technologies were a necessary element in the construction of planetary astronomy, are we beginning to diverge from the consistent humanism of the Cambridge HPS approach, and towards the actor-network theory of Bruno Latour? Awkward historical counterfactuals whisper quietly: could a different form of astronomy have developed amongst these media? One might also take issue with Nall's ruling out of science-fictional sources and angles on the Mars question; historians of science have recently begun to show a permeability, perhaps even a necessary connection, between science fiction and fact. This permeability concerns what is thinkable, what is desirable, and is moreover deeply implicated in shared and specific forms of media. Excluding such sources seems a little arbitrary and difficult to sustain. Without them, we are ill-placed to parse the latest Martian fatuity, namely the recent suggestion, from apparently serious scientists (Stephen Hawking), that the solution to ecological collapse on Earth may be the colonization of Mars. Please, not that question again.

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Richard J. Oosterhoff, **Making Mathematical Culture: University and Print in the Circle of Lefèvre d'Etaples**, Oxford: Oxford University Press, 2018. Pp. 304. ISBN 978-0-1988-2352-0. £65.00 (hardback).
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At the turn of the sixteenth century, Paris pullulated with colleges providing guidance and material support to university students as they went through their formative years. One such institution, the Collège du Cardinal Lemoine, stood out for its teaching staff and its vibrant intellectual life. The main architect of Lemoine's reputation was Jacques Lefèvre d'Etaples (*c.*1455–1536), a classic example of Renaissance polymath and regent master of the college for seventeen years. In that capacity, Lefèvre developed a reform programme in defence of mathematical education at a time in which the scientific status of mathematics was still being discussed. At Lemoine, Lefèvre was not alone but could count on his circle of trusted friends and students, most notably Charles de Bovelles and Josse Clichtove. Together with them he crafted innovative printed textbooks that changed the way mathematics was taught in the university classroom, and contributed to the rise of mathematics as one of the leading scientific disciplines.

This is the history told by Richard Oosterhoff in his book, which follows up numerous articles and a doctoral dissertation on the same topic. In keeping with the idea that Lefèvre's reform project was more of a team effort, Oosterhoff compiles a diversity of perspectives and gives voice to all the parties involved – master and students alike. As a result, the reader not only learns about the intellectual journey that led Lefèvre to embrace mathematics as a scientific and pedagogical model, but also has the opportunity to peek into his classroom and see how his views were received by his students. The opportunity is provided by a collection of manuscripts and heavily annotated printed books owned by a student of Lefèvre's, Beatus Rhenanus. Oosterhoff skilfully manages to turn this group of heterogeneous writings into a coherent whole, thereby shedding new light on what happened within the walls of the Collège du Cardinal Lemoine under Lefèvre's regency.

Traditional histories of mathematics tend to depict the Renaissance as the transitional period that led to the mathematization of science. But how did this transition exactly happen? Oosterhoff answers this question by looking at the way Lefèvre's 'analogical' (i.e. cross-disciplinary) conception of mathematics paved the way for the host of mixed mathematical sciences that flourished in the seventeenth century. In the process, Oosterhoff reassesses the role of textbooks and universities, two elements that have often been associated with cultural conservatism and the defence of the status quo. On the contrary, Oosterhoff claims, it is through their textbooks (which were meant to meet the needs of the university classroom) that Lefèvre and his circle blurred the disciplinary boundaries of the medieval quadrivium. The argument runs through six

chapters. Chapter 1 introduces the themes of the book and raises the question of why the initiatives of the Fabrist circle are relevant to the history of mathematical culture. Chapter 2 traces Lefèvre's reform ideals back to their origins: the mystical teachings of Ramon Llull and Nicholas of Cusa (in addition to the Platonic heritage of Italian humanism). Chapter 3 is written from Beatus Rhenanus's standpoint and outlines the strategies (e.g. note taking, mnemonics, etc.) developed by Renaissance students to deal with the copious amount of literature that the humanistic call *ad fontes*, combined with the rise of printing, contributed to make available. Chapter 4 takes us into the printshop in which Lefèvre, spurred by his students and relying on their support, invented a series of original textbooks characterized by their collective authorship and their rich apparatus of paratexts (i.e. tables, diagrams, etc.). Chapter 5 shows how Lefèvre's practical and multisensory approach to the study of mathematics – involving the use of measurement instruments and computational tools alongside the textbook – made a contribution to the advancement of mixed mathematics, more specifically music and cosmography. Speaking from a post-Koyrean perspective, Chapter 6 illustrates how Lefèvre's sympathy for practical mathematics was fully compatible with a classic yet refined Aristotelian mindset instead of being opposed to it. The epilogue of the book follows Lefèvre away from the university classroom by mapping out his legacy.

The major strength of *Making Mathematical Culture* is that it helps situate the history of mathematics within the broader field of the history of knowledge and cultural history. Too often the history of mathematics has been seen as a tale of brilliant minds, as a linear sequence of breakthroughs, one leading to the other. Apart from the obvious teleological bias, what this view fails to acknowledge is that not everything in the history of mathematics is about mathematics. The concrete and historically embedded practices in which mathematical knowledge was produced and circulated also deserve our attention. This is so not only because similar issues have been explored in closely related fields, such as the history of the book or social history (and it is now time for the historian of mathematics to take advantage of this existing scholarship), but also because an enquiry into the modes of production of mathematical knowledge can help us solve the question of how mathematics became the foundational science that we know today. Chapter 4 of Oosterhoff's book, exploring the invention of the mathematical textbook, is exemplary in this respect. Building on, among others, Ann Blair's pioneering studies on the rise of note taking and Anthony Grafton's research on the making of the printed book, this chapter shows how Lefèvre's wise use of paratexts led to the creation of innovative textbooks aiming to facilitate the students' access to mathematics through a 'collating' approach. In Oosterhoff's opinion, it is this approach – 'a back-and-forth movement between compressed and expanded accounts, between concise elements and their discursive explanations' – that 'deepens the significance of Lefèvre and his little band to the long tradition of methodical reflection that carries through Peter Ramus to René Descartes, and more generally through the German encyclopaedists' (p. 120). The same tradition gave us the idea of a universal mathematics (or *mathesis universalis*) underlying all sciences.

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JoAnne Yates and Craig N. Murphy, **Engineering Rules: Global Standard Setting since 1880**. Baltimore: Johns Hopkins University Press, 2019. Pp. 440. ISBN 978-1-4214-2889-5. $64.95 (hardcover).
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Standards are strange beasts: they are everywhere and pervasive and, at the same time, largely invisible. In a messy and imperfect world, standards enable us to rely on aspects of the world behaving in expected and predictable ways. They are thus often so deeply embedded in everyday life that only a minority of the most obvious ones sometimes become noticeable, especially if they