

## The Treatise on the Rising and Setting of Signs, Ascribed to Roger of Hereford.

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A text beginning "Orizon rectus est circulus magnus" (Thorndike & Kibre 1963, col. 640) is found in ms. Oxford, Bodl.L., Bodl. 300, 84rb-90ra. According to the catalogue,<sup>1</sup> the manuscript is from the early 15th century, written in England. At the beginning of the text, there is a faintish title in a secondary hand, "Incipit(?) tractatus Herfordensis de ortu et occasu signorum". Accordingly, the catalogue lists the piece as "Tractatus [Roger] Her[e]fordensis de ortu & occasu signorum", and both Thorndike and Haskins<sup>2</sup> ascribe it to Roger of Hereford (*fl. ca.* 1170), known as the author of a computus and several astronomical and astrological tracts. In this note I shall try to show that such an ascription has no basis. However, as the present treatise has apparently not been examined till now, a few words about its contents may be in order.

The text discusses some elementary problems that mostly have to do with the rising times and setting times of arcs of the ecliptic. Risings may be with respect to the eastern horizon for a given terrestrial latitude (ascensions *in sphaera obliqua*) or with respect to the meridian or some other great circle through the celestial poles (ascensions *in sphaera recta*); settings are, of course, with respect to the western horizon. Time is measured as the arc of the celestial equator that passes the horizon (or meridian, as the case may be) together with the given arc of the ecliptic during the daily rotation of the heavens.<sup>3</sup> — The following topics are covered:

- (1) **84rb-va:** Definitions.
- (2) **84va-87rb:** Whether an ecliptical arc rises "recte" or "oblique". A given arc rises "recte" if it is less than its counterpart on the equator, and "oblique"

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1: Summary Catalogue (Madan & Craster), vol. II Part I, 1922, p. 386-88, no. 2474. — See also Benjamin & Toomer 1971, p. 60-61.

2: Thorndike: 1923, p.82. Haskins: 1924, p.125.

3: For the general problem of rising times, which can be traced back to the Babylonians, see Neugebauer 1975, 712 ff. It is mostly connected with discussion of the length of daylight, as it is in our treatise.

if greater.<sup>4</sup> Various cases of this are discussed, both for ascensions *in sphaera recta* (84va-85va) and *in sphaera obliqua* (85va-87rb).

The discussion is founded on four theorems about spherical triangles, said to be obvious "ex primo IEBRI" (84va); they are in fact reminiscent of the first book of Jabir b. Aflah, though they have no exact correspondences there. — 86ra, example for terrestrial latitude 51°, which is mentioned as that of "CHURI(N)GIA" (86va) and as "in predicta latitudine, scilicet HERFORDENSI" (86vb); the latitude 51° is mentioned again on 86vb.

- (3) **87rb-88ra:** Mean and true solar days, and equation of time.

Quotes "2 ALMAGESTI" for the mean solar motion of 59'8" per day (87rb); "secundum PTOLOMEUM ubi supra" for the equation of time.<sup>5</sup> References to tables, etc.: "ex tabulis ascensionum in sphaera recta", or else "tabulas ascensionis signorum in circulo recto" (87va); "medii motus planetarum ... quos habemus in capitibus tabularum mediorum motuum" (87va); "in tabulis equationis dierum" (87va); planetary positions "per equationem factam ex tabulis" (87vb).

- (4) **88ra-va:** Problems concerning ecliptical arcs bounded by the sun, considering that the sun moves on the ecliptic while the arc is rising.

Refers to tables "adequatas ad unum meridianum ... sicut ad PARISIUS vel H(ER)FORDIAM", said to be meant for computing the ascendent (88rb).

- (5) **88va-89rb:** Astrological houses, established by dividing the quarter of the ecliptic from the ascendent to the *imum caeli* into 3 parts that have the same right ascensions, and analogously for the other quarters.

89rb, example for houses at 48° terrestrial latitude (which is a common figure for Paris). The largest length of a house is said to be about 42° and the smallest 18°, which "is easy to find on the astrolabe".<sup>6</sup> — Refers to tables for finding the equatorial arc corresponding to a seasonal hour (88va); to "tabula ascensionis signorum in sphaera recta" (88vb), or else

4: The terms "recte / oblique oriri" are ancient; I have seen similar in, e.g., Martianus Capella §844-45; Manilius 3, 226-27. The terms have found their way into Sacrobosco's *Sphaera* (pp. 98 and 103 Thorndike), where Lucanus *Phars.* 9, 533-7 is quoted as an example.

5: In fact, *Almagest* III 9.

6: "in astrolabio" appears to be an easy emendation of the reading "in astrologo" of the manuscript. — A parallel may be seen in a table of houses, common in a late-13th century, mainly Parisian, family of manuscripts for the Toledan tables (Pedersen 2002, p. 1112ff., table BH14; Toomer 1968, p. 146 bottom). The tabular values are in degrees only, and the minimum and maximum lengths of a house are indeed as stated in our text. The usual heading is "Tabula equationis domorum ad latitudinem 48 graduum", and some manuscripts add that the latitude is for Paris, and/or that the table has been made by means of an astrolabe.

"tabula ascensionum circuli recti" (89ra), or else "tabula ascensionis signorum in circulo recto", beginning in Capricorn (89ra), and to finding the ascendent "secundum doctrinam canonum tabularum" (89ra).

- (6) **89rb-vb**: Order of rising and setting of heavenly bodies whose ecliptical coordinates are known, relatively to one another or to the ecliptical degree that marks their longitude.

The rising of the full moon, relative to sunset, is said to depend on the lunar latitude and the terrestrial latitude, which is easy to visualize "in instrumento sphere" (89va). This is no doubt a *sphaera materialis*.

- (7) **89vb-90ra**: "Risings" and "settings" (really, apparitions and occultations) of planets and of the Moon; form of lunar sickle explained.

These things established, the identity of "Herfordia", mentioned in (2) and (4), can be quickly dealt with. As the reader may have noticed, the "Churingia" in (2) is sure to be Thüringen, so "Herfordia" is in fact Erfurt. Further, the stated latitude of  $51^\circ$  for "Herfordia" and for Thüringen fits Erfurt exactly, whereas Hereford (England) is on  $52^\circ 05'$  latitude, and Herford (Germany) is on  $52^\circ 08'$ . Thus the location to Hereford has no foundation, much less the ascription to Roger of Hereford.

What, then, can we know about the text? It is not a translation but shows a normal scholastic style, using the same terminology as Sacrobosco's *Sphere* and other standard astronomical texts of the 13th century. Apart from (1-2), the subjects it treats of are common enough, requiring an amount of familiarity with some such work as the canons to the Toledan Tables (*canones tabularum* are mentioned on 89ra, see (5) above); and the tables it cites may also be the common Toledan ones (or, of course, the selection from these that kept following the Alfonsine Tables in the 14th century<sup>7</sup>). — PARIS is mentioned in (4) and is probably implicit in the latitude of  $48^\circ$  in (5). This may easily be the original location of the treatise. If so, "vel Herfordiam" in (4) is added by some scribe, and the examples in (1-2) for Thüringen and Erfurt are intrusions in the text, or else the whole of (1-2) has been freshly made with a view to Erfurt. — The references to the astrolabe (5), the *sphaera* (6), and those to the *Almagest* (3) and Jabir (2), are such as could be found in a text from the late 13th century such as John of Sicily,<sup>8</sup> as could the unspecified reference to "canones

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7: See Chabás & Goldstein 2003, 303 ff.

8: Cf. Pedersen 1986, p. 14, §6,7.

tabularum" in (5). Thus the original version may plausibly be dated to the late 13th or the early 14th century, though a later date is possible too.

In short: Our text is most probably Parisian from the 13th-14th century, with revisions for Erfurt, which may have been made between the mid 14th century and about 1400, when our copy was written. If the scribe was indeed English, he may even have re-interpreted Erfurt as Hereford, which would explain the spelling if this were needed.

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