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[Astronomical Compendium]
In Latin, with some German, manuscript on paper
Germany, Baden-Württemberg or Rhenish Palatinate (Heidelberg?), c. 1450-1460

93 ff., apparently missing some folios, perhaps a quire at the beginning (collation i^{16}, ii^{12}, iii^{12}, iv^{12}, v^{12}, vi^{12}, vii^{15} [16-1]), on paper (watermarks close to Briquet no. 12995, "Raisin": Eberbach, 1443-1449; Eppelsheim, 1445; Briquet, of the type no. 15106, 15109, 15110, "Tête de boeuf": Hildesheim, 1452; Mainz, 1568, Eberbach, 1471, Stauffenberg, 1467-1469), written in a gothic cursive bookhand in brown ink by up to three different hands, on up to 33 long lines to a page, some text copied horizontally, capitals stroked in red, some underlining in red or brown ink, some headings or words in red, with drawings, diagrams and numerous tables throughout the manuscript. Modern quarter binding of vellum over pasteboards, smooth spine, speckled paper over boards (Some slight wear to boards, a few internal dampstains, else in good condition). Dimensions 215 x 154 mm.

Readily datable and localized, this scientific codex—perhaps a school text—contains a number of rare and unfamiliar writings concerning astronomical instruments, spherical or positional astronomy, astrology and geometry. It can be classified amongst the "quadrivium" manuscripts whose texts relate to arithmetic, geometry, astronomy and music, all mandatory subjects for students in the arts following the *quadrivium* curriculum.

PROVENANCE

1. Watermarks, script and the presence of some words in German (ff. 54, 55, 89) confirm a German origin for this manuscript. Approximate dating is rendered possible because of the presence of dates in the text: astronomical tables for Heidelberg are applied to the year 1450 (f. 4v); the year 1446 is chosen to illustrate the movements of the planets (ff. 53v and 88v); and finally there are tables to determine Full Moon and New Moons for the years 1447-1463. Localization is suggested by repeated references to cities in the Baden-Wurttemberg region (Heidelberg is mentioned repeatedly, ff. 4v, 10, 11v, 23, 35, 48, 83; Villigen, ff. 24v, 31v; Reichenbach, f. 79v) as well as other cities in peripheral regions such as Rhenish Palatinate (Mainz, Frankfurt). Other major cities in Europe are also quoted, particularly Italian cities such as Florence, Bologna, Pisa, Ravenna, Padua, Rome, but also Vienna, Paris, Toulouse and Strasbourg (see f. 11v).

TEXT

ff. 1-12, Description and use of astronomical tables for Heidelberg, with an example for the year 1450, incipit, "Et finis est causa carum 2° philosophorum…" (begins incomplete, perhaps missing a

quire at the beginning); "Secundum autem cessante motu celi cessaverit …"; "Item quod tabule supponite sunt verifficate as meridiam haidelbergensem …" (f. 10) [with 3 circular diagrams, ff. 3, 3v, 9v];

f. 12v, blank;

f. 13, Table for determining sunset, heading, *Tabula declinacione solis…*;

ff. 13v-16v, blank;

ff. 17-22, [Anonymous], Treatise on the construction and use of an astrolabe, heading, *Confectio astrolabii*; incipit, "Astrolabium grece acceptacio stellarum latine…";

Apparently anonymous, this treatise is found with a similar incipit in the following manuscripts recorded in the Jordanus database (see link below): 1) Munich, Bayerische Staatsbibliothek, Cod. lat. 10691, ff. 96v-115, *Compositio astrolabii instrumenti nobilissimi*, c. 1524, incipit: "Astrolabium (quod a Ptolomeo planisperium appellatur) grece latine dicitur acceptio stellarum eo quod per ipsum accipitur…"; 2) Cambridge, Emmanuel College, MS I. 2.15 and I. 3.13, *De Astrolabio*, incipit: "Astrolabium est sicut dicit Tholomeus quasi spera extensa…" [with neatly drawn diagrams] (see James, M.R., *A Descriptive Catalogue of the Western Manuscripts in the Library of Emmanuel College*, Cambridge (1904) p. 37).

This text appears to have been inspired by the famous *De astrolabio* attributed to Messahalla and translated by John of Seville and which presents a similar incipit: "Scito quod astrolabium est nomen grecum cuius interpretation est acceptio stellarum […] Ex dixit Ptholomeus quod fit sicut spera extensa in plano…" (Gunther, 1929, p. 195). However, the likeness between the present manuscript and the Latin translation of Messahalla ends here. A number of treatises on the construction and the use of astrolabes were certainly influenced by the important treatise of Messahala without being a faithful translation (see for example another treatise attributed to [Jean de Meerhout], *Tractatus abbreviatus et compendiosus ad faciendum astrolabium*, by Michel (ed.), "Un traité de l'astrolabe du XVe siècle," in *Homenaje a Millás Vallicrosa (José Maria)*, Barcelona, 1954-1956, vol. 2, pp. 41-71).

f. 22, Two tables: "Tabula stellarum fixarum" (Table of fixed stars) and "Tabula mensium ponendorum" (?);

f. 22v, blank;

ff. 23-25v, [Anonymous], Construction of a sundial, incipit, "Pro horalogiis versus quatuor mundi plagas sciendum. Ita fac horalogium in pariete aut trunco declivi ad elevacionem equinocialem… que elevatio est Erfordie 39 graduum, Maguncie et Haidelberge 40 graddum…"; explicit, "[…] ad omnes modos horalogiorum. Latitudo / gradus / minuta. Roma 41-50 / Florencia 41-50 /…/ Haidelberg 49 – 50 / Maguncia 50 – 14 (?) / Colonia 50 – 50 / Erdford 51 – 50 / Brunswig [Braunschweig] 51 – 50…Vilingen 48 – 24 / Constancia 48 - 36" [illustrated by 4 drawings (ff. 24v-25; f. 25v)];

Text found also in Vatican, BAV, Pal. lat. 1381, ff. 76v-78, "Vierflachige Sonnenuhr." The present copy is illustrated by three drawings of circular dials (ff. 24v-25) and a longitudinal projection of the complete sundial (f. 25v).

f. 26, Altitude of the pole star, heading, *Elevacio poli*, with list of names of cities and their latitude and longitude [amongst the listed German cities one finds Cologne, Würtzburg, Erfurt, Heidelberg, Mainz, Frankfurt, Freiburg; to be noted, the change of hand];

f. 26v, blank;

ff. 27-27v, [Anonymous], Treatise on the construction and use of a quadrant, incipit, "Pro confectione quadrantis recipe tabulam planam…"; explicit, "[…] ex astrolabio sumere" [with a diagram representing a quadrant on f. 27v];

Text also found in Vatican, BAV, Pal. lat. 1381 (1350-1366), f. 192v, incipit: "Quadrans. Pro confectione quadrantis recipe tabulam planam…; see L. Schuba, *Die Quadriviums-Handschriften der Codices Palatini Latini in der Vatikanischen Bibliothek*, Wiesbaden, 1992, p. 124.

f. 28, blank;

f. 28v, Use of a quadrant, incipit, "Quadrans c.l.k. fit etc…" [with a small marginal drawing, f. 28v];

ff. 29-33v, [Anonymous], Treatise on use of the Astrolabe, incipit, "Astrolabii usum sive (?) opera perspexi utilem…";

This treatise might be the continuation of the text found on ff. 17-22. In any case it is not recorded in Thorndike and Kibre with this incipit. A note in the margin reads "Termini astrolabii": the text provides the definitions of the various components and discusses the possible uses of the astronomical instrument. A note supplies information on the latitude of Villigen (f. 31v).

ff. 34-34v, blank;

ff. 35-39, Digressions on Johannes de Sacrobosco, *De sphaera mundi [De sphaera materiali]*, heading, *Declaratio spere materialis*; incipit, "Sed quia usus astrolabii post requirit multorum oculorum cognicionem…Cum autem late dicto mundi machina scripserit Jo[hannes] de Sa[crobosco]";

ff. 39v-40v, blank;

ff. 41-42v, [Anonymous], *Regule de geometria*, incipit, "Sed quia geometer est speculator veri…" [with a number of geometrical figures and shapes penned in the margins];

This treatise of practical geometry is recorded by Menso Folkerts (1981) in his recension of mathematical manuscripts part of the Wolfenbüttel Library; see M. Folkerts, "Mittelalterliche mathematische Handschriften in westlichen Sprachen in der Herzog August Bibliothek

Wolfenbüttel Ein vorläufiges Verzeichnis," in *Centaurus*, 25 (1981), pp. 31-33. A similar text, preceded by a heading *Sequuntur regule de geomethria* and with incipit, "Sed quia geometer est speculator veri…" is found in Wolfenbüttel, Herzog August Bibliothek, Cod. Guelf. 696. Helmst., f. 126 and sq.

ff. 43-49, Various applications of the Astrolabe and Jacob's Staff (f. 45: "De baculo"), used to measure altitude, distance, capacity, with incipit, "Si modo alicuius rei accesibilis altitudinem per scalam..." [with two diagrams, ff. 48, 48v];

This incipit is recorded in Thorndike and Kibre, with the following reference: "Astrolabe" and a reference in Zinner, 1925, 926.

f. 49v, blank;

ff. 50-50v, Remarks on the scales of an astrolabe, incipit, "Item scale in astrolabio sunt duo latera divisa…";

ff. 51-52v, Johannes Campanus Novariensis, Extracts from *Tractatus de quadratura circuli*, heading, *Sequitur quadratura circuli edita a campano*, incipit, "Aristoteles in eo qui de kathegoriis scribitur libro…" [with drawings in the margin];

ff. 53-53v, Movements of the planets, with an example for the year 1446, incipit, "Medium motum saturni iovis…ad anum domini millesimum quadringentesimum quadragesimum sextum..." [astrological symbols in lower margin];

Thorndike and Kibre record an incipit: "Medium motum Saturni…" identified as "Astronomical Tables. Heiligenkreuz Stift. 302, ff. 98v-101v";

ff. 54-64, Astronomical and astrological remarks [with diagrams, ff. 58, 64, 72v];

ff. 64v-67v, ff. 70v-75, Elements of Computus, determining the date of Easter, with the example of the year 1448: "[...] si vis habere festum pasce videas claves [...] anno 1448..." (f. 66) and astronomical calculations using the Astrolabe;

ff. 68-70, Hermes, *De iudicio urine*, incipit, "Dixit Hermenes pater philosophorum non est medicus…";

Incipit recorded in Thorndike and Kibre, 453, referring to 2 manuscripts:
Wiesbaden Landesbibliothek, HS 2841, ff. 380vb-382r; Vienna, National-Bibliothek, HS 5307, ff. 150r-v. The database Jordanus records another manuscript containing this work: Leipzig, Universitätsbibliothek, Cod. 1472, ff. 111-115, entitled "Iudicia ex urina non visa."

ff. 75v-76v, Profacius Judaeus, *De aspectibus lunae*, in hexameters, translated from Hebrew (in Montpellier) (f. 75v), incipit, "Fortunata dies ad agenda negocia regum…" (recorded in Thorndike and Kibre, 569, who give 6 manuscripts); *Versus de electionibus horarum*, incipit, "Fortunata dies in ea

senibus" (recorded in Thorndike and Kibre, 569, one manuscript, Paris, Bibl. Arsenal, MS 699, f. 49v);

ff. 77-78v, Tables and explanations for a Chilinder (Traveler's Dial), heading, "Pro Chilindro" (f. 77);

On the Chilinder, see C. Kren, "The Traveler's Dial in the Late Middle Ages: The Chilinder," in *Technology and Culture*, 18, no. 3 (1977), pp. 419-435.

f. 78v, Notes on the use of a quadrant;

f. 79, Notes on the use of a cross-staff or Jacob's Staff;

f. 79v, Astronomical Calculations relating to the Tables of Reichenbach [Benedictine Priory of Kloster Reichenbach, in Baden-Württemberg];

On the Status of Astronomy and Science in the Monastery of Reichenbach, see Wolfgang Kaunzner, "Zum Stand von Astronomie und Naturwissenschaften im Kloster Reichenbach" [The Status of Astronomy and Science in the Monastery of Reichenbach], in *850 Jahre Kloster Reichenbach*, Munich, Johannes von Gott-Verlag, 1993.

ff. 80-81v, Leopold [Leupoldus] of Austria, Excerpts from *Compilatio de astrorum scientia*, incipit, "Pro intelligentia circulorum..." ; this inscription at the end: "Hic Leupoldus ducatus austrie filius";

ff. 82-82, Remarks on Astronomy (?), quoting such authors as Bede, Boethius, Alphonsus etc., incipit, "Item Beda dicit…";

ff. 83-84v, Tables for determining the New Moon and Full Moon, for the years 1447-1463, with a note referring to Heidelberg;

ff. 85-86v, Position of the planets in relation to the sun, followed by a table;

ff. 87, Table, "Visio et occultatio Mercurii";

ff. 84v, Table, "Tabula ad sciendum introitu solis in [...] signi";

ff. 88-88v, Movements of the planets, with an example for the year 1446;

ff. 89-90v, Elements of Computus;

f. 91, Notes on the use of a cross-staff or Jacob's Staff.

This mid-fifteenth-century codex includes primarily texts concerning astronomical instruments, spherical or positional astronomy, astrology and geometry. It can be classified amongst the "quadrivium" manuscripts ("Quadriviumhandschriften") that contain texts relating to arithmetic,

geometry, astronomy and music, all mandatory subjects for students in arts following the *quadrivium* cursus. The manuscript contains a number of apparently unfamiliar works, some not recorded in Thorndike and Kibre, which merit further study.

A number of texts relate to the construction and uses of such astronomical instruments as the astrolabe (the main treatise in this manuscript on the construction and use of an astrolabe appears to be found in only two other known manuscripts), the quadrant and the instrument known as Jacob's Staff. The astrolabe was in several respects the most important scientific instrument of the Middle Ages. With it one could make reasonably precise observations. The commonest use of the instrument was no doubt for judging time, but an astronomer could be taught a great many more uses, as underscored in the present manuscript. The astrolabe and treatises relating to its fabrication and uses played an extremely important role in scientific training from the thirteenth to the sixteenth centuries.

Likely copied in Heidelberg or nearby, a town which housed an important university, the present manuscript provides interesting research perspectives on positional astronomy, timekeeping and instrumentation in late medieval Germany.

LITERATURE

Poulle, E. *Les sources astronomiques (textes, tables, instruments)*, Typologie des sources du Moyen Age occidental, fasc. 39, Brepols, 1981.

Thorndike L. and P. Kibre. *A Catalogue of Incipits of Medieval Scientific Writings in Latin*, London, 1963.

Zinner, E.*Verzeichnis der astronomischen Handschriften des deutschen Kulturgebietes*, Munich, 1925.

ONLINE RESOURCES

Jordanus, *An International Catalogue of Mediaeval Scientific Manuscripts*
http://jordanus.ign.uni-muenchen.de/

Overview of Astrolabe Principles
http://www.astrolabes.org/
http://www.astrolabes.org/history.htm

On the Nocturlabe and the Astrolabe
http://www.louisg.net/mesure_temps3.htm

On the History of Sundials and Gnomonics
http://www.sundialsoc.org.uk/

Example of a cross-staff (Jacob's staff)
http://www.adlerplanetarium.org/research/collections/4d.shtml

Catalogue of Medieval Astronomical Instruments
http://web.uni-frankfurt.de/fb13/ign/instrument-catalogue.html