BOOK REVIEWS

Review of: Marian Fournier, *The Fabric of Life: the Rise and Decline of Seventeenth-Century Microscopy* (Ph.D. Dissertation University of Twente, Enschede, 1991).

Microscopy in the late seventeenth century is a well-formed contour in the historiography of science, a clutch of famous names, Hooke, Grew, Swammerdam, Malpighi and Leeuwenhoek, having tempted a variety of historians to work on the subject. Two approaches have predominated. First, that adopted by historians of scientific instruments who, in their studies of early microscopes, have investigated provenances, dug up makers and, most important, measured optical capacities. These latter studies, either with or without self-reflection, have usually been pursued with the aim of discovering what these observers 'really' saw. That is, such studies have usually employed the legitimatory approach of science itself. When seventeenth-century representations conform to modern accounts they are deemed accurate and when they do not they are deemed to be faulty by virtue of optical inadequacy. The second group of studies on early microscopy are typified by Clifford Dobell's famous *Leeuwenhoek and his "Little Animals"* of 1932. Such works have been more concerned with what has been regarded as the science of the late seventeenth and early eighteenth century and the ways in which microscopical enquiries promoted this science. These sorts of enquiries share many of the assumptions employed by studies of the first sort.

The heterogeneous literature on the early microscopists leaves the reader with the impression that the late seventeenth century saw a flurry of microscopical activity which subsequently declined. The reader also gains the impression that this decline had something (unspecified) to do with the optical properties of the microscope. The literature also leaves the reader with no strong sense of the place of microscopy as a whole in the late seventeenth century. Marian Fournier's *The Fabric of Life* is an attempt to address both of these issues. Fournier's study begins by addressing the quantitative question. She shows quite clearly that there was a peak in microscopical investigation, 1675-1710, and a second spike around 1750. Grappling with the issue of the optical properties of microscopes and their relation to the growth and decline of the sport of microscopy she claims that there was no significant technological transformation, either for worse or better, that can be reasonably mapped onto the peak of activity. In other words, it is necessary to look elsewhere for the explanation of microscopical rise and decline. Fournier does this by an analysis of the work of the five great names noted above and in this regard her book is the first collective study of these, and a few other less well-known, microscopical

enquirers. Fournier takes the reader through the works of these men, carefully situating their microscopy in the context of their other enquiries. For the clarity of her account, her comprehensive recording of the work of these men and for the bibliography this book will be a valuable future source.

Fournier's work, however, is more than just a compilation. If technological change does not explain the rise and fall of microscopy, what other sorts of factors, she asks, can be invoked? To address the question of microscopy's rise, she turns to the scientific revolution and the ways in which the instrument was employed to promote and extend the mechanical philosophy, natural theology and a category she invokes in a rather cavalier fashion, "Baconianism." More interestingly, Fournier grapples with the question of the decline of microscopy especially with regard to those investigators interested in the workings of the body (rather than in producing descriptive histories of small animals). She concludes that by the end of the seventeenth century a "definite theory" of the construction of the body existed. It was a fabric in which "an intricate arrangement of vessels of various diameters, was thought to bring about the various physiological processes ... Such a system appeared an attractive subject for mathematical analysis, but did not need further ocular investigation" (p. 196).

Such a conclusion (differently expressed perhaps) seems interestingly correct and Fournier needs to be thanked for having addressed the intellectual construction of the microscopists and its place in early eighteenth-century natural philosophy. Yet is might be said that although her conclusion is important and the evidence for it is impressive, the connection between these two is problematical. This is so because, surprisingly these days, Fournier's analysis is resolutely presentist. She examines the late seventeenth century without reflecting whether such terms as science, scientist, life sciences, organic matter and physiology, which occur liberally throughout the monograph, import illegitimate modern meanings into the understanding of the work of the figures she has chosen to study.

This adoption of modern categories is part of an historical approach to natural philosophy which she never makes explicit even though it characterizes the whole study. Quite properly eschewing optical inadequacy as a way of distinguishing between different sorts of microscopical observations, Fournier rightly perceives that these observations were informed by the varieties of the mechanical philosophy which the observers expounded. This is done particularly well in the case of Malpighi. But Fournier also uses this useful insight in the same way that optical inadequacy has been used as an explanatory device by historians of scientific instruments. When the observers can be construed as seeing things in the way they appear to us, Fournier finds this unproblematical. Only when the world they describe seems different from our own is an explanation in terms of the observer's theoretical preference, such as the

observer's Cartesianism, invoked. This weakness prevents her fully exploiting her important conclusion. She notes "In the course of the 1670s and 1680s it became clear that the common result of the microscopists' joint efforts was than an overwhelming number of fibres and vessels constituted the principal structural element throughout organic nature" (p. 194). The passive phrase "it became clear" here hides far more than it reveals. It was not simply that "it became clear," rather the microscopists actively constructed nature in this way, as Fournier details in her evidence. What for Fournier were deviating devices, the mechanical philosophy or natural theology were, for these observers, enabling devices, permitting them to make sense of the world. Make sense is a significant phase in this context. If Fournier had pushed her analysis a little further it might have revealed significant epistemological assumptions shared by these microscopists. To a great extent all seemed to assume that the visual world of the microscope was *not* going to be qualitatively different from the visual world of everyday experience (this assumption was also explicit in Galileo's use of the telescope). They assumed that the visually given did not require translation into another set of categories. A fibre was a fibre was a fibre. This is not the case for us, since we might say what *looks like* a fibre is *really* a cell. Natural theology, the mechanical philosophy, and "Baconianism" are indeed the keys to this epistemological universe but they unlock at a deeper level than Fournier explores. For example she is quite correct to note that all the microscopists found in nature the handiwork of the Creator but she never exploits what this entails. The microscopists all assumed that God had created nature but they also assumed that He had created the human mind in such a way that it might comprehend His creation. The ultimate sensory data were the minima out of which God created the universe (or, if they were not, what was invisible beyond them would, if we could see them, *look like* them, only smaller; an assumption, as she shows, quite explicit in Leeuwenhoek's work). God's providence, in other words, ensured that nature was *comprehensible*, at least descriptively. From these premises and using various varieties of the mechanical philosophy, the microscopists constructed their world (Fournier quite clearly shows that this was true of Leeuwenhoek even though she allows the myth that he was an unlettered observer to pass without significant challenge).

Her suggestion that, having constituted the microscopic world in this way, the iatromathematicians and others, notably, Herman Boerhaave usurped it for their own ends without needing to extend it further, seems entirely credible. This would certainly explain why these people happily dispensed with the microscope. Conversely, the renewed interest in microscopy in the middle of the eighteenth century which Fournier distinguishes ties in quite well with the well-recognised move away from physical reductionism. Investigators such as Albrecht von Haller, who declared that they were not prepared to speculate below the level of

phenomena, repudiated the view that the invisible must be like the visible. On these grounds Haller and others used the microscope to dispute the view of Boerhaave that the blood globules were composed of even smaller non-visible globules. Fournier's work does not raise these issues but is suggestive as to how they need to be addressed. Fournier, in fact, has done much to reveal the strange world of these early observers (and non-observers). How very strange it was, however, is by no means clear yet.

Christopher Lawrence
Wellcome Istitute for the History of Medicine
183 Euston Road
London NW1 2BN
England