Quantum leap?

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Science, Optics and Music in Medieval and Early Modern Thought. By A. C. Crombie. *The Hambledon Press: 1990. Pp. 474. £37.50, $60.*

ONE of the most disputed issues in the history of early modern science is that of continuity. Was there a quantum leap in the seventeenth century, and if so, what was its base? Alistair Crombie was a prominent pioneer of the view, now widely accepted, that there was such a leap forward ("the confident establishment of the 'new sort of philosophizing' in the 'physico-mathematical experimental learning' of the seventeenth century"), and that the Middle Ages had made highly important contributions to the base from which the quantum leap took place. Though mediaeval academics were stronger in philosophizing than in experimental or mathematical achievements they enriched the ancient Greek idea of nature, and set the potential of this enrichment in a stronger, more fertile context of society and technology. To these elements the Renaissance, drawing afresh upon the founts of European civilization in antiquity, added new ones such as platonism, hermeticism and atomism; to these surely geometry should be added.

Choosing 18 papers (and some annexed documents) for revision and reprinting in facsimile, Crombie has devoted nearly half to this earlier and major theme in a scholarly career both long and distinguished. His investigation of mediaeval and Renaissance science during the last 20 years is notably broader, more complex and more balanced than it was in his 1953 monograph *Robert Grosseteste and the Origins of Modern Experimental Science (Clarendon Press, Oxford)* in which the 'Crombie thesis' was first expressed with great learning and great force. Such a paper as that of 1980 on Science and Arts in the Renaissance admirably adds to Crombie's earlier studies of mediaeval conceptual science an emphasis upon the practical and mathematical accomplishments of the Renaissance.

In the last 20 years, too, Crombie has developed a new interest in major figures of the second phase of the scientific revolution; Galileo, Kepler, Mersenne, Descartes. Two long papers — the second a translation of Kepler's chapters on The Manner of Vision — deal with the context and nature of Kepler's treatment (1603) of the eye's formation of a retinal image, "the first thorough and successful solution of an important physiological problem to be made in modern times." Kepler's, and later Descartes', analyses of vision also had important technical implications for the design of lens-systems. The former of these two papers, which might with advantage have been placed second here, very impressively represents Crombie's abilities in massive original investigation.

The remaining papers are all connected with the author's works which have not yet seen print, one on Galileo, the other on 'styles' of scientific thought. A pervasive theme, found also in the papers on vision, is "the power of those commitments to quantification, demonstration, and the hypothetical model [that were] brought into physiology by mathematics" in the seventeenth century — and one might add, into aesthetics also. The example is Mersenne's investigation of acoustics/music, where Galileo also figures in his own right, and his father's:

> We may recognize in Vincenzo Galilei's insistence on both the complexity and on the discoverable regularities of auditory experience something of Galileo's approach to natural science, and certainly a family likeness in the polemical aggressiveness to be made famous by his son.

A fundamental issue in this connection was the distinction between primary and secondary qualities drawn from physicists by Galileo, for philosophers by Locke; this of course defines the domain of natural science as "the art of the possible". A very interesting paper of 1964 examines the junction in the seventeenth century between mechanistic philosophy and the ocular demonstrations of the anatomists: another facet of a problem continuing since Galen.

Reading or re-reading these fruits of 40 years, one finds that they present one conspectus of the evolution of the historiography of science over more than a generation. Be it said in his praise, Crombie is largely consistent with himself and has found little to rewrite. But he is occasionally ambivalent; can a disciple of Alexandre Koyr (as he ardently proclaims himself) also affirm "how misleading it would be for historians to separate the technical science of a period from its ambience of larger intellectual commitments"? Koyr did not mingle intellect with technique. In the present collection, to be followed by another, there are inevitably some repetitions and the author expects his reader to be almost as learned as himself. To unfold an allusion to "the validity in physics, in any inquiry for physical causes, of the axiomatic theory of truly scientific apodeictic demonstration embodied in somewhat different forms in Aristotle's logic and Euclid's geometry" a treatise is required. Yet, with much mental agility as well as full deployment of the heavy artillery of scholarship, Crombie has won his own considerable victories in a field dominated by German and North American scholarship. □

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Spring Books

The next review supplement to appear in *Nature* will be Spring Books to be published on 11 April.

Just words

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The Rhetoric of Science. By Alan G. Gross. *Harvard University Press: 1990. Pp. 248. £23.95, $29.95.*

IT is quite some time now that working scientists have been enduring a bad press from the scholars who analyse their activity. Starting explicitly with P. Feyerabend's *Against Method* (New Left Books, London) of 1975, the tide has been running away from philosophical explanations of how science gets it right, to social-science analyses of the practices of science which variously deconstruct, demystify or debunk. Those who try to defend the old verities of science, in the name of 'realism', are an embattled minority.

Someone writing on the 'rhetoric' of science might be expected to belong to the pack of critics, since 'rhetoric' has come to stand for mere persuasion, in contrast to logic and scientific method which yield truth. Even more than a sociologist, a rhetorician has a professional motivation for reducing science to the same lowly status to which it had been assigned. Because (as all philosophers have agreed) the arguments of empirical science are not formally valid in the logical sense, all it needs is an all-or-nothing pattern of logic to lead to the conclusion that science is no better than poetry or propaganda.

On the other hand, because recent writings on theory of rhetoric have reclaimed it as a genuine mode of discourse, perhaps a rhetorician might be more generous than an anthropologist, and demonstrate at least an intersubjective validity in scientific discourse. The issue at stake here is not mere academic infighting, but the long-term influence on how natural science is perceived, by the general public and also by the next generation of teachers and their students.

The author of *The Rhetoric of Science* seems at first to incline to the more generous interpretation. In his first interpretative essay, on taxonomic language (is evolutionary theory inconsistent with species as natural kinds?), he envisages a complementarity between rational and rhetorical reconstruction. The one is subsumed under the cognitive/technical 'interest' (in Habermas' sense), and the other under the practical 'interest', relating to various forms of life. But when he confronts the philosophical problems inherent in such a duality, he comes out in favour of Habermas' third 'interest', which is emancipatory by its demystification of the objectivity of science.

His subjects for analysis are widely drawn, ranging from the discovery of DNA (and James Watson's retrospective autobiographical fable about it), the reception of the Copernican theory (with a good discussion of 'rational conversion'), an analysis of