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brary in 1978–1979, during the editor's tenure as Clark Library Professor at UCLA. Burke's temperate and noncommittal introductory essay gropes for unifying concerns and finds them in recent historiographic recommendations that historians be more attentive to the uses of science. He cautiously aligns himself with the revaluation of use over belief, of practice over theory.

Nevertheless, his contributors put the editor in an awkward position, for the overall effect of the volume is to leave one doubting whether science "in the age of Newton" *did* have any significant and decisive uses. Consider the group of five papers dealing generally with the technological and economic uses of science. Of these, three do not explicitly address themselves to the customary interpretative debates in this area: David W. Waters's essay on the problem of longitude, Albert van Helden's perceptive account of seventeenth-century scientific instruments, and M. B. Hall's narration of the "undignified squabble" over technological rights involving Robert Hooke, Henry Oldenburg, and Christiaan Huygens.

The two key contributions are those by A. R. Hall and R. S. Westfall. Hall reaches back to his research on ballistics in the early 1950s and to the historiographic sentiments he voiced in his 1963 "Merton Revisited." The judgment on Robert Merton (and Boris Hessen) is as it was. Although seventeenth-century virtuosi expressed enthusiastic conviction that theoretical science would perfect technical arts, Hall still finds no empirical warrant for historians to accept that this was the case. The evidence is persuasively mobilized, even if Hall inevitably overreaches that evidence in concluding that attempts "to graft craft experience onto academic learning . . . must always fail." While Hall surveys a field of collective endeavor, Westfall picks out one individual who aspired to apply new scientific theory to practical problems. Hooke labored tirelessly to create a scientific technology, but Westfall asks whether "the ideal was translated into fact." Again, the answer is unambiguously negative: "Talk of utility is one thing; the fact of utility is something else."

These are two highly important and beautifully researched papers. They make adherence to certain naive forms of the Merton (or the Hessen) thesis utterly un-

tenable. Nevertheless, a definitive response to Merton's claims still requires greater clarity and precision in enunciating the thesis to be refuted. Is it (primarily) a claim about technological *motivation* (assumed by Hall), or is it an argument about the unproblematic efficacy of scientific interventions in the economy (exploded by Hall and Westfall)? Supporters of Merton might respond that neither critic has adequately grasped the *social-structural* nature of the link he posited between science and the economy.

If science in the age of Newton had no telling economic uses, did it have any other sort of utility? One paper confronts recent emphases on the social and political uses of Newtonian science. Richard Olson dissents from Margaret Jacob's contention that Newtonianism rose with the Whig constitution, but he does this in a circuitous way. He turns her claim into a prediction that *Tories* would be found to be specifically anti-Newtonian, and then surveys three Tory literati (John Arbuthnot, Jonathan Swift and Samuel Johnson) who were not. Their "antiscientific" attitudes generally rebelled against grandiose views of human reason and insisted upon the role of mystery in religious belief. Unfortunately, Olson's paper was not revised in light of C. B. Wilde's 1980 work on the Hutchinsonians (much less Larry Stewart's 1981 essay), and the argument that there was no particularly anti-Newtonian strand in Tory thought cannot be convincing in a paper that does not mention John Hutchinson and his followers.

STEVEN SHAPIN

Anne Conway. *The Principles of the Most Ancient and Modern Philosophy.* Edited with an introduction by **Peter Loftson.** (Archives Internationales d'Histoire des Idées, 101.) 252 pp., illus., bibl., index. The Hague/Boston/London: Martinus Nijhoff Publishers, 1982.

Anne Conway (1631–1679) was a seventeenth-century English philosopher, pupil of Cambridge Platonist Henry More (1614–1687), collaborator of Francis Mercury van Helmont (1618–1698), and forerunner of Gottfried Wilhelm Leibniz (1646–1716). Although she corresponded extensively with Henry More and others (her letters were collected and edited by Marjorie Hope Nicolson in 1930), she left only one philo-

sophical treatise, few copies of which have survived their Latin and English printings in the 1690s. In it she uses the principles of the ancient philosophies of Platonism and the cabala to criticize the modern philosophies of Descartes, Hobbes, and Spinoza. Peter Loftson has republished her *Principles of the Most Ancient and Modern Philosophy* in both its Latin translation (1690) and English retranslation (1692), for the original English notebook written in her own hand was lost. He also provides a valuable and insightful commentary in which he assesses her philosophical insights and their historical significance in anticipating major ideas of two later philosophers—Leibniz and the twentieth-century philosopher Ludwig Wittgenstein.

After Conway's death in 1679 from the painful and debilitating migraine headaches that plagued her life from the age of fourteen onward, More and van Helmont undertook the task of publishing her treatise. More wrote a preface to which van Helmont signed his name and which is reprinted in the appendix, and van Helmont (most probably) edited and annotated her *Principles*. The Latin text that appeared in Amsterdam in 1690 was one of three treatises in a volume edited by van Helmont. He presumably carried it with him on his visit in 1696 to Leibniz, to whom he recounted her ideas and history. All four of the above philosophers shared an interest in, and were influenced by, the ancient philosophies of Platonism and the cabala.

Loftson makes a strong case for the similarities between the vitalistic philosophies of Conway and Leibniz. He believes that Conway's concept of vital substances as monistic unities of body and spirit (as opposed to Descartes's dual substances of mind and body) is an anticipation of Leibniz's concept of the monad. Leibniz's assessment of her thought and his acknowledgment of its similarities to his own philosophy of life and consciousness in all things are contained in a letter he wrote Thomas Burnett in 1697 and in his *New Essays Concerning the Human Understanding*, begun that year and published posthumously in 1765.

Conway criticized the "moderns" of her age—Descartes, Hobbes, and Spinoza—on their views of substance, but like them she was a systematizer, concerned with substances, essences, modes, time, and individuals. In this, Loftson maintains, she

differed from More, whose primary interest was in religious philosophy. Conway also criticized Descartes's theory that the essence of an individual created substance was either thought or extension, and she held a view that all created substances were both mental and physical in some degree, having both thought and extension essentially. Body and spirit were one and the same substance, differing only as to mode. A continuum existed, therefore, between the most "bodily" of substances and the most "spiritual," and evolutionary transmutation to spiritually higher forms was possible.

Loftson's unique contribution is to see Anne Conway's philosophy as an anticipation of essentialist theory as developed by Ludwig Wittgenstein in his *Tractatus Logico-Philosophicus*. Although Wittgenstein did not know Conway's work, his doctrines of logical space, modal internal properties, the colorlessness of objects, and a "sharp well defined notion of *de re* modality" express views similar to hers (pp. 17, 18, note). Loftson's carefully prepared edition and insightful commentary will be of value to any historian of science interested in the philosophical dimensions of the Scientific Revolution.

CAROLYN MERCHANT

Vincenzo Ferrone. *Scienza, natura, religione: Mondo newtoniano e cultura italiana nel primo settecento.* (Storia e Diritto, 9.) 701 pp., illus., indexes. Naples: Editrice Jovene, 1982. L 32,000 (paper).

With the publication of this book, in which Vincenzo Ferrone deepens some perspectives already drawn by Paolo Casini, those interested in a general survey of the Italian contributions to the late seventeenth- and early eighteenth-century European debates on the natural sciences, and particularly to the shift of orientation from Descartes to Newton, need no longer consult the outdated volume by Gabriel Maugain.

Ferrone's work is not without flaws. He often relies on absolute categories such as "Cartesianism" (not distinguished from its close cousins "Leibnizianism" or "Malebranchianism") and "Newtonianism" (elevated here to a "Weltanschauung"), which recent scholarship has questioned in order to permit more faithful and less positivistic characterizations of fence-straddlers like