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Steven Shapin and Simon Schaffer. *Leviathan and the Air Pump: Hobbes, Boyle, and the Experimental Life: Including a Translation of Thomas Hobbes, Dialogus Physicus de Natura Aeris.* Princeton: Princeton University Press, 1985. xiv + 440 pp. Illustrations, bibliography, and index.

A preoccupation with worldly concerns and a vulnerability to the passions of the soul are not generally considered to be hallmarks of the scientific way of thought. Thomas S. Kuhn, in *Structure of Scientific Revolutions* (Chicago, 1962), touched off one of his own by asserting that human motivations do enter into the virgin realm of pure scientific thought—if only during the necessarily eccentric instances of paradigm—shattering revolutions. Steven Shapin and Simon Schaffer, in *Leviathan and the Air Pump*, plunge deeply into a post-Kuhnian universe that denies all scientific thinking a privileged status, and declares that all knowledge is a part of culture—and therefore man-made, artifactual, and value-laden.

Their work is virtually a manifesto on how to do history of science in a brave new world; Shapin and Schaffer attempt nothing less than the shattering of both pedestrian models of sociology of scientific knowledge as well as claustrophobic rationalist models of the history of science. As they bluntly state at the outset: "One can either debate the possibility of the sociology of knowledge, or one can get on with the job of doing the thing." (p. 15) In getting on with the job Shapin and Schaffer aggressively present a stance which moves beyond suggesting that social factors somehow "influence" passive scientific actors, to contending that the nature of scientific knowledge and the nature of the larger polity are inseparable and reciprocal relationships. Both their methodology and their interpretations have important implications not only for the history of science but intellectual history as well.

The claim which Shapin and Schaffer advance is that "solutions to the problem of knowledge are solutions to the problem of social order." (p. 33) What constitutes knowledge, how such knowledge is obtained, and to what uses it is then put, are, for Shapin and Schaffer, all of a piece with the political arrangements operable in a given society. In explication of this thesis they undertake a reexamination of the Hobbes-Boyle controversy.

Robert Boyle's experiments with the air pump in the 1660s have achieved a canonical status in science pedagogy, and are accepted literally as textbook examples of the way in which science operates. Boyle's work has been celebrated not only for his adherence to building an objective science based on the observation of experimental facts, but for his routing of the philosophical trappings which threatened to subvert the experimental program. Thomas Hobbes was Boyle's most vocal and persistent critic.

The experimental method is accepted as a routine practice in our society —it is synonymous with how science proceeds, and is therefore not regarded as problematic, or in need of explanation. Shapin and Schaffer point out that

such unreflective membership in a culture carries with it serious disadvantages in the search for understanding how and why certain practices have developed. Such enterprises as the experimental method, embedded into the very structure of our society, seem self-evidently valid. Shapin and Schaffer propose, instead, to "play the stranger," suspending unquestioned perceptions regarding experimental practice and its products. In not accepting that the success of Boyle's experimental program of scientific inquiry is its own explanation they gain a valuable vantage point in their investigation: they are in a position, as strangers, to *know* that there are alternatives to accepted beliefs and practices. In adopting this strategy the voice of Hobbes becomes an important ally, for in his explicit denunciation of Boyle's moves he attempts to deconstruct the taken-for-granted quality of his adversary's beliefs, and to lay bare their artifactual and conventional status. Hobbes's views on how knowledge is properly attained lost out to Boyle's agenda on how best to secure knowledge, but rather than seeing this eclipse as an inevitable matter, Shapin and Schaffer choose rather to examine Hobbes's concerns as a contemporary might—as ideas which need to be actively dealt with. It is the difference between seeing the "losing side" in an intellectual debate as the helpless victim of its adherents's own fallacious thinking—a tendency in classical history of science—or of seeing the "losing side" rather as representative of certain ways of ordering the world which were rejected for specific and fundamental reasons. It is Shapin and Schaffer's contention that the experimental form of life succeeded because it insinuated itself most successfully into the activities of other institutions and other interest groups. As they state: "He who has the most, and the most powerful allies, wins" (p. 342).

What was at stake in Restoration England was the very stability of society itself. What was being produced in the nascent laboratory of the Royal Society was a way to obtain knowledge which would not disrupt the fragile and tenuous peace which had been achieved. Boyle proposed that the study of nature would occupy a quite different space from the study of men and their affairs. The experimental community was neither a tyranny—as the absolutism of Hobbes would recommend, nor a democracy—with its spectre of competing factions and attendant chaos. It would occupy a "middle way." That the middle way offered a model which allowed for agreement by substituting consensual authority for individual responsibility is one of the most provocative undercurrents of the book.

For a philosopher like Hobbes it was clear that man makes his world; society is in no sense given. But for the empiricist the man-made component of knowledge is distortion. What the mind must seek to do is *mirror* reality. The empiricist received facts, rather than producing them. Shapin and Schaffer find this to be one of the opening moves for the establishment of a science that is "safe" for the wider polity. Not only is the collection of knowledge to be a passive enterprise, it is to be a collective one. In analyzing

the discourse which bound the experimentalists together, and in examining how matters of fact in Boyle's experimental program were established, Shapin and Schaffer suggest that three *technologies* were utilized: a material technology, embedded in the operation of experimental hardware; a literary technology, which communicated experimental results, and made others indirect witnesses to them; and a social technology, which directed how competing knowledge claims were to be handled. These technologies resulted in empiricists being able to assert: "It is not I who says this—it is the machine. It is not I who says this—it is all of us." Knowledge was constituted when all believed alike.

The experimenter could claim to have factored out human agency in the search for knowledge, and the experimental method lent credence to the neutrality of scientific facts. Facts existed beyond the world of suasion and fallible thinking. Science, then, under the aegis of Boyle's experimental program, could enable men to establish a polity without laying bare the metaphysical—and therefore potentially divisive—assumptions which a philosophy, such as Hobbes's, is required to baldly state. Society, modeled after the ideals of the experimental community, could be organized into units in which individual responsibility was diluted, and controversy less likely to occur.

That politics constitutes the very act of knowing, and that the very act of knowing constitutes politics is a question which Shapin and Schaffer's handling of the Hobbes-Boyle controversy thrusts squarely into the forefront of both the history of science and intellectual history. That many of the concerns which animated the Hobbes-Boyle controversy are still integral components of the relationship between science and society today suggests that the issues which Shapin and Schaffer raise demand more explicit scrutiny.

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Shirley Christian. *Nicaragua: Revolution in the Family.* New York: Random House, 1985. xi + 337 pp. Illustrations, bibliography, and index. $16.50 (paper).

Nicaragua: Revolution in the Family is a well-written and relatively even-handed chronicle of the triumphs and tribulations of the Sandinista revolution in Nicaragua, 1978 - 1984. While Shirley Christian makes little attempt to hide her political biases in the book, at least these biases fall far from both those of the Somocistas, as expressed in Somoza's *Nicaragua Betrayed*, and, at the other extreme, those of the far-left rhetoricians that dominate so much current writing on Nicaragua's revolution. The basic fairness and accuracy