

man's requirement that nothing explanatory be asserted in natural philosophy that is not imaginatively picturable in terms of mechanisms intelligible to a practical craftsman.

The latter point leads to van Berkel's two closing chapters, dealing with the problem of how to understand Beeckman's invention of mechanical philosophy. Unlike Descartes and Gassendi, who had the good fortune to have met him, Beeckman at first could not have been "influenced" by any existing mechanist. His trajectory to mechanism thus offers a window on the larger drivers that shaped this stage of the Scientific Revolution. In effect, van Berkel is endeavoring to throw light on that most tantalizing of historical questions about the rise of modern science in Europe: What were the relations between the bubbling, action-oriented world of the practical arts and their maestros, on the one hand, and, on the other hand, the delayed rise of mechanistic and Baconian elite programs for change in natural philosophy? Van Berkel originally derived this framing of the problem from Paolo Rossi, enriching it by invoking Pamela Smith's insights about the culture and habits of superior craftsmen. Van Berkel shows that Beeckman arrived at his mechanical philosophy of nature through reflection on exactly that powerful mix of practice and ideology of the practical arts, Ramist pedagogy and practical orientation, and realist Copernican denial of Scholastic Aristotelianism that are often invoked in the abstract as drivers of the Scientific Revolution. But in van Berkel's hands these are no longer just abstract categories. He reconstructs Beeckman's internal course of imaginative construction, so that the usual "causes" become lived elements in Beeckman's cognition and invention.

Additionally, van Berkel claims to identify the philosophical carrier beam, as it were, that both motivated Beeckman and concretely mediated his course of construction. The hallmark of Beeckman's mechanism, van Berkel plausibly argues, was the application of criteria of "picturability" to the explanatory realm of particles and motions—where such picturability was explicated in terms of what would make imaginative sense to a master mechanic and craftsman, such as Beeckman, rather than, say, symbolic-metaphorical sense to a neo-Platonist. But why value such a version of picturability and then transplant it to the heart of something so high cultural as natural philosophy? Here van Berkel brings into play Beeckman's deep commitment to Ramism as a philosophy, pedagogical policy, and model of human cognition. His very plausible argument on this point deserves

further exploration. As van Berkel observes, similar points about picturability (without the explicit Ramism) also apply to Descartes's corpuscular-mechanism.

Thanks to van Berkel, historians of science now have a historiographically state-of-the-art account that successfully places Beeckman's mechanistic natural philosophizing in the context of a sophisticated understanding of both the Scientific Revolution and Dutch intellectual and social history. This very important book is thus a starting point, and a benchmark, for extending these inquiries.

JOHN A. SCHUSTER

■ Modern (Nineteenth Century to 1950)

David Arnold. *Everyday Technology: Machines and the Making of India's Modernity.* 223 pp., index. Chicago/London: University of Chicago Press, 2013. \$30 (cloth).

Much of the scholarship on the history of technology in colonial India has focused on large projects—the textile industry, railways, telegraphs, bridges, dams, and modern manufacturing. This is understandable, for such "big technologies" played a major role in the construction of modern India. But the exclusive concern with high-profile technology has come at the expense of studying the diffusion and use of small machines. As a welcome corrective, the present volume offers a survey of the part performed by "everyday technology" in shaping technological modernity in British India. The principal examples of such technology covered by the volume are sewing machines, typewriters, bicycles, and rice mills. Regrettably, cameras and watches are left out.

Unlike big technologies, which were introduced with much fanfare, small machines entered Indian life without much fuss. Of course, colonial conditions meant that the ideology of the advanced West and backward India was never far from the surface. For example, the Singer agents assumed that only Europeans would use sewing machines; Indians were considered too backward and ignorant to understand and make use of them. But a Parsi agent, N. M. Patell, proved them wrong. In the late nineteenth century, he devised a marketing strategy aimed at Indian consumers, particularly targeting tailors. He appointed agents in different parts of the country and offered hire-purchase and loan agreements to make sewing machines affordable to tailors. The sale of Singer machines rose steadily. Sewing machine sales increased once

more when they became part of the Hindu social reform movement's drive to uplift women. Reformers successfully urged middle-class women to take up sewing both as a modern domestic duty and to support the family.

David Arnold argues that the foreign origin of small machines was no hindrance to their ready acceptance. Thus bicycles, like sewing machines, were also imported. By the 1890s, a significant number of bicycles began to appear in import trade statistics. The extension of urban and rural roads and the need for mobility in a growing market economy created the conditions for the widespread use of bicycles. Employers supplied them to office workers, low-level government servants like policemen, and postal and sanitation staff. Bicycles became a common sight in cities and towns and even penetrated the countryside. Also commonly visible in the villages was mechanized rice milling. With the component parts easy to replicate, rice mills to husk paddy were widely adopted. Rich peasants and trading communities led the way, seeing an economic advantage in milling over agricultural cultivation.

Typewriters did not achieve the ubiquity of sewing machines, bicycles, and rice mills, but they became a common sight in government offices, commercial establishments, courts, and political organizations. The typewriter brought women into the modern workplace, though initially they were largely Europeans and Indian Christians.

Modernizing goods were easily accepted, but the numbers were limited. In 1946, for example, there were only 4 bicycles per 1,000 inhabitants in India, compared to 255 in Britain and 463 in the Netherlands. The figures for sewing machines, typewriters, and rice mills were even lower. The problem was the cost. The price of imported machines was beyond the reach of most Indians. In spite of the demand for the small machines, no manufacturing developed in India because, as the nationalists charged, colonial tariffs and economic policies systematically favored imports. American manufacturers, who excelled in the production and marketing of small machines, carved out a large share in sales of typewriters, sewing machines, and rice mills. Remington typewriters and Singer sewing machines became household names in India.

What was the social and cultural impact of the entry of small machines on Indian life? Here, the contribution of *Everyday Technology* is anecdotal. It refers to the appearance of bicycles and typewriters in Indian novels but fails to explore the meaning of technological modernity in everyday life. We do not learn,

for example, how the tapping of keys, the pulling of levers, and the pushing of buttons affected the conception of writing as a hand-crafted, manual exercise. Nor are we told how sewing machines changed women's experience of domestic life. The book points to the association of bicycles with health and pleasure in advertisements but does not address how they changed the riders' experience of time and space. Failing to address these issues, it reads like a survey, touching on a number of interesting details but seldom digging deep. The result is that the term "everyday technology" in the book's title remains restricted to meaning items of daily use; it does not rise to provide an account of everyday technological life as a distinct space of modernity in colonial India. These flaws aside, the volume provides a useful overview of the presence of small technologies in colonial India that will be valuable for further research.

GYAN PRAKASH

Peter G. Ayres. *Shaping Ecology: The Life of Arthur Tansley*. xii + 213 pp., illus., bibl., index. Hoboken, N.J.: Wiley-Blackwell, 2012. \$99.95 (cloth).

This new biography of Arthur George Tansley, the British ecologist and psychologist, brings together a complete account of his life and work. Peter G. Ayres has done a fine job of constructing a likable and well-written history.

Tansley was a bigwig in the field of ecology. Born in London in 1871, he attended classes at the left-leaning Working Men's College before he began studying botany at the University College, London, and subsequently at Trinity College, Cambridge. From the mid 1890s he would promote the field of ecology in no uncertain terms as the founding editor of the *New Phytologist* and the *Journal of Ecology*, as a key president of the British Ecological Society, and, later, as professor of botany at Oxford until his retirement in 1937. Up to his death in 1955 he was the prime architect behind the Nature Conservancy and a mover in environmental policy issues in Britain and beyond. Ecologists today tend to remember him for coining ecosystem terminology.

Ayres provides the reader with both a detailed account of Tansley's professional life as a scientist and his personal and social contextual history. The book benefits from the fact that Ayres worked with and was taught by former friends of Tansley—and from Ayres's long ser-