

Western European Science – Postclassical period

Overview The development of anything like empirical science--systematic observation, hypothesizing and experimentation-- had to await 13th century thinkers like Roger Bacon, who, together with many others like Robert Grosseteste or Albertus Magnus, were starting to probe the natural world with questions unleashed from the earlier mediaeval assumptions that the natural world was best understood as an expression of the mind of God. The scientific attitude was beginning to prevail, by the time of Dante.

The early period *The Etymologies* of Isidore of Seville (580-636 C.E.) can were the most influential text for 'scientific knowledge' in the early period of Mediaeval science. The scientific knowledge available to the Greco-Roman world--the works of Hippocrates, the Greek mathematicians, Galen the physician, Euclid and Ptolemy--were lost from sight in the world of Isidore, whose gigantic compendium simply drew on earlier encyclopedias, to create what to us seems an indiscriminate jumble of 'facts.' The fantasy element in many of these facts can be illustrated: 'The race of the Sciopodes is said to live in Etiopia. They have one leg apiece and are of a marvelous swiftness, and the Greeks call them Sciopodes from this, that in summertime they lie on the ground on their backs, and are shaded by the greatness of their feet.' The 'progress' of mediaeval science can be measured by the distance from Isidore of the *Speculum maius* of Vincent of Beauvais (1190-1264 C.E.), the chief encyclopedia of the later mediaeval period. This text, three times the size of Isidore's, is a compendium of the--by that time--wide range of Greco-Roman scientific works available in Latin, in translations from Greek, Arabic, and Hebrew.

Later Mediaeval science With the opening up of the Byzantine and Near Eastern worlds to the West, in the trade and commerce expanding world of 11th-13th century Western Europe, there came a steady flow of translated texts from Greek and Arabic into Latin. Aristotle reentered the western bloodstream, and with Ptolemy, Euclid, and many others became the fountainhead of discovery work in math, science, geography, astronomy and astrology, and medicine.

Mathematics and physics By the early 12th century the *Elements* of Euclid appeared in the west in Latin translation, while translated Arabic knowledge of algebra opened the door to numerous new insights, including the exceptionally brilliant work of Leonard of Pisa, who introduced the Hindu-Arabic numerical system to the West, and whose reintroduction of the ancient *abacus*, for purposes of calculating, brought algebra to the point 'from which it was not to make notable advances until the sixteenth century.' (Haskins, *The Renaissance of the 12th century*, p. 312.) Those minds concerned with physics found themselves debating the conflicting claims between then recently accessible Aristotelian texts, like his *Physics* and *Meteorology*, both of which were available by the second half of the twelfth century, and Plato's *Timaeus*, which introduced a totally diverse cosmology from Aristotle's.

Geography While the geographical theory of the late Middle Ages reflected little input from such expeditions as the Crusades, there was much observational material owing to individual travelers. Among the known and familiar lands of the west, travelers like Giraldus Cambrensis, in his *Topography of Ireland* (1188), 'gives us much first-hand description of lakes, rivers, mountains, ...the tidal phenomena of the coasts of the Irish sea....' while discussing the customs of the inhabitants, which--as Taine might have said, eight centuries later-- coordinated closely with the kinds of landscape in which they lived.

Astrology Widely accepted as a branch of science, astrology--a 'humanized astronomy'--was strongly revived in the twelfth century. Not only did astrology serve purely speculative ends, like the prediction of personal traits based on star positions at one's birth, but the higher astrology--there were Professors of Astrology in major Universities--served as a portal through which to observe the movements of the constellations, to calculate the major solar and lunar events that shaped the Church (and other) calendars, and to supervise and organize military campaigns.

Medicine By the twelfth century mediaeval scholars had recovered all the essential texts of ancient Greek medicine, the writings of mediaeval Arab physicians had been translated into Latin, and the first medical school in western Europe, the University of Salerno, was functioning strongly. By the tenth century, Salerno had been a noted healing center, and by the twelfth century a substantial medical literature was being created in Salerno--much of it

on pharmacology and diseases of the eye--which drew on the presence and researches of physicians based firmly not only in Latin, but in Greek and Arabic.

Readings

Crombie, A.C., *Augustine to Galileo: The History of Science, AD 400-1650*, Harmondsworth, 1969.

Lindberg, David C., *Science In the Middle Ages*, Chicago, 1978.

Discussion questions

The role of translators, in bringing Greek and Arabic science to 12th century Europe, was very important. Who were these translators? Did they come from various countries? Who hired them?

Alchemy, as well as astronomy, played a fringe role in the development of modern science. What did alchemy contribute to the development of science during the Middle Ages?

What was the role of surgery, in mediaeval western medicine? Was it widely practiced? What kind of implements and sanitary precautions were available? What were the main centers of surgical practice?