further reading, Harison's book has provided a rich and fascinating history of Paris that is both scholarly and easy to read. Seated in social and cultural history, he shows sympathy for the working people of Paris as well as the undergraduate reader.

Leslie Page Moch

*Michigan State University*

**The Italian Renaissance of Machines.** By *Paolo Galluzzi*. Translated by *Jonathan Mandelbaum*. The Bernard Berenson Lectures on the Italian Renaissance. Cambridge, MA: Harvard University Press, 2020. Pp. xiv+276. $39.95.

This book derives from the Bernard Berenson Lectures on the Italian Renaissance that Paolo Galluzzi, director of the Museo Galileo, the museum for the history of science in Florence, delivered at the Villa I Tatti, the Harvard University Center for Italian Renaissance Studies in the same city. It builds upon Galluzzi's oeuvre on the history of machines and mechanics from Leonardo to Galileo: numerous publications as well as major exhibitions in the Museo Galileo (formerly the Museo di Storia della Scienza) and other venues in Florence (Palazzo Strozzi) and Siena since the 1990s. Galluzzi is a prominent voice in marking and rethinking the importance of the Italian Renaissance "artist-engineer" in the history of science and technology, following in the footsteps of the Italian historiographical tradition initiated by Leonardo Olschki. At the same time, however, Galluzzi engages with the most recent international scholarship—among others, Wolfgang Lefèvre's work on drawings of machines at the Max Planck Institute for the History of Science in Berlin, Martin Kemp's seminal publications on Leonardo bridging the history of art and science, and Pamela Long's work on artisans, authorship, and the Vitruvian tradition in the Renaissance. The book is an authoritative introduction to Galluzzi's scholarly achievement, making it accessible as a reference work to an international English-language reading audience, while at the same retaining stylistic traces of the vividness of the lectures.

The book is divided into three chapters. While chapter 2 focuses on Leonardo and chapter 3 emphasizes the work of Galileo, the first chapter, making up about half of the book's length, shifts attention from the big names and the main center of Florence to two less well-known Sienese artist-engineers, Taccola and Francesco di Giorgio Martini. With this shift of focus Galluzzi does not just intend to contextualize Leonardo and Galileo within a much wider universe of artist-engineers and their production as authors. On the basis of the literary production of these Sienese artist-engineers, he also shows that these fifteenth- and sixteenth-century manuscripts containing textual descriptions and drawings of machines are not a homogeneous set. According to Galluzzi, it is necessary to recognize the diversity of the artist-engineers' production as authors and to make distinctions in the content, iconography, and audience of the manuscripts. He convincingly argues that Taccola's manuscripts do not belong to the genre of presentation works for patrons, nor are they workshop notebooks. Remarkably, Taccola did not seem to be interested in the physical construction of the machines, and in his manuscripts he never presented himself as their inventor. Rather, Galluzzi concludes, Taccola considered himself to be part of the humanist movement, and "his works show his ambition to restore dignity, social visibility, and authority to technical literature" (22). He strove for recognition not as the inventor of machines but as the inventor of a renewed literary genre inspired by the technical writings of antiquity. Indeed, one of the key arguments throughout the book is about the importance of Vitruvius's *De Architectura* to the Italian artist-engineers. In

chapter 2 Galluzzi shows that Francesco di Giorgio Martini's authorship emulated the admired model of the Roman architect. Consequently, Francesco "assigned a central role to machines and technical devices, establishing a balanced relationship between them and a set of precepts, rules, and insights of fundamental importance for the theory and practice of architecture and for understanding the nature of man and his place in the universe" (87–88).

Another line of argument is about the diversity of the visual production of the artist-engineers and the necessity of making distinctions between the different ways machines were represented in their fifteenth- and sixteenth-century manuscripts. The book is lavishly and beautifully illustrated, but the images are not just there as eye candy for the reader: they are inherent to the argument and an object of investigation in themselves. These images were not just eye candy in the Renaissance either, nor were the manuscripts of the artist-engineers coffee table books. In Taccola's *De ingeneis*, images occupy the whole of two facing pages while the textual description is confined to the next page, clearly showing how textual descriptions had become marginal and the images were meant to speak for themselves. Taccola also kept to the principle of one machine, one drawing inherited from Villard de Honnecourt and Guido da Vigevano. Therefore, paradoxically, for intelligibility the Sienese artist-engineer needed to distort his drawings of complex machines, adopting a "multifocal approach" integrating multiple viewpoints in one drawing of the machine so as to make all its internal and external parts visible. For this purpose, Francesco di Giorgio Martini invented the graphic convention of presenting the machines inserted in open boxes drawn in perspective. Galluzzi thus not only underscores the diversity of drawings of machines but also reveals the development of visual representations of machines. Initiated by Leonardo, the time-honored principle of one machine, one drawing was abandoned.

In chapter 2, Leonardo's visualization of machines takes center stage. Galluzzi argues that Leonardo adopts an "anatomical approach" as he shifts away from the one machine, one drawing principle toward a focus "on the limited number of basic mechanisms whose diverse combinations yield a variety of devices" (108). To this end, Leonardo adopts a wide array of methods of visualization in combination, from linear perspective drawings to exploded views to geometrical diagrams. Remarkably, in his later anatomical drawings executed after 1500 he applied these graphic conventions first developed in the context of depiction of machines. For Leonardo, drawing was a way of thinking, as it allowed him to visualize a level of reality beyond the sensory appearances. This is a conception of drawing in line with his mature vision of science as an inspiration for practical applications, but not one based solely on practice and experience. In chapter 3 Galluzzi makes this development of a vision of science culminate in Galileo's relentless criticism of the impossibilities presented in the lavishly illustrated *Theatres of Machines*, and in the absolute primacy of geometrical diagrams in Galileo's *Two New Sciences*. Between Leonardo and Galileo, Galluzzi forcefully points to the role of the sixteenth-century editors of Vitruvius's *De Architectura*, Fra Giocondo, Cesare Cesariano, and Daniele Barbaro, who praised the skills of the new generation of artist-engineers as essential to their interpretation of Vitruvius's work. Crucial to their expertise was *machinatione*, which they differentiated from craft know-how, and which Barbaro characterized as a "rational activity . . . that first takes place in the mind and then dictates the rules that govern construction processes" (180). In sum, in this book, Galluzzi shows that the Renaissance of machines was actually the birth of *machinatione*.

Sven Dupré

*Utrecht University*