the status of experience, gesture, and actors. First, the aim is to present different dimensions of *experience*. This can sometimes mean “what one experiences for oneself” (Vesalius and Bacon) in seeking to push back the limits of knowledge, to superimpose the types of knowledge (by adding the autopsy to the *auctoritas*) and thus to make science a “hunt for the secrets of nature” (Cardano). The meaning of invention (Jaucourt) is modified: repeated essays (Leonardo's drawings) or techniques of improvement are brought to the fore. Sometimes experiment is experimentation, as in the “laboratory of Nature”: operative knowledges (“recipes” of Nature) are put forward, as are the expert eyes of collectives (academies). Thus, the idea of Nature moves from occult power to a system of laws. The gestures are linked to scientific instruments in order to highlight a craftsman's intelligence (Galileo's telescope, John Arnold's watch) or to enhance the epistemic reach of the dissection of bodies and to make room for the actors: the figure of the scientist, the amateur, the learned woman—but also craftsmen, hybrid but invisible players in modern science, at least as compared to the later visibility of engineers (relations between knowledge, know-how, and powers).

The second part of the book focuses on the specificity of spaces of knowledge production: laboratories between sciences and arts, urban places of knowledge (e.g., the Observatoire de Paris), and the evolution of specialized collections, from curiosity cabinets to museums, draw the contours of a Republic of Sciences. This Republic of Sciences prescribes and follows an ethic of the community of scholars, thus con-