

Practical Matter: Newton's Science in the Service of Industry and Empire, 1687–1851.
By Margaret C. Jacob and Larry Stewart. Cambridge: Harvard University Press, 2004.
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Reviewed by Thomas J. Misa

In the opening pages of *The Lunar Men*, Jenny Uglow's recent popular history of the Birmingham scientific society whose membership numbered such industrial luminaries as Matthew Boulton and Josiah Wedgwood, none other than Erasmus Darwin (a physician-poet, early evolutionary theorist, and grandfather of Charles) describes his joy in scientific experiments as "a little philosophical laughing." In Uglow's pages, science is the glue that binds together these varied gentlemen, odd-ball clergy, upstart industrialists, and wacko Romantics. In science they find wonder and astonishment, they find demonstration of a rational and knowable world, and they find clues to clean up their dirty cities; in the background you can hear the hiss and clang of a Watt steam engine. It is a colorful world, where science is a prominent thread in the tapestry of culture. By contrast, Jacob and Stewart's *Practical Matter* tries to press the whole of post-Newtonian science into the strict service of utilitarian industry and the project of empire. The fit is an uneasy one. Scholars following up on Joel Mokyr's *The Gifts of Athena* (2002), or seeking lecture examples of early industrial technologies influenced by science, should probably instead look to the mother lode, A. E. Musson and Eric Robinson's classic *Science and Technology in the Industrial Revolution* (1969).

Part of what makes this a difficult book is that Margaret Jacob herself, in earlier work, has already stolen much of its thunder. She has written extensively on the underlying question of how science gained its cultural clout in the Western world (p. 3). The approach here—as well as in Jacob's earlier *The Cultural Meaning of the Scientific Revolution* (1988) and *Scientific Culture and the Making of the Industrial West* (1997)—is to link scientific advances to economic changes and political challenges. It is a view of Western modernity in which science, technology, and economic growth are of a piece (p. 60). Jacob and Stewart do not claim that Newton *created* his science because of, or in response to, the imperatives of the commercial era all around him: the problems of ocean

navigation, weights and measures, administering the nascent nation-state, or improving industry. But they do forcefully argue that the widespread *adoption* of Newtonian science was strongly conditioned by such practical applications. There is little philosophical laughing in this book.

The empirical core of the book treats a number of fascinating topics, summarizing Jacob's long-standing interest in science and English politics and Stewart's writings on public science. If you can unzip the straitjacket of the book's thesis, you can find inside a marvelous and multidimensional view of science and culture. Beyond the scientific elites of the Royal Society, where Newton himself reigned as president (he was elected in 1703), there is an entire world of clubs and taverns and coffeehouses, where the latest commercial news buzzed alongside the latest scientific discoveries. The authors hazard several bold hypotheses about how the particular political and religious situation in late-seventeenth-century Britain "set the stage" for the acceptance of Newton's science (pp. 21, 74). In subsequent decades, a profusion of local clubs, societies, and associations (including one Dutch club expressly for women) created a huge and enthusiastic audience for scientific demonstrations. There is the immensely entertaining world of London lecturers, who pressed mechanics and electricity into the service of public spectacle and polite learning. In the middle of industrial London was the Spitalfields Mathematical Society, established in 1717, with its sizable library and cabinet of experimental apparatus for scientific demonstrations. While focused for the most part on British sources, there are asides exploring the French Newtonians, the German and French university systems, and numerous educational reform efforts. Then, just when utility seems surely to be losing its explanatory power, one hits a conjecture that stops the laughing and returns the narrative to the business at hand: "that British education in mathematics was superior . . . must be seen as one part in the complex story of why Britain industrialized first" (p. 58). And "the outpouring of scientific lectures . . . , regardless of content, . . . served the purpose of sustaining social stability" (p. 71).

Even considering that Jacob and Stewart end their treatment with the Crystal Palace exposition of 1851, just as British imperialism in India was really gearing up, the book has only limited glances at how "empire" conditioned science and culture. The treatment deals mostly with the Europeans' great (pre-Newtonian) voyages of

exploration. For example, “we realize that Newton’s achievement can be tied to the vast increase in general knowledge that overseas trade and exploration had brought to Europeans” (p. 16) when surveying the immense geographic range of measurements available to Newton, including accurate timings of pendulum swings taken across Europe, the Americas, and Africa. Jacob and Stewart also suggest that imperial outposts frequently sponsored scientific societies (for much the same reason, I believe, that Birmingham and Manchester gentlemen soaked up science: the direct benefits of utility were a factor of course, but so also were the allurements of polite culture and civic improvement). But there is little on mapmaking or public health in the colonies, and nothing on empirical investigations of malaria or yellow fever. Curiously enough for a book on science and empire, gunpowder weapons are nowhere in sight. (Britain’s great globe-girdling effort in underwater cable telegraphy that so engaged Lord Kelvin falls just beyond the book’s 1851 cutoff.) Finally, what puzzles me most about this book is its sometimes Newtonian concept of culture. The cultural histories that I most admire describe a set of cultural developments but also examine the concept of “culture,” showing (say) how elite commitments to a program were contested by rivals or popular movements, examining the inclusions and exclusions of cultural claims, and helping us think through what “culture” entails. We still need such a history of science in the long shadow of Newton.

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