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Simon Werrett. *Thrifty Science: Making the Most of Materials in the History of Experiment.* Chicago: University of Chicago Press, 2019. 304 pp. $45.00, cloth, ISBN 978-0-226-61025-2.

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In *Thrifty Science* Simon Werrett builds a complex and significant role for thrift in early modern science. Indeed the themes examined in the book, which include maintenance, expense, and the design of experiments, can be applied to almost any history of science and technology, in any period. Werrett explores how everyday household objects, materials, and spaces were embraced in experiment and the pursuit of knowledge. This approach is a welcome new addition to the history of early modern science, which typically associates this period with the emergence of a more practical and structured experimental science, characterized by specialist laboratories, practitioners, and instrumentation. While Werrett does emphasize that these were a key feature of experimental science and that there continues to be a significant place in history for specialist apparatus such as the air pump, he shows that the new science also embraced less obvious materials and spaces. Many of the practitioners we associate most closely with the "Scientific Revolution," including Robert Boyle, Isaac Newton, and Robert Hooke, exemplify how knowledge could be elucidated from all manner of materials and situations. The "thrifty science" at the heart of Werrett's exposition is broad in its definition, encompassing reuse, innovation, repair, and changes in ownership. Further, this thrift was more than an exercise in saving money. Indeed if this were the case then Robert Boyle would have had little desire to make do and mend.

On Werrett's analysis, thrift is closely tied to key values arising in the early modern literature of household economy, which refers to the everyday running of the household. We learn that the lines between the home and science were often blurred, and experiments often arose from observations of seemingly mundane situations. A particularly effective example is Werrett's depiction of Robert Symmer's electrical experiments being inspired by Symmer's observations of the electricity produced when taking off his black stockings. A chapter dedicated to the household further demonstrates how domestic and laboratory space could be thought of collectively. A tour through a large English house of the period shows how different rooms were useful for different practices. That early modern experimenters had laboratories and equipment in their homes is not a particularly new observation and Werrett does situate himself within the existing literature. But by focusing on the materials and conditions in these specific rooms he provides further emphasis on the home as a site for science. Furthermore, Werrett's approach enables us to get a sense for how women, who are largely absent from the main forums for scientific practice and dissemination of

the period, such as the Royal Society, contributed to natural philosophy.

A particularly exciting theme in the book is that of the Baconian "polychrest." Francis Bacon described "polychrests" in the *Novum Organum* (1620) as instances which had many potential uses and to that end could benefit a thorough and wide-ranging scientific enquiry while also enabling potential savings in labor. Bacon, as Werrett does clarify, did not equate basic household observations with his *Great Instauration*, which was a detailed and structured proposal for scientific practice. Yet the concept of polychrests did embody the value that mundane and everyday materials should be the subject of scrutiny. It is not only novel or exotic materials that have the potential to reveal new uses or knowledge when studied according to the rigor of his experimental methods. Werrett draws on this Baconian observation throughout the book, even proposing that the concept of sustainability itself may be considered a polychrest. This term provides a useful way to conceptualize the potentially multiple concurrent uses and meanings that are embodied in single objects, materials, and places. It also emphasizes that while thrift was not necessarily typical or even essential for early modern experimenters, it did tie in with the core values of some of the most influential natural philosophers.

The book's scope falls largely within the seventeenth and eighteenth centuries, and a thematic division of chapters explores aspects of thrift including the household, reuse, repair, maintenance, and changes in ownership via auction houses. In the final chapter and conclusion Werrett brings the book up-to-date following a brief exploration of the science of the nineteenth century, eventually leading to "big science" characterized by large, costly, and highly specialized experiments. Comparisons of early modern thrift with contemporary values that increasingly emphasize sustainability help to bring Werrett's book to an apt conclusion. Werrett draws important connections between modern understandings of thrift—in relation to the household as well as in technological spheres. And while he does not paint both modern and early modern thrifty science as the same, he does successfully show that these values as they relate to science are not necessarily new, and have a surprising and revealing past.

As a topic that focuses on the varying uses and values of materials, apparatus, and spaces, Werrett's points have particular impact when coupled with illustrations. The book does draw on a broad range of figures that includes, for example, artworks and trade cards. A photograph of a porcelain dish that bears visible signs of use and repair was simple but made a large impact in explaining how different materials could have their use-life prolonged using a variety of methods—both basic and specialized (p. 116). If I were to raise a minor complaint about the book, it would be that it could have drawn slightly more on museum objects as case studies to illustrate the points about materiality made so well in writing.

Overall, Werrett's book is well researched and well executed, using a wide range of primary sources and secondary literature. *Thrifty Science* is a valuable contribution to the literature in the history of early modern science, and provides an important approach to the materials, places, and values that were so central in the experimental sciences, which prioritized a blend of theory and practice. It is critical to remember that early modern experimenters could, and did, make use of almost anything.

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