

BOOK REVIEW

Marco Beretta and Paolo Brenni, *The Arsenal of Eighteenth-Century Chemistry: The Laboratories of Antoine Laurent Lavoisier (1743–1794)*

Leiden: Brill, 2022. Pp. 425. ISBN 978-90-04-40869-2. €199.00 (hardback).

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Antoine Lavoisier's scientific instruments have been a constant source of historical interest for many years. Many of the apparatuses utilized in Lavoisier's laboratory at the Paris Arsenal were notorious for their expense and complexity and the novel claims generated using them. Marco Beretta and Paolo Brenni's *The Arsenal of Eighteenth-Century Chemistry* presents a catalogue of known instruments from Lavoisier's laboratories and collections along with an excellent historical introduction, a list of Lavoisier's instrument makers, and five historical inventories of Lavoisier's apparatus. Although attempts to inventory Lavoisier's surviving instruments began in the 1950s, this book represents the culmination of a twenty-year project by historian Beretta and scientific instruments curator par excellence Brenni, who sadly passed in 2021, before the book was published.

The heart of the book is a catalogue of Lavoisier's surviving instruments and apparatus from the Musée des arts et métiers, which acquired the instruments in two large acquisitions in 1864 and 1952. As the authors note, this collection is the largest and arguably the most important collection of chemical instruments from the eighteenth century. Each of the several hundred entries in the catalogue contains a curator's description of the instrument, including a date of construction, the maker's name (if known) and, in most cases, one or more photographs of the item. The instruments range from the mundane, such as folding rules (p. 183), to complex apparatus, such as Lavoisier's gasometers, which he used in his water synthesis experiments (pp. 340–5). The more noteworthy items, such as the gasometers or Lavoisier's and Pierre-Simon Laplace's calorimeters (pp. 229–32), receive additional description and explanation regarding how they worked and their historical context. The collection also includes a number of instruments not used for chemistry, such as astrolabes (pp. 200–3), Leyden jars (pp. 254–6) and various pieces of meteorological equipment, which suggests the wide range of Lavoisier's scientific interests.

Beretta's 113-page introduction provides an excellent overview of the changing nature of Parisian chemical laboratories in the eighteenth century, the development of the Parisian instrument-making community and Lavoisier's contributions to both of these things. As Beretta points out, Lavoisier conducted chemical research and analysis in many locations – in the field, at several of his residences, at several hospitals in Paris, at the Académie royale des sciences – but his most important laboratory, and the focus of this collection, was the facility at his residence at the Paris Arsenal. Because the arsenal buildings no longer exist, Beretta uses historical maps and visitors' accounts to reconstruct the laboratory's

location and layout. Since Lavoisier worked with numerous collaborators, Beretta characterizes the laboratory as a 'collaborative experimentation site' (p. 40). These collaborators included artisans, engineers and younger, ambitious men, who constructed the specialized and often novel apparatus he required. Beretta notes that, as late as 1770, Paris did not host any specialized artisans who fashioned chemical equipment. Rather, chemists and apothecaries purchased their equipment from workers in traditional trades, such as ceramicists, glazers and so on. Lavoisier helped establish the instrument maker's trade in Paris, by employing younger men, such as Nicolas Fortin, who began as an assistant in his laboratory, but who later established a successful atelier as a chemical and philosophical instrument maker. Beretta argues that training younger chemists and artisans was an important part of Lavoisier's system at the arsenal. Most helpfully, following the introduction, Beretta included an appendix (the last of six) which presents a biographical dictionary of Lavoisier's instrument makers and chemical suppliers.

The introduction also examines the role of novel instruments in Lavoisier's evolving research programme and addresses questions regarding their cost and complexity. Beretta shows how Lavoisier's network of collaborators, philosophical and artisanal, allowed him to modify apparatus continually during the course of a series of experiments. As an example, Beretta maps out the evolution of Lavoisier's gasometers from an earlier device, hydrostatic bellows, as his research progressed towards his water synthesis experiments (pp. 39–41). The final apparatus, assembled from many discrete pieces of equipment, was a complex and expensive device. Beretta argues that Lavoisier believed that his experimental results from this complex apparatus were seen as more convincing, compared to those made by others with simpler apparatus. However, Beretta challenges the view that Lavoisier's instruments were prohibitively expensive for even established chemists and experimental philosophers. While individual apparatus could be quite expensive, Lavoisier's one-time assistant, Armand Séguin, reported that Lavoisier spent only a small fraction of his admittedly large income on laboratory equipment (p. 83). Additionally, Beretta asserts that the value of Lavoisier's laboratory equipment as assessed in 1794 was commensurate with the value of other large laboratories of the time, such as that of Antoine Baumé.

The Arsenal of Eighteenth-Century Chemistry provides an excellent resource for anyone interested in Lavoisier's laboratories, his collaborations with instrument makers or the material culture of late eighteenth-century chemistry and natural philosophy. Beretta's introduction is worth reading by itself, bringing together extant work and offering some useful insights. The instrument catalogue is informative and indicative of the range of Lavoisier's work and interests. Finally, the volume contains so many wonderful illustrations that it could easily double as a coffee-table book. In addition to the photographs of instruments, Beretta and Brenni have included dozens of drawings, paintings, maps, plates and portraits of Lavoisier, his collaborators and their world. This is perhaps the most impressive collection of images relevant to the Chemical Revolution in one book. Overall, Beretta and Brenni present a fine resource for the history of eighteenth-century French chemistry from a material perspective.