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10-12 minutes

(also known as **Hermannus Contractus** or **Hermann of Reichenau**) (*b*. Altshausen, Germany, 18 July 1013; *d*. Altshausen, 24 September 1054)

astronomy, *mathematics*.

Hermannus was the son of Count Wolferat of Altshausen. He entered the cloister school at Reichenau on 13 September 1020 and became a monk at Reichenau in 1043. Throughout his life he suffered from an extreme physical disability which severely limited his movements and his ability to speak; hence the appellation “contractus,” attached to his name since the twelfth century.

Hermannus is one of the key figures in the transmission of Arabic astronomical techniques and instruments to the Latin West before the period of translation. His familiarity with Islamic materials indicates that this knowledge had reached southern Germany by the early eleventh century. It is unlikely, though, that Hermannus knew Arabic; his devoted pupil Berthold of Reichenau, who has left a biographical sketch of his master (see Manitius, *Geschichte der lateinischen Literatur...* , pp. 756–777), would almost surely have mentioned this accomplishment.

Hermannus is one of the earliest Latin authors responsible for the introduction or reintroduction into the West from the Islamic world (undoubtedly Spain) of three astronomical instruments; the astrolabe, the chilinder (a portable sundial), and the quadrant with cursor. Since the thirteenth century a *De mensura astrolabii* has been ascribed to Hermannus. The first section of a second work, often called in its entirety *De utilitatibus astrolabii*, is a treatise on the astrolabe in twenty-one chapters which contains many Arabic expressions; not written by Hermannus, it was attributed to Gerbert as early as the twelfth century. N. Bubnov, the eidtor of Gerbert’s mathematical works, has placed the twenty-one-chapter treatise among the doubtful works of Gerbert. The second section of the *De utilitatibus*, containing a description of the chilinder and the quadrant, is generally considered to be by Hermannus. Further evidence for his authorship lies in the subsequent paragraphs of this second section which contain an account of Eratosthenes’ measurement of the circumference of the earth as reported by Macrobius, with a calculation of the earth’s diameter using the Archimedean value of 22/7 for pi. These paragraphs were the subject of correspondence in 1048 between Hermannus and his former pupil Meinzo of Constance.

The *De mensura astrolabii*, which contains many latinized Arabic words, begins with a description of the fundamental circles of the base plate of the astrolabe, or *walzachora*, followed by a delineation of the rete. The astrolabe is designed for a latitude of forty-eight degrees, the latitude of Reichenau; no mention is made of the number of plates the instrument should have. Designed in the conventional manner for Western astrolabes, the dorsum contains a shadow square. This practice of expressing angles in terms of twelve points of either the inverse or the plane shadow (*umbra versa or umbra recta*) stemmed from Hindu sources and was transmitted through Arabic writings. The *De mensura* also contains a star table with the coordinates of twenty-seven stars expressed in right ascension and the stars’ meridian altitude.

The chilinder is a portable altitude sundial designed for one latitude—forty-eight degrees in this case. Since the altitude varies symmetrically with the declination throughout the sun’s yearly cycle, the surface of the dial with the hour lines is wrapped around a cylindrical column. The dial provides the time in unequal hours, that is, daylight hours derived by dividing the diurnal arc by twelve. Hermannus provides an altitude table expressed in degrees rather than inverse shadow points, as was customary later. His treatise was the first in the Latin West to describe this type of sundial, which had antecedents in Islam. Through Hermannus the chilinder became the inheritor of the *horologium viatorum* (traveler’s dial) tradition first mentioned in the West in Vitruvius’ *De architectura*.

The quadrant described by Hermannus is a quadrant with cursor, the “Alphonsine” type similar to that appearing in the *Libras del saber de astronomia*. It is the usual one-fourth of a circle with the margin divided into ninety degrees and has two small plates with holes on one edge for sighting and a plumb line. A cursor, inscribed with the months of the year, slides in a groove concentric to the margin. The remainder of the body of the quadrant contains the hour lines. This instrument was used to measure the sun’s altitude; with the cursor it could also provide the observer’s latitude and the time of day (in unequal hours).

All three instruments were widely used in the Latin West. The popularity of the astrolabe is well attested. The chilinder and quadrant with cursor also are well represented in the Latin manuscript tradition and continued to appear in printed works through the seventeenth century. It is of interest that all of these instruments were used during the Middle Ages to solve

problems in mensuration as well as in pure astronomy. Hermannus' astronomical writings include a work on the length of the month (*De mense lunari*) in which he criticizes the Venerable Bede; according to Berthold, Hermannus also wrote a computus.

In mathematics Hermannus composed a treatise teaching multiplication and division with the abacus (*Qualiter multiplicationes fiant in abbaco*); the work uses Roman numerals only. He also wrote the earliest treatise on rithmomachia (*De conflictu rithmimachie*), a very complex game based on Pythagorean number theory derived from Boethius. The game was played with counters on a board; capture of the opponent's pieces was dependent on the determination of arithmetical ratios and arithmetic, geometrical, and harmonic progressions. This game, which enjoyed a considerable vogue during the Middle Ages, has been attributed to Pythagoras, Boethius, and Gerbert.

Hermannus composed an excellent world chronicle dating from the birth of Christ which was continued by Berthold and was used by later German historians, such as Manegold of Lautenbach and Otto of Freising. He was also the author of a work on music (*Opuscula musica*) containing a system of notation of musical intervals which was his own invention but had no influence, although he did make an original contribution to medieval modal theory. In addition Hermannus wrote poems and hymns.

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