

Edward Grant, *The Foundations of Modern Science in the Middle Ages. Their Religious, Institutional, and Intellectual Contexts*. Cambridge etc. (Cambridge University Press) 1996. xiv+247 pp. ISBN 0-521-56762-9 (Cambridge History of Science).

In 1971 Edward Grant published *Physical Science in the Middle Ages*, which, characterized in brief, was concerned with scientific *knowledge* and *ideas*. To some extent, the present volume is an updated version of this precursor, but the whole perspective has been shifted, towards the study of (still mainly physical) science as part of a larger knowledge *system* – in particular the system of the scholastic university. The 1971-volume was forced to conclude that the contents and orientation of scholastic natural philosophy were so different from what emerged in the seventeenth century that it was unlikely to count as an important ingredient of the fundament for the scientific revolution – *pace* Pierre Duhem and John Herman Randall. Asking now whether the Modern breakthrough would have been possible without the triple infrastructure provided by the translation of the Greco-Islamic heritage, the establishment of the university system with its intellectual autonomy, and the acceptance of natural philosophy as a legitimate interest and education by the theological establishment (on the part of many theologians much more than acceptance, as exemplified by Albertus Magnus, Pecham, Oresme and others), Grant's answer (obvious once the question is formulated) is “no”.

From chapter 1, “The Roman Empire and the first six centuries of Christianity”, four important themes stand out: That Western Christianity received the ancient scientific heritage only as digested in the handbook tradition and the hexaëmeral commentaries of the Fathers; that these commentaries already imply an acceptance of the relevance of natural philosophy for faith; that the initial “handmaiden” status of natural knowledge in these commentaries “became little more than formulaic” (p.7) in the later Middle Ages; and that the system of seven liberal arts epitomized in the handbooks remained the programme for higher education until the twelfth century.

Chapter 2, on the 12th–13th-century “age of translation”, starts by sketching the development of the cathedral school system and the pre-translation culmination of “Latin learning” in the early twelfth century with its strong interest in nature. The chapter focuses on the translations of Aristotle's “books on nature” (with the Greek and Arabic commentaries) and their impact; relatively little is said about Aristotle's biology and about geometry, optics, medicine, astrology, alchemy and magic, which were not strongly represented in official university curricula (but some of which were certainly important motivations for translators like Adelard and Gerard of Cremona).

Chapter 3 describes the university system – including structure, teaching methods (commentaries, questions and disputations) and curriculum; social and intellectual role (pointing to the contrast between the non-utilitarian curriculum and the future professional function of most students); and the conditions of learning in a manuscript culture.

Chapters 4–6 delineate the physics and cosmology of Aristotle, on the whole seen through the spectacles of the schoolmen (chapter 7 does point out that there is a difference between the historical philosopher and the Philosopher of these); the reception and the theological reactions (including the condemnation of 1277 and its core problems – the eternity of the world, the “double truth”, and the limits which philosophy might set to God’s absolute power); and the fourteenth-century discussions of physics and cosmology. Chapter 7 takes up the difficult task to portray that elusive entity “Aristotelianism”, and describes aptly why no unambiguous definition can be given. Much of the discussion turns around the *questiones* genre and actual *questiones*, where the character of the movement finds concrete expression. Other focal points are “abstract methodology” versus “methodologies that were actually used”; and the relations of Aristotelian natural philosophy to mathematics, theology, medicine and music. Chapter 8 is the conclusion, in which the importance of the medieval infrastructure for the scientific revolution is discussed, supported by comparisons with medieval Islam and Byzantium.

This conclusion is what the whole book aims at, in agreement with its title. It does not pretend to be, and is not, a general history of thinking about nature in the High and Late Middle Ages; in such a history, e.g., astrology would have to be investigated as an independent major component, not as a concern derived in the main from Aristotelian cosmology. In relation to its declared aim, the book is highly welcome; it is clearly written, it contains many insights and much matter for reflection, and gives much information rarely explained in detail by those (few!) who are as familiar with the sources as Grant. A final rich bibliographic essay opens the doors to much more than dealt with in the preceding pages.

If a few doubts may be allowed the reviewer, Grant’s perspective on the infrastructure of early modern science may be too clean. Firstly, the ongoing magico-medico-astrological naturalism was both part of that background against which early Modern science defined itself, and a constituent (after all, della Porta was the jewel of that Accademia de’ Lincei of which Galileo was so proud of having been a member); Grant does touch this possibility in four lines (p. 169). Secondly, as pointed out by Grant, Aristotelian and scholastic philosophy of nature was interested in the *normal course* of nature; it therefore had little use for experiments, which would at best tell

how nature behaved *outside* its normal course, and under unnatural circumstances. This heritage was an obstacle which the generation of Francis Bacon, Galileo and Descartes was able to circumvent because of other constituents of its total intellectual infrastructure: a new legitimacy of “mechanics” and technology, coupled both to the inheritance from natural magic and *meraviglia*, to Humanist approval of civic utility, and to a new analytical and conceptual tool that had been born from the interaction between practised mathematics and a theoretical approach incarnated in the figure of Archimedes (mostly misunderstood as “Platonism”).

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