

Pseudo-Māshā'allāh  
*On the Astrolabe*

Part II: *De compositione astrolabii*  
Critical Edition  
with English Translation``  
by

Ron B. Thomson

Version 1.7

Toronto, 2022

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- Bα Brugge, Openbare Bibliotheek Biekorf, ms. 523, ff. 79<sup>r</sup>-85<sup>v</sup>
- Bγ Berlin, Staatsbibliothek zu Berlin - Preussischer Kulturbesitz, ms. lat. fol. 610, ff. 63<sup>r</sup>-82<sup>r</sup>
- Bδ Berlin, Staatsbibliothek zu Berlin - Preussischer Kulturbesitz, ms. lat. fol. 192, ff. 29<sup>r</sup>-32<sup>r</sup>
- Bε Berlin, Staatsbibliothek zu Berlin - Preussischer Kulturbesitz, ms. lat. fol. 246, ff. 32<sup>r</sup>-38<sup>v</sup>
- Bζ Basel, Öffentliche Bibliothek der Universität Basel, ms. F-III-25, ff. 26<sup>v</sup>-40<sup>r</sup>, 41<sup>r</sup>
- Bη Bernkastel-Kues, St. Nikolaus-Hospitals, Bibliothek, ms. 212, ff. 118<sup>r</sup>-122<sup>r</sup>; 124<sup>r</sup>-126<sup>v</sup>
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- Bκ Brno, Moravská zemská knihovna v Brně, ms A 64, ff. 406<sup>v</sup>-420<sup>r</sup>
- Cβ Cambridge, St John's College Library, ms. 162 (*olim* F.25), ff. 50<sup>r</sup>-54<sup>r</sup>
- Cδ Cambridge, University Library, ms. Hh.6.8, ff. 185<sup>r</sup>-190<sup>v</sup>; 193<sup>r</sup>-196<sup>v</sup>; 199<sup>v</sup>
- Cε Cambridge, University Library, ms. Ii.1.13, ff. 84<sup>v</sup>-94<sup>v</sup> (*olim* 75<sup>v</sup>-85<sup>v</sup>)
- Cζ Cambridge, University Library, Additional ms. 6860, ff. 66<sup>v</sup>-76<sup>r</sup>; 76<sup>r</sup>-77<sup>r</sup>
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- Cι Cambridge, Gonville and Caius College Library, ms. 174/95, pp. 24<sup>a</sup>-53<sup>b</sup>
- Dβ Darmstadt, Universitäts- und Landesbibliothek, ms. 1227, 117<sup>r</sup>-120<sup>v</sup>
- Dγ Darmstadt, Universitäts- und Landesbibliothek, ms. 2661, ff. 146<sup>r</sup>-168<sup>r</sup>
- Dη Dublin, Trinity College Library, ms 403 (D.2.29/502), ff. 57<sup>r</sup>-78<sup>r</sup>
- Eα Edinburgh, Royal Observatory, Crawford Library, ms 3.12, ff. 4<sup>r</sup>-10<sup>r</sup>
- Eβ Eger, Főegyházmegyei Könyvtár, ms U<sup>2</sup> VI 1, ff. 79<sup>r</sup>-97<sup>v</sup>
- Eγ Edinburgh, Royal Observatory, Crawford Library, ms 5.14, ff. 8<sup>r</sup>-8<sup>v</sup>
- Eδ Einsiedeln, Stiftsbibliothek, ms 29 (878), pp. 103-136
- Eζ Erfurt, Universitäts- und Forschungsbibl. Erfurt/Gotha, ms Amplon. F<sup>o</sup> 376, ff. 82<sup>v</sup>-95<sup>v</sup>
- Eη Erfurt, Universitäts- und Forschungsbibl. Erfurt/Gotha, ms Amplon. F<sup>o</sup> 394, ff. 60<sup>r</sup>-67<sup>r</sup>
- Eμ Erfurt, Universitäts- und Forschungsbibl. Erfurt/Gotha, ms Amplon. Q<sup>o</sup> 355, ff. 49<sup>r</sup>-62<sup>r</sup>
- Eν Erfurt, Universitäts- und Forschungsbibl. Erfurt/Gotha, ms Amplon. Q<sup>o</sup> 363, ff. 94<sup>r</sup>-95<sup>v</sup>
- Eο Erfurt, Universitäts- und Forschungsbibl. Erfurt/Gotha, ms Amplon. Q<sup>o</sup> 369, ff. 184<sup>r</sup>-190<sup>v</sup>
- Eτ Erfurt, Universitäts- und Forschungsbibl. Erfurt/Gotha, ms Amplon. Q<sup>o</sup> 386, ff. 130<sup>r</sup>-150<sup>v</sup>
- Eυ Erlangen, Friedrich-Alexander-Universität Erlangen-Nürnberg, Universitätsbibliothek, ms. 665, ff. 9<sup>r</sup>-26<sup>v</sup>
- Eφ El Escorial, Real Biblioteca del Monasterio de San Lorenzo, ms. O.II.10, ff. 69<sup>r</sup>-71<sup>v</sup>
- Fα Firenze, Biblioteca Nazionale Centrale, ms. II.III.24, ff. 189<sup>r</sup>-198<sup>r</sup>
- Fβ Firenze, Biblioteca Nazionale Centrale, ms. Con. Sop. J.II.10 ff. 197<sup>r</sup>-216<sup>r</sup> (189<sup>r</sup>-208<sup>r</sup>)
- Fδ Firenze, Biblioteca Riccardiana, ms. 885, ff. 104<sup>r</sup>-107<sup>r</sup>
- Fζ Firenze, Biblioteca Medicea Laurenziana, ms. Plut. XVIII sin. cod. 3, ff. 68<sup>v</sup>-90<sup>r</sup>
- Gα Göttingen, Niedersächsische Staats- und Universitätsbibl., ms. Theol. 124, ff. 145<sup>r</sup>-147<sup>v</sup>,  
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- Λβ London, British Library, ms. Arundel 268, ff. 49<sup>r</sup>-61<sup>r</sup>  
 Λγ London, British Library, ms. Egerton 844, ff. 58<sup>r</sup>-77<sup>r</sup>  
 Λε London, British Library, ms. Harley 3647, ff. 63<sup>r</sup>-81<sup>r</sup>  
 Λζ London, British Library, ms. Royal 12.C.ix, ff. 38<sup>r</sup>-49<sup>v</sup>  
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 Λκ London, Middle Temple, ms. 75, ff. 132<sup>v</sup>-133<sup>r</sup>, 136<sup>r</sup>-140<sup>r</sup>
- Μγ Mantova, Biblioteca Comunale Teresiana, ms. 125, ff. 13<sup>r</sup>-21<sup>v</sup>  
 Μδ Manchester, University of Manchester, John Rylands Library, ms. 67, ff. 218<sup>r</sup>-231<sup>r</sup>  
 Μζ Melk, Stifsbibliothek, Cod. 601 (*olim*. 51; *olim* B.16), f. 17<sup>v</sup>  
 Μη Milano, Biblioteca Pinacoteca Accademia Ambrosiana, ms. H.75.Sup., ff. 34<sup>r</sup>-51<sup>v</sup>  
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- Μλ Montpellier, Bibliothèque Interuniversitaire, Section Médecine, ms. H 323, ff. 74<sup>r</sup>-98<sup>v</sup>  
 Μν München, Bayerische Staatsbibliothek, Clm 353, ff. 41<sup>r</sup>-54<sup>r</sup>  
 Μο München, Bayerische Staatsbibliothek, Clm 572, ff. 1<sup>r</sup>-27<sup>v</sup>  
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 Μφ München, Bayerische Staatsbibliothek, Clm 14684, ff. 82<sup>v</sup>-98<sup>r</sup>  
 Μχ München, Bayerische Staatsbibliothek, Clm 19689, f. 66<sup>r</sup> (*olim* 60<sup>r</sup>)  
 Μψ München, Bayerische Staatsbibliothek, Clm 19690, ff. 108<sup>r</sup>-109<sup>r</sup>
- Να Napoli, Biblioteca Nazionale "Vittorio Emanuele III", ms. VIII-C-36, ff. 29<sup>r</sup>-36<sup>r</sup>  
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 Νε Napoli, Biblioteca Nazionale "Vittorio Emanuele III", ms. VIII-C-46, ff. 43<sup>r</sup>-58<sup>r</sup>
- Οα Oxford, Bodleian Library, ms. Bodley 430, ff. 42<sup>r</sup>-45<sup>v</sup>  
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 Οφ Oxford, Magdalene College, ms. 182, ff. 103<sup>r</sup>-109<sup>r</sup> (*olim* ff. 48<sup>r</sup>-54<sup>r</sup>)
- Πα Paris, Bibliothèque Sainte-Geneviève, ms. 1043, ff. 65<sup>r</sup>-80<sup>r</sup>  
 Πγ Paris, Bibliothèque nationale de France, ms. lat. 7194, ff. 46<sup>r</sup>-62<sup>v</sup>  
 Πδ Paris, Bibliothèque nationale de France, ms. lat. 7195, ff. 44<sup>r</sup>-61<sup>r</sup>  
 Πθ Paris, Bibliothèque nationale de France, ms. lat. 7280, ff. 73<sup>r</sup>-82<sup>r</sup>

- Pλ Paris, Bibliothèque nationale de France, ms. lat. 7295A, ff. 49<sup>r</sup>-62<sup>v</sup>
- Pμ Paris, Bibliothèque nationale de France, ms. lat. 7298, ff. 61<sup>v</sup>-75<sup>v</sup>
- Pν Paris, Bibliothèque nationale de France, ms. lat. 7336, ff. 307<sup>r</sup>-326<sup>v</sup>
- Pο Paris, Bibliothèque nationale de France, ms. lat. 7413(1), ff. 1<sup>r</sup>-18<sup>v</sup>
- Pπ Paris, Bibliothèque nationale de France, ms. lat. 7413(2), f. 75<sup>v</sup>; 36<sup>v</sup>
- Pρ Paris, Bibliothèque nationale de France, ms. lat. 7414, ff. 9<sup>r</sup>/1<sup>r</sup>-[48<sup>v</sup>]/40<sup>v</sup>
- Pτ Paris, Bibliothèque nationale de France, ms. lat. 7416B, ff. 75<sup>v</sup>-86<sup>r</sup>
- Pυ Paris, Bibliothèque nationale de France, ms. lat. 7421, ff. 62<sup>r</sup>-89<sup>v</sup> (*olim* 61<sup>r</sup>-88<sup>v</sup>)
- Pφ Paris, Bibliothèque nationale de France, ms. lat. 10266, ff. 126<sup>r</sup>-147<sup>r</sup>
- Pψ Paris, Bibliothèque nationale de France, ms. lat. 16652, ff. 2<sup>r</sup>-6<sup>r</sup>
- Qα Paris, Bibliothèque nationale de France, ms. n.a.l. 693, ff. 9<sup>r</sup>-14<sup>r</sup>
- Qβ Paris, Bibliothèque nationale de France, ms. n.a.l. 1893, ff. 48<sup>v</sup>-65<sup>r</sup>
- Qγ Paris, Bibliothèque de la Sorbonne, ms. 595, ff. 68<sup>r</sup>-88<sup>r</sup>
- Qδ Parma, Biblioteca Palatina, ms. 984 (*olim* HH.III.17), ff. 115<sup>r</sup>-130<sup>v</sup>
- Qλ Princeton, Princeton University Library, ms. Garrett 99, ff. 180<sup>r</sup>-198<sup>r</sup>
- Qμ Private Collection, ff. 133<sup>r</sup>-157<sup>v</sup>
- Rα Ravenna, Biblioteca Classense, ms. 269, ff. 1<sup>r</sup>-24<sup>v</sup>
- Rβ Rovigo, Biblioteca dell'Accademia dei Concordi, ms. Silvestriano 88, ff. 70<sup>r</sup>-79<sup>v</sup>
- Rδ Roma, Biblioteca Vallicelliana, ms. D 40, ff. 88<sup>r</sup>-104<sup>v</sup>
- Rε Roma, Osservatorio Astronomico, Biblioteca, ms. III C.14, ff. 160<sup>r</sup>-171<sup>v</sup>
- Sβ Salamanca, Universidad de Salamanca, Biblioteca, ms. 2353, ff. 4<sup>v</sup>-12<sup>r</sup>
- Sδ Salamanca, Universidad de Salamanca, Biblioteca, ms. 2662, ff. 67<sup>r</sup>-84<sup>v</sup>
- Sθ Sevilla, Biblioteca Capitular y Colombina, ms. 7-6-2, ff. 121<sup>r</sup>-140<sup>v</sup>
- Si Sevilla, Biblioteca Capitular y Colombina, ms. 7-7-2, ff. 43<sup>r</sup>-49<sup>r</sup>, 51<sup>r</sup>-55<sup>r</sup>
- Sk Stams, Stiftsbibliothek, ms. 13, ff. 78<sup>r</sup>-101<sup>r</sup>
- Sλ Sankt-Peterburg, Rossijskaja Nacionalnaja Biblioteka, ms. Lat O.v.IX n<sup>o</sup>. 2, ff. 6<sup>v</sup>-25<sup>r</sup>
- Tδ Trier, Stadtbibliothek, ms. 1074/1271 (8<sup>o</sup>), ff. 49<sup>r</sup>-81<sup>v</sup> (*olim* 50<sup>r</sup>-82<sup>v</sup>)
- Uα Uppsala, Universitetsbibliotek, ms. C 653, ff. 61<sup>r</sup>-65<sup>v</sup>
- Vα Vatican, Biblioteca Apostolica Vaticana, ms. Barb. lat. 156, ff. 198<sup>r</sup>-214<sup>r</sup>
- Vβ Vatican, Biblioteca Apostolica Vaticana, ms. Barb. lat. 276, ff. 41<sup>r</sup>-50<sup>v</sup>/91<sup>r</sup>-109<sup>r</sup>, 57<sup>r</sup>-71<sup>v</sup>
- Vε Vatican, Biblioteca Apostolica Vaticana, ms. Borg. 312, ff. 15<sup>r</sup>-18<sup>r</sup>
- Vθ Vatican, Biblioteca Apostolica Vaticana, ms. Pal. lat. 1391, ff. 195<sup>v</sup>-198<sup>v</sup>
- Vι Vatican, Biblioteca Apostolica Vaticana, ms. Pal. lat. 1376, ff. 335<sup>r</sup>-342<sup>v</sup>
- Vκ Vatican, Biblioteca Apostolica Vaticana, ms. Pal. lat. 1381, ff. 137<sup>r</sup>-147<sup>r</sup>
- Vν Vatican, Biblioteca Apostolica Vaticana, ms. Pal. lat. 1414, ff. 179<sup>v</sup>-189<sup>v</sup>
- Vπ Vatican, Biblioteca Apostolica Vaticana, ms. Rossiano 732 (*olim* X,112), ff. 47<sup>v</sup>-66<sup>v</sup>
- Vσ Vatican, Biblioteca Apostolica Vaticana, ms. Urb. lat. 1408, ff. 7<sup>r</sup>-20<sup>r</sup>
- Vυ Vatican, Biblioteca Apostolica Vaticana, ms. Vat. lat. 3099, ff. 28<sup>r</sup>-33<sup>v</sup>; 35<sup>r</sup>-38<sup>v</sup>
- Vχ Vatican, Biblioteca Apostolica Vaticana, ms. Vat. lat. 3133, ff. 58<sup>r</sup>-62<sup>r</sup>
- Vψ Vatican, Biblioteca Apostolica Vaticana, ms. Vat. lat. 4037, ff. 168<sup>r</sup>-186<sup>r</sup>

- W $\alpha$  Wien, Österreichische Nationalbibliothek, ms. Palatinus 2367, ff. 77<sup>r</sup>-92<sup>v</sup>, 184<sup>r</sup>, 196<sup>r</sup>  
W $\beta$  Wien, Österreichische Nationalbibliothek, ms. Palatinus 2386, ff. 1<sup>r</sup>-6<sup>v</sup>  
W $\epsilon$  Wien, Österreichische Nationalbibliothek, ms. Palatinus 5277, ff. 110<sup>v</sup>-116<sup>v</sup>  
W $\iota$  Wolfenbüttel, Herzog August Bibliothek, Cod. Guelf. 76.1 Aug. 2<sup>o</sup>, ff. 2<sup>r</sup>-22<sup>v</sup>  
W $\kappa$  Wolfenbüttel, Herzog August Bibliothek, Cod. Guelf. 81.26 Aug. 2<sup>o</sup>, ff. 139<sup>v</sup>-140<sup>r</sup>  
X $\alpha$  Venezia, Biblioteca Nazionale Marciana, ms. VIII.33 (= 2499), ff. 92<sup>r</sup>-99<sup>v</sup>  
X $\beta$  Venezia, Biblioteca Nazionale Marciana, ms. VIII.33 (= 2499), ff. 100<sup>r</sup>-115<sup>v</sup>(?)

Note: the page numbering (with occasional blank pages) is designed to display the Latin on the left and the corresponding English on the right when printed as a book.

[ De compositione  
astrolabii ]

[ On the Construction  
of an Astrolabe ]

The following manuscripts begin with the Prologue, line 1 (“Scito quod astrolabium ....”):

Aα Bα Bγ Bε Bζ Bη Bι Bκ Cβ Cδ Cε Cη Cθ Cι Dβ Dγ Dη Eα Eβ Eδ Eζ Eη Eμ Eν Eο Eτ Eυ Eφ Fα Fβ Fδ Fζ Lβ Lγ  
Lε Lζ Lη Lκ Mγ Mδ Mη Mθ Mκ Mλ Mν Mο Mυ Mφ Nα Nδ Nε Oα Oζ Oη Oκ Oμ Oξ Oο Oπ Oσ Oτ Oυ Pα Pγ Pδ  
Pθ Pλ Pμ Pν Pο Pπ Pρ Pτ Pυ Pφ Qα Qβ Qγ Qδ Qλ Qμ Rα Rβ Rδ Rε Sβ Sδ Sθ Si Sk Sl Tδ Uα Vα Vβ Vε Vi Vκ Vν  
Vπ Vσ Vυ Vχ Vψ Wα Wβ Wι Xα Xβ

## [ Prologue ]

## INCIPIT ASTROLABIUM MESSEHALLE / PROHEMIUM IN ASTROLABIUM MESSEHALLE

Scito quod “astrolabium” est nomen grecum cuius interpretatio est “acceptio

- 1 Incipit ... Massehalle<sub>2</sub>] *om.* Bα Bε Cβ Cθ Dβ Eα Eμ Nα Oη Oο Pγ Pπ Qα Qμ Sβ Sι Sλ Vα Vν; *illeg.* Uα(*later hand*); Canones de compositione astrolabii Rε; Compositio astrolabii Vχ(*later hand*); Compositio astrolabii M~ Eτ Lζ; Compositio astrolabii secundum M~ prohemium Vβ; De astrolabio Lκ Vν; De astrolabio compositione Cδ(*later hand*); Hic incipit astrolabium Pο; Hic est incaptio astrolabii ad sumi pontificis dei honorem Mγ; De compositione astrolabii Bκ; Hic incipit canon novi astrolabii M~ Eο(*later hand*); In nomine domini Iesu Christi ... astrolabii M~... Bε(*later hand*); Incipit astrolabium Cι Sθ; Incipit astrolabium M~ [*illeg.*] Pν; Incipit astrolabium M~ Bγ(*later hand*) Bη Bι Eδ Eζ Mη Mθ Mλ Mν Mo Nε (*add.* etc.) Pτ Qδ Rα Rβ Vκ Vψ Wβ Wι Xβ; Incipit astrolabium M~ prohemium Bζ Fα Pλ; Incipit astrolabium M~ vel tractatus astrolabii Pδ; Incipit astrolabium secundum M~ Dγ; Incipit compositio astrolabii Oπ; Incipit compositio astrolabium M~ Vε; Incipit de compositione astrolabii Fδ; Incipit liber sive tractatus astrolabii M~ Rubrica Vπ; Incipit opus astrolabii secundum M~ Oα; Incipit proemium in astrolabium M~ Rδ; Incipit tractatus astrolabii Cε(*marg.*) Oμ(*marg.*); Incipit tractatus astrolabii edicionis M~ prohemium Cη; Incipit tractatus astrolabii M~ Aα Eν Pν; Incipit tractatus de compositione astrolabii secundum doctrinam M~ Dη; Opus astrolabii secundum M~ Eν Mκ Oσ(*later hand*) Vσ; Opus astrolabii secundum M~ Rubrica Oκ; Prohemium abstrolabium M~ Pα; Proemium astrolabii M~ Pο; Proemium in astrolabium M~ Eβ Eφ Fβ Fζ Lβ Lε Lη Mδ Mφ Nδ Oζ Oτ Oξ Oυ Pα Pθ Pμ Pο Pυ Qλ Sδ Tδ Vι Wα; Proemium in astrolabium M~ 1445 Mν(*diff. hand*); Prohemium in astrolabium M~ capitulum primum Qγ; Prohemium in astrolabium M~ et primo compositio eiusdem Eη; Prohemium in compositione astrolabii M~ Qβ; Prohemium tabularum in astrolabium M~ Lγ; Sequitur alia compositio astrolabii bona Pφ(*later hand add.*: que est M~); Tractatus astrolabii secundum magistrum Johannem Sacro Boscho Xα
- 1 Messehalle] Macelama Eν Oσ; Macellama Mκ Oα(?) Vσ; Mensehale Nε; Mesaalat Rβ; Mesahallach Fβ; Mesalahat Qδ; Mesehalle Qβ; Mese<sup>le</sup> Dγ; Meshale Wι; Meshalle Bζ Pτ; Messah[*cut off*] Bκ(*marg.*); Messahalach Eη; Messahale Mη Mθ Mo Pλ; Messahallach Mδ; Messahallah Dη Vε; Messahalle Pδ Vψ; Messalahat Pφ; Messcallath Oκ; Messeh<sup>a</sup>... Lζ; Messahalath Bη Oζ Pο; Messehale Mλ Oυ; Messehallach Eβ Eο Fα Lβ(*marg.*) Mυ Mφ Nδ Oξ Vβ Vι; Messehallat Vκ; Messehallath Bε Cη Fζ Lβ Lγ Lη Oτ Pα Pθ Pμ Qγ Qλ Sδ Tδ; Messehallaz Pυ Wα; Messehallaz<sub>1</sub> Aα; Messehalla<sub>3</sub> Eν Vπ; Messehallath Sκ; Messehalle Bγ Bι Eδ Eζ Eτ Eφ Oυ Rα Wβ; Messehallhach Lε; Messehalath Xβ; Messisus allath Rδ; Methalle Mν
- 2 Scito] Sciendum Oη est] sit Aα Bζ Cδ Cθ Dβ Dη Eν Eυ Fδ Mγ Mθ Mκ Mλ Mν Oη Oκ Oμ Oπ Pπ Sθ Sι Sλ Vα Vπ Vσ Vχ

[ *Prologue* ]

HERE BEGINS THE ASTROLABE [TEXT] OF MESSAHALLA / PROLOGUE TO THE ASTROLABE [TEXT]  
OF MESSAHALLA

Know that “astrolabe” is a Greek noun whose meaning is “the reception of the

5 stellarum,” eo quod accipiatur ex eo veritas earum rerum quarum scientia queritur ex locis stellarum. Et dixit Ptholomeus quod sit sicut spera que fuerit extensa. Eritque punctus ipsius axis apparens et almucanthat, que sunt in omni tabula eius, sunt

- 3 eo] eis Nδ earum rerum quarum] earum quarum Bζ Bι Dγ Eδ Eζ Eτ Lζ Mβ Mo Oκ Qβ Pγ Po Pτ Rα Sβ Wι Xα; eorum quorum Bα Cβ Cδ Cθ Eμ Ev Mγ Mκ Mλ Mν Oα Oη Oμ Oπ Oσ Qα Qμ Sθ Sι Sλ Uα Vε Vσ Vχ Vυ
- 4 stellarum] *ms* Lκ *ends*; *add.* fixarum Mγ Ptholomeus] Pholo' Qμ; Phtholo~ Pρ; Phto' Rα; Phtolo~ Oα Oσ Vπ; prologus Bα; P'holo~ Rδ; Ptolo~ Bη Bκ Dβ Eδ Eζ Eη Ev Eφ Fβ Mγ Mν Mo Mυ Mφ Pγ Po Pφ Sλ Vα Vε Vχ Vψ Xβ; Tholo~ Bζ Cθ Eα Mη Oκ Oπ Qα Sι Vν; Tolo~ Cβ Oξ Vκ; Tpholo~ Sκ quod] *om.* Sκ sit] est<sup>1</sup> Eμ Oη Pα; fit Ev Mδ Qγ Sδ Tδ Uα Vσ Xα que fuerit extensa] extensa in plano<sup>2</sup> Bγ Bε Bη Bζ Bι Cε Cη Cι Dγ Dη Eα Eβ Eδ Eζ Eη Eτ Eφ Fα Fβ Fζ Lγ Lη Lε Lζ Mη Mo Mρ Mυ Nα Nδ Nε Oζ Oξ Oτ Oυ Pγ Pδ Pθ Pλ Pμ Pν Po Pρ Pτ Pυ Rε Qβ Qγ Qδ Qλ Qμ Rα Rβ Sβ Sδ Tδ UαVβ Vι Vκ Vψ Wα Wβ Wι Xα Xβ; in plano Rδ; que fuerit extensa in plano Eo Ev Mδ Pα Vε Vπ; oculo supra posito in polo australi *add.* Lβ Pρ(*interlin.*) Qβ Eritque] Estque Rε
- 5 apparens] *add.* oculo supple positio in polo australi Fζ almucanthat] almicanthat Xα; almicantarach Bζ; almicantarath Ev; almicantarath Eα Oη Rδ; almicantaraz Oμ; almicanth'ach Eτ; almicantha'th Uα; almicanthatrath Aα Pν Tδ; almicanthatrath Dη; almicantrach Pλ; almicanthatrath Mν; almicanthatrath Bε; almitantarath Bκ; almucacharath Pα; almucan<sup>rat</sup> Vε; almucanthatrath Fζ; almicantarach Sι; almicantarath Bα Cβ Cθ Mκ Oκ Oπ Sθ Vα Vσ; almicantarath Vκ; almicantarath Mδ Mθ Nα Pθ Pρ Rβ Sλ Vν; almicantaraz Cδ Oσ Qα; almicantaraz Vυ; almicanthatrath Vχ(*corr. from almi~*); almicanthatrath Cθ; almicanthatrath Eφ almicanthatrath Lη; almicanthatrath Cη; almicanthatrath Lγ Nδ; almicanthatrath Sκ; almicanthatrath Bγ Bη Cι Dγ Eβ Eζ Eη Fα Lβ Lε Lζ Mλ Mo Mυ Mφ Nε Oζ Oξ Oτ Oυ Pγ Pδ Pμ Po Pπ Pτ Pυ Qβ Qγ Qλ Qμ Rα Sβ Sδ Vβ Vι Vπ Wα Wβ Wι; almuchanthatrath Mγ; almuchanthatrath Eμ; almuchanthatrath Bι Ev Pφ; almuchanthatrath Qδ Xβ; almuchanthatrath Vψ; almutantarath Fβ; almutantarath Oα; almutanthatrath Eδ; almutanthatrath Dβ; almutanthatrath Fδ Oo; almutanthatrath Rε; almutanthatrath Mη et ... sunt<sub>1</sub>] *lac.* Cε

<sup>1</sup> “sit” might be “fit” in some manuscripts – it is often difficult to distinguish between the two.

<sup>2</sup> Both versions can be found in both early and late manuscripts.



stars”<sup>3</sup> because with it the truth is obtained of these things whose knowledge is sought of<sup>4</sup> the positions of the stars. And Ptolemy said that it is like a sphere which has been spread out.<sup>5</sup> And the point<sup>6</sup> of its axis will be visible<sup>7</sup> [there]; and the almucantars,<sup>8</sup> which are on all of its plates, are

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<sup>3</sup> Cf. Cap. 4 line 20.

<sup>4</sup> For the Arabic tradition of this phrase, see David King, “On the Origin of the Astrolabe According to the Medieval Arabic Sources,” *Journal for the History of Arabic Science* 5 (Aleppo, 1981), pp. 44-83; reprinted in D. King, *Islamic Astronomical Instruments* (London: Variorum, 1987), text III. See especially pp. 47 and 52. In the treatise by al-Zarqāllu, the Arabic reads “because with it is obtained what you want to know of the positions of the stars”; “with it you obtain what you want to know about the position of the stars” (p. 69).

<sup>5</sup> Many manuscripts have “like a sphere spread out in a plane”.

<sup>6</sup> Arabic: “centre”.

<sup>7</sup> Arabic: “becomes visible”.

<sup>8</sup> Almucantar (Arabic: *al-muqaṭṭarāt*, المقنطرة; Latin: *almucanthatat*): a circle of equal altitude concentric with the zenith of the observer and parallel to the observer’s horizon; hence a different plate is needed for each latitude of observation. The Latin word has many variants throughout the treatise. Here it seems to be treated as a feminine plural noun. See Kunitzsch, *Glossar*, no. 31, pp. 535ff.

opposite circulis qui sunt in directo, quorum cuspis est punctus cenith capitis in eodem climate. Et initium eorum est ex circulo emisperii eiusdem climatis cui lineate sunt, scilicet ille almucanthat. Invenimus quoque antiquos contentos fuisse mansione septem climatum, eo quod populationem et plus habitationis invenissent in eis. Et  
10 nomen “climatis” est nomen grecum significans declinationem, quia, cum esset terra

- 6 circulus] *lac.* Cε in directo] *add. interlin.* scilicet azimuth Vβ quorum] *add. interlin.* scilicet almucanthat Vβ cuspis] punctus Bγ(*del.*; *add. in marg.* cuspis) Bη Cη Eθ (*add. interlin.* scilicet cuspis) Eτ Eφ Mo Pγ Pτ Σκ Wβ Wι; *add. interlin.* al'<sup>9</sup> punctus id est centrum Vβ est] est positus Rδ punctus *interlin.* Bζ Sβ; *om.* Bα Bε Dη Eα Eβ Eη Fα Fβ Fδ Fζ Lγ Lη Mυ Mφ Nδ Oζ Oλ Oξ Oτ Pα Pλ Pμ Pν Pρ Qβ Qγ Tδ Vι cenith] cenit *some* capitis] capitum Bζ Bη Bι Cι Dβ Dγ Eδ Eο Eφ Mγ Mδ Mν Oα Oκ Oο Oπ Oσ Pδ Pθ Pο Pτ Pφ Qδ Qμ Rα Rβ Rδ Sθ Sι Σκ Σλ Uα Vα Vκ Vν Vσ Vυ Vψ Wβ; captum Mη Mκ Mλ Pα Pγ; *add. interlin.* al' capitum Vβ
- 7 emisperii] hemisperii *many* cui lineate] circumlineate Qμ lineate] mmedite (?) Σκ sunt] *om.* Nδ
- 8 scilicet ille almucanthat] *om.* Bα Cβ Cδ Cθ Dβ Eμ Ev Fδ Mγ Mθ Mκ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pπ Pφ Qα Sθ Σλ Vα Vε Vν Vσ Vυ Vχ scilicet] *om.* Rδ ille] *om.* Nδ almucanthat] allmucanthat Pδ; almicantarath Rδ; almicantarath3 Dη; almicanth'ach Eτ Uα; almicanthatrah Xα; almicanthatrath Aα Eα; almicantrach Pλ; almichantarath Cε; almiszanthanth Bε; almitantarath Bκ; almocantarach Bζ; almucan<sup>rat</sup> Lζ Sβ; almucan<sup>rat</sup> Bι; almucancharath Pα; almucantar<sup>t</sup> Fζ; almucant'at Wβ; almucantarach Lγ Xβ; almucantarath Mδ Mλ Nα Oξ Pθ Pρ Pυ Qλ Wα; almucanth' Oζ Pγ; almucanth'at Eβ Fα; almucanth'ath Bγ Eφ; almucanthatrath Cη; almucanthatrath Eη; almucanthatrath Lε Σκ Tδ; almucanthatrath Cι Dγ Eζ Eο Fδ Lη Mo Mυ Mφ Nε Oτ Oυ Pμ Pν Pο Pτ Qβ Qγ Qδ Qμ Sδ Vβ Vι Vκ Wι; almucanthatrath Nδ; almucanthatrath Eδ; almucanthatrath Vπ; almucanthatrath Ev Fβ; almucanthatrath Rβ Vψ; almucanthatrath Rα; almutantarath Lβ; almutanthatrath Mη; almutanthatrath Rε invenimus] *corr. in marg.* Qμ quoque] *om.* Mγ; quomodo Rδ contentos] conceptos Cε Cθ Mν Oπ Qα Vπ Vχ; contemptos Aα Bα Ev Sι fuisse] *add. in Vψ* mansione] mentione Mγ; fecisse mentionem Sι mensionem fecisse Rε; *add. interlin* inventione Σλ
- 9 septem] vii or 7 *many*; *add.* sicisse Mγ eo] *om.* Vψ habitationis] *add.* non Mγ eis] *add. in marg.* 7 climatibus Sθ
- 10 climatis] climatum Rδ grecum significans declinationem] *om.* Rδ; declinationis Bγ Sβ; entium declinationis Aα Bι Bκ Dγ Eδ Eζ Eο Eτ Eφ Lζ Pο Pυ Rα Σκ Uα Vκ; entium declinationis *del. and add. in marg.* grecum significans declinationem Wι; *add.* Est nomen entium declinationis Qμ

<sup>9</sup> The abbreviation *al'* found throughout ms Vβ is difficult to expand with any certainty. Obviously it means “other [scribe/manuscripts]” or “elsewhere,” but whether it should be expanded as *alias* (or some form thereof), *aliter*, or even *alibi* is not possible to determine.

different from the circles which are [projected vertically from the pole],<sup>10</sup> whose centre is the point of the overhead zenith in the same latitude.<sup>11</sup> And their start is from the circle of the horizon of the same plate<sup>12</sup> in which they (that is, these almucantars) are engraved. We also find the ancients content that there were seven climes for living, this because they found in them the population and the greater part of the housing. And the name “clime” is a Greek name signifying “declination.”<sup>13</sup> For, since the earth is

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<sup>10</sup> “*in directo*”

<sup>11</sup> That is, in the same latitude as that for which the plate being used was designed.

<sup>12</sup> Astrolabe plates (for various latitudes) were sometimes known as “climes” or “climates”; this is different from (although related to) the Greek “*climata*” (latitudinal regions) mentioned further on.

It seems that the oldest Arabic-Islamic astrolabes had plates only for the seven climes; in a later development the plates were made for the (geographical) latitudes of specific places. [P.K.]

<sup>13</sup> Alternate reading (*entium declinationis*): “...the name of the declination of things”.

15 rotunde figure, essent illi, qui habitant sub equinoctiali linea, in equalitate temporum  
semper;<sup>14</sup> et quorum cenith caputum declinaverit a predicta linea fiunt eis diversa  
horarum tempora. Ideoque dividerunt antiqui declinationem per septem divisiones  
quas vocaverunt “climata.” Fuitque longitudo prime divisionis a linea equinoctiali  
secundum quantitatem unius hore equalis, et longitudo diversitatis reliquarum partium  
dimidium hore unius, perveneritque diversitas in septimo climate ad quattuor horas

- 11 essent] *mss* essentque<sup>15</sup>; essent quia *corr. in marg. to essentque* Nε(*later hand*) illi qui]  
quod [*illeg.*] Rδ linea] *om.* Sλ
- 12 semper] *om.* Cδ Ea Sλ; *illeg.* Sβ; similiter Aα Bγ Bι Bκ Cη Dγ Eδ Eζ Eο Eτ Eυ Eφ Lζ Mη  
Mλ Mο Nα Pγ Pο Pτ Pυ Qμ Rα Sκ Uα Vβ Vε Vκ Vπ Wι; semper. Similiter Bη Qδ Rβ; *add.*  
*interlin.* illi scilicet Vβ quorum] eorum Rε cenith] zenith Bκ predicta]  
equinoctiale Nδ linea] circulo Sλ diversa] *om.* Sκ
- 13 ideoque] ideo Nε; item Sι per] in Nδ septem] vii or 7 many
- 14 quas] *om.* Fζ quas ... climata] *om.* Nε vocaverunt] *add.* 7 Mγ Rε climata]  
*om.* Sι fuitque] fitque Sι Sλ
- 15 quantitatem] *add.* diversitatis Aα Bα Bζ Bι Bκ Cδ Cθ Dβ Dγ Eζ Eμ Eν Eο Eυ Fδ Lζ Mγ Mδ  
Mθ Mκ Mλ Mν Oα Oη Oκ Oο Oπ Oσ Pα Pπ Pτ Pφ Qα Qδ Rα Rβ Sβ Sθ Sι Sλ Vα Vβ Vν  
Vσ Vυ Vχ unius ... longitudo *om.* Vε equalis] *om.* Nδ partium] *add.* est  
Rε; *add.* per Sλ; *add. interlin.* est Vβ
- 16 dimidium] *add.* est Mγ Sι unius] *add. interlin.* scilicet equalis Vβ septimo] vii° /  
7 / 7° / 7<sup>mo</sup> many climate] *ms* Pπ ends ad] *marg.* Rα quattuor] 4 many
- 16-17 horas equales] *marg.* Rα

<sup>14</sup> Of the 62 manuscripts with “semper”, 40 have punctuation following making “semper” part of the previous sentence. (20 have no punctuation and 2 have punctuation before “semper”.) Of the 28 manuscripts with “similiter”, 14 have punctuation preceding it, making “similiter” part of the following sentence. (Eleven have no punctuation and 3 have punctuation after “similiter”.) Note: this does not include the 3 manuscripts with the variant “semper. Similiter”.

<sup>15</sup> The text is amended from *mss* “essentque” here. The *-que* appears to have been added because scribes thought that this clause was also governed by *cum* (l. 10); but that would leave the conjunction *quia* (l. 10) with no verb to govern. [C.J.McD.]

a round shape, those who live on the equator are always in an equality of time;<sup>16</sup> and for those whose overhead zenith is off the said [equatorial] line, the times of the hours become different for them. For this reason the ancients divided the declination<sup>17</sup> into seven sections which they called “climes.” And the length of the first part [i.e., the first clime] from the equator was according to the quantity of one equal hour, and the length of the difference of the other parts is a half of one hour; and the difference in the seventh clime reached four equal hours,

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<sup>16</sup> This could refer to the fact that night and day are always the same length at the equator, or to the corollary of this, that the day and night hours are always equal.

<sup>17</sup> The equatorial latitude between the equator and the poles.

equales, et factus est longior dies illius loci 16 horarum, et brevior octo.

- 17      equales] *om.* Mγ      dies] diebus Cθ Qλ; *add.* diebus Aα Bι Cι Dγ Eα Eβ Eδ Eζ Eη Eο Eτ Eυ Eφ Fα Fβ Lβ Lγ Lε Lζ Lη Mδ Mη Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pγ Pδ Pλ Pμ Pν Pο Pυ Qβ Qγ Qδ Qμ Rα Rβ Sβ Sδ Sκ Tδ Uα Vι Vκ Vπ Wα Xα; *add.* dierum Bε Nα Vψ; *add.* in diebus Pτ      illius] *om.* Qα Sθ; *alius* Pγ; *eiusdem* Bα Bζ Cβ Cδ Cε Cθ Dβ Dη Eμ Eν Fδ Mγ Mθ Mκ Mλ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pφ Sι Sλ Vα Vβ(*add. interlin.* al' illius) Vν Vσ Vυ Vχ      16] xvi *some*      et<sub>2</sub>] *add.* dies Mγ Rε; *add. interlin.* dies scilicet Vβ et<sub>2</sub> ... octo] *om.* Fζ      brevior] *add.* dies Qμ Vψ      octo ] viii or 8 or 8° *many*; *add.* horarum Bε Bζ Cι Dβ Dη Eα Eβ Eη Eμ(*interlin.*) Fα Fβ Fδ Lβ Lγ Lε Lη Mγ Mδ Mη Mκ(*interlin.*) Nδ Oη Oζ Oξ Oο Oτ Oυ Pδ Pλ Pμ Pν Pρ Pτ Qβ Qγ Qλ Qμ Rδ Rε Sδ Tδ Vν Vψ Wα Xβ; *add.* horarum [*illeg.*] et cetera Nε; *add. interlin.* scilicet horarum Vβ

and the longest<sup>18</sup> day of this place became 16 hours and the shortest 8 [hours].<sup>19</sup>

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<sup>18</sup> Latin translations often replace the Arabic superlative with a Latin comparative, as (for example) practically always in Gerard of Cremona. {PK}

<sup>19</sup> The phrase “seven climes” refers to the division of the “habitable world” (between the Equator and the Arctic Circle) but excluding two extreme bands, north of the Equator and south of the Arctic Circle, as being too hot and too cold for humans to inhabit. As presented in John of Sacrobosco’s *Sphere* (Iohannes de Sacrobosco, *Tractatus de sphaera*), each clime is defined by its mid-latitude where the longest day (sunrise to sunset) is half an hour different from its neighbour. A chart of Sacrobosco’s climes would look like this:

CLIME	LENGTH OF LONGEST DAY AT MID-LATITUDE	LATITUDE OF SOUTHERN EDGE	LATITUDE OF NORTHERN EDGE
I	13 hours	12° 30' north	20° 30' north
II	13 hours 30 minutes	20° 30' north	27° 30' north
III	14 hours	27° 30' north	33° 40' north
IV	14 hours 30 minutes	33° 40' north	39° north
V	15 hours	39° north	43° 30' north
VI	15 hours 30 minutes	43° 30' north	47° 15' north
VII	16 hours	47° 15' north	50° 30' north

Latitude 12° 30' north is the southern edge of the Sahara desert; 50° 30' north runs through the English Channel, Brussels and northern Czech Republic.

The description of the climes in our text is slightly different from that in Sacrobosco, especially in reference to the first clime. The longest day at the equator (which is actually every day) is 12 hours. Our text would thus define the first clime as extending from the equator up to 20° 30', past the point where the longest day is 13 hours. Then he follows the half-hour-difference calculation for the other climes. In the seventh clime the longest day at mid-latitude is 16 hours, and the shortest is 8 hours, a difference of 4 hours from the equator as stated in the text. Note that our text also seems to state that the divisions between climes are the latitudes which Sacrobosco cites as the mid-clime lines. However, our text is presenting a quick summary of the concept, rather than a detailed discussion.

See Lynn Thorndike, *The Sphere of Sacrobosco and Its Commentators* (Chicago: University of Chicago Press, 1949), pp. 110-112 (Latin) and 138-140 (English). Thorndike also surveys earlier discussions of climes, from the ancient world up to 1949, in note 88 on pp. 16-18.

## [ Construction, Section I ]

## COMPOSITIONIS ASTROLABII CAPITULUM PRIMUM: DE PREPARATIONE MATRIS

Cum volueris facere astrolabium ad latitudinem cuiuscumque regionis, unum est opus atque equale in omni latitudine. Fac tabulam pro matre que sit latior tabula rethis per quantitatem latitudinis limbi (qui limbus debet esse latior circulo Capricorni

- 1 Compositionis ... matris] *om.* Bα Bι Bκ Cδ Cε Dβ Eα Eο Lζ Nα Mγ Oη Oο Pγ Rα Sβ Sθ Si Uα Vα Vυ Xα; *add.* Capitulum compositionis astrolabii, primo de compositione matris Wβ; Capitulum primum compositionis astrolabii de preparatione matris Fα; Capitulum primum de compositione matris Sκ; Capitulum primum de preparatione matris Bε Pν; Compositio astrolabii Cβ Cι Eζ Eτ Mη Mν Nε Pδ Po Pτ Vψ Wι; Compositio matris Dγ Vκ; Compositionis astrolabii capitulum primum de preparatione matris Ou Pμ Vι; De astrolabii compositione Aα Eυ; De compositione Pυ; De compositione astrolabii Bγ(*later hand*) Eδ Vπ; De compositione astrolabii et primo de compositione matris Bη; De compositione astrolabii et primo de matre et al. Eφ; De compositione matris Qμ; De forma limbi Bζ Fδ Vν; De formatione limbi Rε; De matre Eη; De preparatione matris Qδ Rβ; Incipit compositio astrolabii et primo de preparatione matris Pλ; Inicium operis Oπ Qα; Inicium operis astrolabii Cθ Eμ(*marg.*) Eν Mθ Mκ Mλ Oα Oκ Oσ(*later hand*) Sλ Vσ Vχ; Initium operis astrolabii. Et primo. De formatione limbi Vβ; Primum capitulum in Compositionem astrolabii et primo De preparatione matris, que postena dicitur Cη; Sequitur de compositione matris astrolabii Dη; Sequitur de compositione astrolabii et primo de preparatione matris. Capitulum Qγ; Sequitur tractatus astrolabii in quo primo agit de compositione matris Qβ
- 1 astrolabii] *add.* ad cuiuscumque regionis latitudinem Xβ
- 2 Cum] *add.* ergo Eβ Fα Fβ Fζ Lβ Lε Lη Nδ Oξ Ou Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Xβ; *add.* igitur ergo Wα; vero Bκ ad] *add.* uniuscumque Sβ ad latitudinem] altitudinem Si cuiuscumque] *om.* Sβ; cuiusque Mγ Nδ Nε Sθ regionis] *add.* volueris Cθ Eν Eο Oα Oπ Oσ Vυ unum] nom/uom Si; *add.* enim Aα Bα Cβ Cδ Cε Cθ Dβ Dη Eμ Eν Eο Fδ Lε Mγ Mδ Mθ Mκ Mλ Oα Oη Oκ Oο Pτ Pφ Sθ Si Sλ Vα Vν Vπ Vσ Vυ Vχ Wα
- 3 est] *add.* equale Si tabula] *om.* Bε Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Mφ Oζ Oξ Oτ Ou Pγ Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Xβ sit] *om.* Mγ
- 3-4 tabula rethis] rethi Nδ
- 4 rethis] retis *many, and elsewhere*; rechi Fζ; rectis Sθ qui] *add.* quidem Rδ
- 4-5 limbi ... latitudinis] *om.* Sλ  
qui ... latitudinis] *om.* Eη



[ *Construction, Section I* ]

## FIRST CHAPTER ON THE CONSTRUCTION OF AN ASTROLABE: ON THE PREPARATION OF THE MOTHER

When you wish to make an astrolabe for the latitude of any region, there is one method and it is the same for every latitude. Make a plate for the mother<sup>1</sup> which is wider than the plate for the rete<sup>2</sup> by the amount of the width of the rim (this rim should be a little bit wider than the circle of [the Tropic of] Capricorn),

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<sup>1</sup> The “mother” (Latin: *mater*) is the main plate of an astrolabe with a rim within which the rete, and any other plates, can sit.

<sup>2</sup> The “rete” or “net” (also called the “spider”) (Latin: *rete/rethe, retis/rethis*) is the open-network plate which displays the positions of the fixed stars and the ecliptic.

- 5 paulisper) secundum eam, scilicet quantitatem latitudinis, in qua poterit describi almuri graduum qui est denticulus egrediens a capite Capricorni super gradus limbi predicti.
- Cuius limbi densitas sit secundum quantitatem rethis, si fuerit astrolabium unius latitudinis, aut secundum quantitatem tabularum et rethis ut equentur, dum ponitur axis, et non transgrediantur invicem.
- 10 Et figes limbum clavis in quatuor partibus vel absolute ut quibusdam placet in
- 5 paulisper] *om.* Bδ Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mυ Mφ Nδ Oζ Oξ Oτ Oυ Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Wα Xβ secundum] per Aα Bα Cβ Cδ Cθ Dβ Eμ Ev Mγ Mθ Mκ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Qα Pφ Sθ Si Vα Vε Vν Vσ Vυ Vχ eam] *om.* Sκ scilicet] *om.* Wι latitudinis] *om.* Aα Bγ Bε Bη Bι Cβ Cη Cθ Dβ Dγ Eζ Eμ Ev Et Ev Fδ Lζ Mγ Mκ Mν Mo Nα Oη Oο Oπ Pα Pγ Po Pτ Qα Rα Rδ Re Sβ Si Sκ Uα Vβ Vκ Vν Vπ Vχ Wβ Wι in] *om.* Aα Bγ Bη Bκ Cθ Cη Dβ Dγ Eδ Eζ Eο Et Ev Lζ Mγ Mη Nα Oο Oπ Pα Pγ Pδ Po Pτ Qδ Qμ Rα Rβ Re Uα Vβ Vε Vκ Vν Vπ Wι Xα; secundum Sβ in qua] *om.* Sκ; qua Rδ qua] *add. interlin.* al' quod Vβ poterit] possit Bγ Bη Cη Dβ Eφ Oο Pα Pθ Qα Rδ; *add.* in ea Aα Bγ Bη Bι Bκ Cη Dγ Eζ Et Ev Eφ Lζ Mγ Mη Mo Nα Pα Pγ Pθ Po Pτ Pυ Qδ Qμ Rα Rβ Rδ Re Sβ Sκ Uα Vκ Vπ Wβ Xα; *add. interlin.* possit Vβ describi] esse Bα Bζ Cβ Cδ Cε Cθ Dβ Dη Eμ Ev Eο Fδ Mγ Mδ Mθ Mκ Mλ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pφ Qα Sθ Si Sλ Vε Vν Vο Vσ Vχ; scrobo Ne; *add.* numer~s Nδ almuri] muri Cδ(*add. interlin.* almuri) Eμ Mθ Mκ Oα Oη Oκ Oπ Oς Sλ(*add. interlin.* almuri) Vα Vε Vσ Vυ Vχ(*add. interlin.* al-); muri *corr.* to almuri Sθ; tauri *and add. in marg.* tau Si; *add.* muri Fβ Lγ Lη Mδ Mυ Mφ Pα Wα Xβ Vι; *add. interlin.* id est ostensor Vβ
- 6 graduum] *om.* Bγ Bη Bι Bκ Cη Dγ Eδ Et Eφ Lζ Mo Nα Pγ Pθ Pλ Po Pυ Rα Rδ Sβ Sκ Uα Vκ Wβ Wι Xα qui] *add. interlin.* scilicet almure Vβ egrediens] qui egreditur Aα Bα Bζ Cβ Cδ Cε Cθ Dβ Dη Eμ Ev Eο Fδ Mγ Mθ Mκ Mλ Mν Oα Oκ Oπ Oσ Pη Pφ Qα Sθ Sλ Vμ Vν Vπ Vυ Vχ Wα; *add. interlin.* in al' qui egredit ur Vβ predicte] *add. interlin.* scilicet rethe Vβ
- 7 Cuius] *add. interlin.* Scilicet limbi Sλ Cuius ... densitas] desintas Sθ limbi] *om.* Bα Cβ Cθ Dβ Eμ Ev Fδ Mγ Mθ Mλ Mν Oα Oκ Oμ Oο Oπ Oσ Pφ Qα Si Sλ Vε Vν Vυ Vχ; *interlin.* Cδ Mκ rethis] rechis Fζ
- 7-8 si ... rethis] *om.* Fδ Oο Oπ
- 8 unius] *add. illeg.* Rδ
- 9 ponitur] *add.* rethis Mγ transgrediantur]<sup>3</sup> transgredientur Bε Cη Eα Eη Ev Ev Eφ Fα Fβ Lβ Lε Lη Mυ Mφ Oζ Oξ Oτ Oυ Pα Pθ Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Uα Vι Vν Vπ Wα Xβ; transgredientur *corr.* to transgrediantur Bγ; transgreditur Aα
- 10 before Et *add. rubric* DE FIGURATIONE LIMBE Eμ(*marg.*) Mκ Sσ Et] sed Wι figes] figas Sβ limbum] *add.* 4 Mγ Re quatuor] 4 or 4<sup>or</sup> many absolute] *om.* Sλ

<sup>3</sup> Many scribes were uncertain about the mood of the verb, i.e., whether or not it was governed by “ut” (which it is) requiring the subjunctive.

by so much (that is, the amount of space) inside of which the indicator<sup>4</sup> of degrees can be traced out; the indicator-muri is a small tooth projecting from the beginning of Capricorn over the degrees [inscribed] on the aforementioned rim. The depth of this rim should be according to the thickness of the rete, if it be an astrolabe for one latitude; or according to the thickness of the plates and the rete, so that they are level when the pin is inserted and they do not stick out beyond each other.

And you will fasten the rim [together] with rivets in four places or completely, as some people in

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<sup>4</sup> The indicator (Arabic: *al-murī*, المرّي ; Latin: *almuri* or *muri*) is a small pointer, or “hand” on the rete at 270° longitude (the beginning of Capricorn) used to read degrees along the rim. See Kunitzsch, *Glossar*, no. 32a, p. 538. See also Anthony Turner, “Concerning a Pointer on the Astrolabe,” *Journal for the History of Astronomy*, 46 (2015), 413-418.

15 quibusdam locis ad placitum. Et coniunges ipsum limbum matri cum stagno vel argento, et facies super extremitatem eius circulum. Post hoc dimittes spacium litteris, et facies iterum duos circulos ad invicem propinquos, inter quos erunt gradus succedentes rethi. Dividesque ipsum spacium quod fuerit inter ipsos circulos per 360 divisiones equales, et incipies scribere ab initio quarte occidentalis et meridiane ex puncto A, eundo ad punctum C continuatim usque in 360 divisiones, si deus voluerit.

- 11 placitum] libitum Rε Sθ; *add. interlin.* libitum Vβ coniunges] iunges Sκ ipsum  
limbum] eum Bα Cβ Cδ Cε Cθ Dβ Eμ Ev Fδ Mγ Mδ Mθ Mκ Mv Oα Oη Oκ Oμ Oo Oπ  
Oσ Pφ Sθ Si Sλ Vα Vv Vv Vχ limbum] *om.* Dη Pρ cum stagno] *lac.* Xα  
stagno] cupro, auricalco Bε; stagno *or* stagno Bζ Bκ Eμ Ev Fβ Mκ Oη Pδ Si Sκ Vκ  
Vπ Vχ Wβ Xβ; stanno Bα Bi Cε Dβ Ev Fδ Mv Mφ Pτ Rδ Vi Vσ vel] *add.* cum Aα Bζ  
Cβ Cθ Ev Mγ Mκ Mλ Oμ Oo Sθ Si Vπ Vσ
- 11-12 vel argento] *om.* Bα
- 12 argento] arguinsito Rδ; *add.* si volueris Aα Bζ Cβ Cδ Cθ Dβ Eη Eμ Ev Eo Ev Fδ Mγ Mθ  
Mκ Mλ Mv Oα Oη Oκ Oμ Oo Oπ Oσ Pφ Re Sθ Si Sλ Vα Vβ Vε Vv Vπ Vσ Vv Vχ  
extremitatem] extremitates Fζ; *add. interlin.* exteriorem Bγ; *add.* scilicet exteriorem  
Aα Eo Ev Vπ eius] eiusdem Mθ Oκ; *add.* exteriorem Bi Dβ Dγ Eδ Eζ Lζ Po Qδ Rβ  
Sβ Vκ; *add.* unum Bζ Post hoc] Postea *many*; *add. interlin.* al' Et postea Vβ  
demittes] dimitte *some* spacium] *add.* per Sβ litteris] circulus Mφ Mu Vi;  
*add.* in exteriori margine limbi Mv
- 13 duos ... inter] *om.* Bη
- 14 rethi] recti Si; rete Sλ ipsum] *om.* Bε Cε Ci Eα Eβ Eη Eτ Fα Fβ Fζ Lβ Lε Lη Mv Mo  
Mv Mφ Nδ Nε Oζ Oη Oξ Oτ Pα Pγ Pδ Pλ Pv Po Pρ Pτ Qβ Qγ Qδ Qμ Rβ Sδ Sκ Uα Vi Vψ  
Wα Wβ Wi; primum Dη ipsos] illos duos Re
- 15 divisiones] partes Bα Cδ Dβ Eμ Fδ Mγ Mθ Mκ Mv Oα Oη Oκ Oμ Oo Oσ Pρ Pφ Re Sθ Si  
Sλ Vα Vv Vσ Vv; gradus sive divisiones Dη equales] *marg.* Rα quarte] X<sup>e</sup> *many*  
occidentalis et] *with erasure dots* Rα ex] scilicet a Mγ Re
- 16 A] *add.* qui est sub armilla Cδ Sλ(*marg.*) Vσ; *add.* qui est sub armilla ad occidentem Oμ  
C] B, C, D et iterum revertendo ad A Bε Eα Eβ Fα(*om.* C, D) Fζ Lβ Lη Nδ(*om.*  
revertendo) Oζ Oξ Oτ Ov Pλ Pv Pρ Pμ Qβ Qγ Qδ Rβ Sδ Tδ Xβ; G *corr.* to C Vχ  
continuatim] *add. interlin.* versus occidentum Sλ in] ad *some* divisiones]  
*om.* Bα Bζ Bη Bi Bκ Cβ Cδ Cθ Dγ Eδ Eζ Eμ Ev Eo Eτ Lζ Mδ Mθ Mκ Mλ Mv Mo Nα Oα  
Oη Oκ Oμ Oπ Oσ Pγ Pθ Po Pτ Pv Pφ Qδ Qμ Rα Rβ Sβ Si Sκ Sλ Uα Vα Vε Vκ Vπ Vσ Vv  
Vχ Wβ Xα; divisiones vel gradus Pδ; gradus Bγ Cε Cη Dβ Dη Eφ Fδ Oo Pα Rδ Re Vβ Vv;  
partes Pρ; partes confimentes sub armilla Qα si ... voluerit] *om.* Aα Bγ Bη Bi Bκ Cη  
Dγ Ev Eφ Lζ Mλ Oη Pα Pθ Qα Rα Rδ Sβ Vκ Vπ Vv Wβ

some places like, as you please. And you will join the rim itself to the mother with tin or silver; and you will make a circle around its edge. After this you will leave space for the inscribing and make again two circles close to one another between which will be the successive degrees of the rete. And you will divide this space which was between these circles into 360 equal divisions and begin to write from the first quarter (between the west and the south) from point A, going to point C, continuing for 360 degrees (God willing<sup>5</sup>).

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<sup>5</sup> Here and elsewhere, a possible vestige of an Arabic original.

20 Et elucidabis tabulam et equabis eam prout melius poteris. Deinde extrahes diametra illius que quadrant eam abscondens unum eorum per alterum super punctum cuspidis E et ita ut quadrant es sint equales; et facies in alia parte similiter. Suntque diametra que se abscondunt in alia parte tabule opposita diametris que se abscondunt in altera, id est, sint in directo eorum.

- 17 Et ... poteris] *om.* Oo elucidabis] [*lac.*]-dabis Xα; planes Bα; polies Bι Bκ Dγ Lζ Rβ Vκ; pollies Qδ; pones Mλ Rα Sβ; *add.* et pones Eδ Eζ Pο; *add.* eam id est pones Eν; *add.* id est polies Eο; *add.* id est pones Aα Eν; *add.* *interlin.* al' dilucidabis Vβ; *expunged and add. in marg.* elimabis et pones hoc modo faciens tabulam Bγ elucidabis ... eam] elucidabis et equabis eam tabulam Bε Cι Eα Eβ Eη Fα Fβ Lβ Lγ Lε Lη Mη Mν Mφ Oζ Oξ Oτ Oυ Pα Pδ Pλ Pμ Pν Pρ Qβ Qγ Qλ Qμ Sδ Tδ Vι Vπ Wα Xα Xβ tabulam] *om.* Bγ Bη Cε Cη Dη Eτ Eφ Mο Nα Pγ Pθ Pτ Rδ Sκ Uα Wι Wβ; eam Pυ et equabis] *om.* Nδ et equabis ... poteris] *om.* Bα melius] *rep.* Sι poteris] potueris Mγ extrahes] *om.* Nε
- 18 que ... alterum] in quadratum ita quod unum abscondat alterum Qα quadrant] *ms* Cζ *begins* abscondens] *corr.* to absconde Wι; *corr.* to abscondentque Sθ; abscondensque *corr.* to abscondetque Sλ per] *om.* Cζ Sθ Sι Sλ per alterum] *om.* Mγ super] *add.* C Cη; *add.* E Bγ Bη Eφ Pα Pθ Vβ Wβ punctum] *add.* id est centrum Sβ
- 19 cuspidis] cuspidi Sβ; *add.* *interlin.* id est centri Vβ E] *om.* Bα Bγ Bη Cβ Cδ Cη Cθ Dβ Eμ Eν Eτ Eφ Fδ Mγ Mδ Mη Mθ Mκ Mν Mο Nα Oα Oη Oκ Oμ Oο Oπ Oσ Pα Pγ Pθ Pτ Pυ Pφ Qμ Rε Sβ Sθ Sι Sκ Sλ Uα Vα Vβ Vε Vν Vσ Vυ Wβ Xα; C Mν; equalis Eα; id est centri Bι Bκ Cζ Eζ Eο Lη Mλ Pο Rα; scilicet centrum Qα; unius centri Dγ Vκ; *add.* id est centri Eδ Qδ Rβ; *add.* scilicet centri Bζ et] in Rε(*add.* *interlin.* centrum) et ita] terminato Fβ ut] quod Bκ parte] *add.* id est in dorso Cζ; *add.* matris Rε suntque] eruntque Sι
- 19-20 alia ... in] *om.* Oο Vα
- 19-21 Suntque ... eorum] scilicet in dorso ita ut sint in directo aliorum Qα
- 20 se<sub>1</sub>] *om.* Sκ Wι abscondunt<sub>1</sub>] abscondant Fζ tabule] *om.* Bγ Bη Bι Cη Eφ Pα Pθ Rδ Wβ; *add.* matris Cζ Oη
- 20-21 alia ... in] *om.* Bα Cε Eα Nε tabule ... altera] *om.* Eν
- 21 altera] alia Dγ Uα; alius Xα; latera Vν; *add.* parte Cζ id est] que Rε sint] *om.* Cζ

And you will polish the plate and make it level as best you can. Then draw its diameters which quarter it, intersecting one of them by the other over the centre point E and in such a way that the quadrants are equal; and do the same on the back. And the diameters which intersect on one side of the plate are opposite the diameters which intersect on the other [side], that is, they should be lined up with them.

Post hec statues in interiori parte circulum Arietis et circulum Cancri. Circulus autem Capricorni est ille qui incedit vel vadit per extremitatem tabule, et ipse est maior circulus qui cadit in matre et interius.

- 22 Post ... Cancri] *om.* Pα statues] etiam facies Mγ; facies Bα Bη Dβ Mv Pφ Rε St Vv in] *om.* Sκ parte] *add.* id est in profundo matris Cζ; *add.* matris Rε Cancri] *add.* et circulum Capricorni Rε
- 22-24 Circulus ... interius] Et Capricorni ut patebit alibi Qα
- 23 est,] *add. interlin.* al' erit Vβ est<sub>1</sub> ... vadit] erit ille qui incedit Mδ; erit ille qui incedit vel vadit Cδ Eδ Mv Vχ; erit qui cadit Ev; erit qui incedit Bι Bκ Cβ Cθ Dγ Eo Ev Oα Oπ Oσ Rα Sβ Vε Vκ Vπ Vv; erit qui incedit et vadit Sθ; erit qui incedit vel vadit; Eζ Eμ Po Pφ St Vα Xα; erit qui vadit Aα Bα Cζ Lζ Mθ Mκ Oκ Vσ; est circulus qui incedit vel vadit Dβ Fδ Mγ Vv; est ille qui incedit Fβ Nα Tδ; est ille qui vadit Pρ Pv; est qui incedit Bγ Bη Cη Eφ Oμ Pα Pθ Wβ; est qui incedit vel vadit Pλ Sλ; est talis qui incedit Bε; ille est circulus qui incedit vel vadit Oo; qui vadit Oη vel vadit] *om.* Rδ; *marg.* Ov tabula] *add.* cum limbo Oσ(*marg.*) Sλ(*interlin.*)
- 24 et] *om. some* interius] in ceteris Aα Cβ Cδ Cθ Dβ Eμ Ev Eo Fa Fδ Mη Mκ Mλ Mv Oη Oo Oπ Rε(*add. interlin. interius*) Vα Vε Vv Vσ Vv; Et in ceteris facies ... [Cap. 2] Nα; in ceteris punctus dorsi astrolabii *corr. to* in ceteris Oσ; in ceteris scilicet tabulis Bζ; in ceteris vel interius inferius Cη; in tabulis Cι Ev; in tabulis ceteris Mθ Oκ; in tabulis(*interlin.*) ceteris punctus ut si astrolabii Oα; id est invenire matri et in ceteris similibus verse figuras videbis Bα; scilicet tabulis Cζ; *add.* hic autem(?) clarius possit per figuram sic subscriptum Pρ; *add.* sicut in presenti patet figura Dη



After this set up in the interior [i.e., central] part [of the mother/plate] the circle of Aries [i.e., the Equator] and the circle [i.e., the Tropic] of Cancer. Moreover the circle [i.e., the Tropic] of Capricorn is the one which extends to or runs along the outer edge of the plate and this is the largest circle which falls inside the mother.

[ FIGURA 1 ]<sup>6</sup>

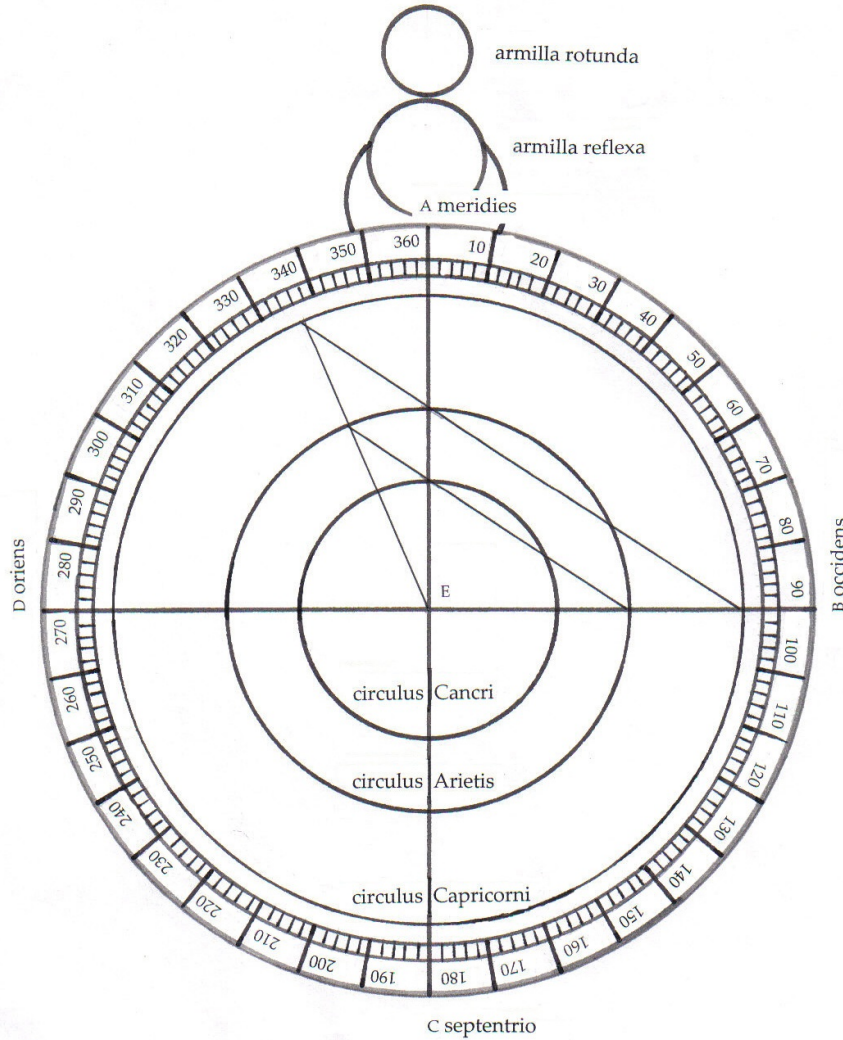


Figura interioris partis matris /  
Figure of the interior part of the mother

[Complete diagram] Bγ Bζ Bη Bι Cη Eβ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mλ Mν (fol. 53<sup>v</sup>)  
Mo Mυ (fol. 406<sup>r</sup>) Nδ Nε Oζ Oτ Oυ Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Rα Rδ Re Sδ Sκ<sup>7</sup> Tδ

<sup>6</sup> The drawing of the equator and the Tropic of Cancer within the Tropic of Capricorn has to be made correctly. No information is given in the text at this point on how to do this; but see Cap. 7.

<sup>7</sup> In ms Sκ the complete diagram is on f. 79<sup>r</sup>. On fol. 78<sup>r</sup> there is a similar diagram with only the limbus with its numbered divisions drawn, and labelled “Figura Limbi”. On fol. 78<sup>v</sup> there is also a similar diagram with the limbus and its numbered divisions drawn, as well as the horizontal and vertical diameters.

Vι(fol. 331<sup>v</sup>) Vκ Wβ<sup>8</sup> Xβ

[*Partial diagram*] Bε Cθ Cι Eη Eμ Mδ Mθ Mκ Oη Oκ Pγ Qλ Sθ Vε Vσ Wι

[*Outline, or space only*] Cβ Cε Dγ Dη Eα Eδ Eζ Ev Lβ Mφ Oξ Oπ Pv Pφ Qα Rβ Si Uα Vα

Vβ Vν Vπ Vψ Wα

[*No space*] Aα Bα Bκ Cδ Cζ Dβ Eo Fδ Lζ Mγ Mν Na Oα Oμ Oo Oσ Sβ SA Vυ Vχ Xα

Pθ: “A”<sup>9</sup>

[*Caption*]

Figura ... matris] *om.* Cβ Cθ Cι Eη Eμ Fα Mθ Nδ Nε Oζ Oη Oκ Oλ Pγ Pτ Vε; *illeg.* Eβ Vσ; Figura anterioris partis matris id est atene<sup>10</sup> per interiorule(?) Wβ; Figura dorsi astrolabii que antenna dicitur Qλ; Figura inscriptionis limbi Mκ; Figura inscriptionis limbi matris qui in arstrolabium dicitur Pδ; Figure inscriptiones trium circulorum arietis cancri et capricorni super circulum declinationem Vκ; Figura interioris partis astrolabii scilicet matris et debet poni in [*sign; similar sign at end of Cap. 1*] Bη; Figuratiōe limbi. Ista dyiameter descendit in profundo [*illeg.*] et post describuntur .3. circuli. Si voluerunt in eodem profundo [*illeg.*] in latera. Sed cum hoc non oportet ni quando astrolabium [*illeg.*] cum super una latitudine Eμ; Interior pars matris Lη; Interior pars matris que dicitur antenna Bγ Mo Po; limbus Qα; *add.* qui dicitur antenna Rα Oτ; *add.* id est ant(h)ene Eτ Ev Lγ Lε Mη Mν Mu Qγ Qμ Rδ Sδ Sκ Vi Xβ; *add.* scilicet ant(h)ene Bζ Mλ Tδ; *add.* scilicet asuji Bι

[*Lettering on the diagram*]

A] Bγ Bζ Bη Bι Cη Eβ Eτ Ev Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mo Mu Nδ Nε Oζ Oτ Ou Pα Pλ Pμ Po Pq Pτ Pv Qβ Qγ Qμ Rα Rδ Rε Sδ Sκ Tδ Vκ Xβ Wβ; *om.* Mλ Mν Pδ Qδ Vi B<sup>11</sup>] Bγ Bζ Bι Cη Eβ Eτ Ev Eφ Fα Fβ Lγ Lε Lη Mν Mo Mu Nδ Nε Oζ Oτ Ou Pα Pλ Pμ Po Pq Pτ Pv Qβ Qγ Qμ Rα Rδ Rε Sδ Tδ Vi Vκ Xβ Wβ; *om.* Fζ Pδ Qδ; *cut off* Bη Mη Mλ; D Sκ; *add.* qualibet partis quartis divide 90 punctus Xβ C] Bγ Bζ Bη Bι Cη Eβ Eτ Ev Eφ Fα Fβ Lγ Lε Mη Mλ Mν Mo Mu Nδ Nε Oζ Oτ Ou Pα Pλ Pμ Po Pq Pτ Pv Qβ Qγ Qμ Rα Rε Sδ Sκ Tδ Vi Vκ Xβ Wβ; *om.* Fζ Lη Pδ Qδ; *illeg.* Rδ

D] Bγ Bζ Bη Bι Cη Eβ Eτ Ev Eφ Fα Fβ Lγ Lε Lη Mη Mλ Mν Mo Nδ Nε Oζ Oτ Ou Pλ Pμ Po Pq Pτ Pv Qβ Qγ Qμ Rα Rε Sδ Tδ Vi Vκ Xβ Wβ; *om.* Fζ Mu Pα Pδ Qδ; *illeg.* Rδ; B Sκ E] Bγ Bη Bι Cη Eβ Eτ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mλ Mν Mo Mu Nδ Nε Oζ Oτ Ou Pα Pλ Pμ Po Pq Pτ Pv

<sup>8</sup> Note: in ms Wβ the drawing of the armillae, plus the word “meridies” is at about 11 o’clock on the diagram, because of a lack of space in the top margin.

<sup>9</sup> In ms Pθ there is a line in the text and a large “A” in the margin indicating where Fig. 1 should go, but there are no diagrams (but many partially or wholly blank pages) in the manuscript. Similar references to subsequent figures are given at the appropriate places (“B”, “C”, etc.) but no diagrams are found in the manuscript for these, either.

<sup>10</sup> *atena / antenna / anthena*: It is unclear where this word comes from. There is no Arabic astrolabe term to which it can be immediately related. Similarly for “*asuji*”. See also Fig. 2. It should be noted that here these words refer to the plates in the “mother” on the front of the astrolabe, although ms Qλ refers to the back as does ms Eβ in Fig. 2.

<sup>11</sup> “B” and “*occidens*” may have been on the diagram at an earlier stage in some manuscripts, but could have been cut off either by rebinding or in the filming (e.g., Mλ Oτ).

Qβ Qγ Qμ Rα Rδ Rε Sδ Sκ Tδ Vκ Xβ Wβ; *om.* Bζ Ev Pδ Qδ Vι

[*Numbering on the diagram*]

*om.* Cβ Cθ Mθ Nδ Qα Rα Vε 10, 20, ... 360] Cη Cι Eμ Eτ Ev Eφ Fα Fζ Lγ Lη Mη Mκ Mλ Mν  
Mo Mv Nε Oζ Ok Pγ Pλ Po Pρ Pv Qλ Qγ Qμ Rε Vι Vκ 5, 10, 15, 20, 25, 30] Bη 5, 10,  
15, ... 360] Bζ Bι Eη Fβ Lε Oτ Ov Pα Pδ Pτ Qβ Qδ Sδ Tδ Wβ 5, 10, 15, 20, 25, 30, 40, 60, 70,  
80, 90 | 340, 345, 350, 355] Bε 5, 10, 15, 20 | 85, 90 | 180, 185 | 270, 275 | 360 Xβ 10, 20,  
30 ... 80, 90] Mδ 10, 20, ... 90 | 110 ... 190 | 210 ... 320 | 340 | 360] Oη 15, 30, 45, ... 360]  
Bγ *add.* .36. Gradus] Vσ *add.* ab A ad B divide esse punctus omnis 5 et reinde | qualibet  
partes quarte circuli divide 90 pars Xβ A-B] 5, 10, 15, ... 55, 60 Rδ<sup>12</sup> D-A] 5, 10, 15, ... 85,  
90 Sκ<sup>13</sup>; 335, 340 ... 360 Rδ B-A] 5, 10, 15, ... 85, 90 Sκ D-C] 5, 10, 15, ... 85, 90 Sκ  
B-C] 5, 10, 15, ... 85, 90 Sκ

[*Other information*]

meridies] *om.* Bζ Bι Mλ Nε Pδ Po occidens] *om.* Bζ Bι Fα Fζ Lγ Mλ Nδ Nε Oτ Pδ Po Qγ; *cut  
off* Rδ septentrio] *om.* Bζ Bι Fα Fζ Lη Mλ Nδ Nε Ov Pδ Po; *illeg.* Eβ Qμ; *angulus terre* Rε  
oriens] *om.* Bζ Bι Fα Fζ Nε Pδ Po Qμ

armilla rotunda] *om.* Bζ Bι Cβ Cι Eη Eμ Ev Eφ Fβ Lε Mη Mθ Mλ Mo Mv Nδ Nε Oη Ok Oξ Pα Pγ  
Po Pv Qα Qδ Tδ Vε Vι Vσ; armilla Cθ; armilla reflexa Mκ; armilla suspensoria Bγ armilla  
reflexa] *om.* Bι Cι Eη Eμ Ev Eφ Fβ Lε Lη Mη Mλ Nε Oη Ok Oξ Pα Pγ Po Pv Qα Qδ Qμ Tδ Vε Vι  
Vσ; armilla Cβ; reflexa Lγ Vκ; armilla reflexa in qua fixa est rotundi Xβ; *add.* *in text after Cap. 2*  
armilla reflexa vel suspensoria que alhantica<sup>14</sup> dicitur abraice [= arabice] alhabor<sup>15</sup> ansa Pδ; *add.*  
ansa Wβ

circulus Cancrī] *om.* Bγ Cβ Cθ Cι Eη Eμ Eφ Fα Mθ Mκ Mo Nδ Oη Ok Pγ Pδ Po Pv Qα Vε; *illeg.*  
Eβ; Cancrī Pρ; Cancrī Rε Vκ circulus Arietis] *om.* Bγ Cβ Cθ Cι Eη Eμ Eφ Fα Mθ Mκ Mo Nδ  
Oη Ok Qα Pγ Pδ Po Pv; *illeg.* Eβ; Arietis Rε; Declinatio solis | Aries equinoc[tia]lis Libra Pρ;  
Arietis et Librarum Lη Pλ; circulus Arietis et Librarum Bη Cη Oζ Qδ; circulus equinoctis Rδ  
circulus Capricorni] *om.* Bγ Cβ Cη Cθ Cι Eη Eμ Eφ Fα Fβ Mθ Mκ Mo Mv Nδ Oη Ok Pγ Pδ  
Po Pv Qα Vε; *illeg.* Eβ; Capricorni Lη Pλ Vκ; Capricornus Rε Pρ; *add.* *on outer rim* limbus Bι Mλ

*Some diagrams have other points – from Figura 7 – marked on them:*

G] Vκ  
H] Bι Fα Mλ Mv Rα Sκ Vκ  
K] Fα Mv

<sup>12</sup> In ms Rδ the outer rim is only partially divided and numbered, running from 335, 340 ... 360 [A] 5, 10 ... to 55, 60 in quarter A-B.

<sup>13</sup> In ms Sκ this pattern of numbering is also found in the figure on f. 78<sup>v</sup>. In the diagram on f. 78<sup>r</sup>, however, the limbus is numbered “10, 20, ... 350, 360”, but counter-clockwise rather than clockwise.

<sup>14</sup> *alhantica*; a variant on *al-ḥalqa* (see Fig. 2, as well as Cap. 2, note 25 and Kunitzsch, *Glossar*, p. 522).

<sup>15</sup> *alhabor*: a variant on the Arabic word for “holding or keeping back” (*al-ḥabs*; الحبس), an alternative for “handle”; in Latin: *armilla reflexa* or *ansa*. See Kunitzsch, *Glossar*, p. 559.

L] Fα Vκ  
M] Fα Mυ Vκ; κ Bι Mλ Rα Sκ  
N] Fα Mυ Sκ Vκ  
O] Mυ Vκ  
Q] Vκ  
S] Mυ Vκ  
T] Fα Mυ Vκ; ι Bι Rα  
V] Mυ Vκ  
Z] Mυ Pυ Vκ; G Bι Fα Mλ Rα

[CAPITULUM 2.] DE DORSO ASTROLABII ET PRIMO DE CIRCULO ALTITUDINIS<sup>1</sup>

5 Facies circulum super extremitatem tabule, dimittesque spacium, in quo possint scribi littere numeri, et incipies scribere litteras a puncto D, qui est in oriente, usque in punctum A, qui est sub armilla, qui significat in astrolabio meridiem. Perficiesque in eandem quartam 90 gradus hoc modo. Divides predictam quartam per 18 divisiones

- 1 De ... altitudinis] *in marg.* Eζ Lγ Mv(*diff. hand*) Po Qλ(*later hand*); *illeg.* Eδ; *om.* Aα Bα Bζ Bι Bκ Cβ Cδ Cε Cθ Cη Dβ Dγ Eα Eη Eο Eτ Eυ Eφ Fβ Lζ Mγ Mv Mφ Nα Oη Oμ Oο Oτ Oυ Pα Pγ Pθ Pv Pφ Qα Qδ Rα Rβ Rδ Rε Sβ Uα Vα Vε Vκ Vπ Vυ Wα Wβ Xα Xβ; Capitulum dorsi astrolabii Oα; Capitulum secundum Oτ; Capitulum secundum de dorso astrolabii primo de circulo altitudinis Mo; Capitulum secundum scilicet de dorso astrolabii et post de circulo abscisior Bε(*marg.*); De compositionem trium circulorum scilicet Cancri, Arietis et Capricorni Sκ; De divisione limbi et circulorum dorsi astrolabii et inscriptione ipsorum Mλ; De dorso astrolabii Dη Eμ Fα Pο(*diff. hand in marg; add. c. ii*) Qγ Vψ; De formatione dorsi astrolabii Fδ Vβ Vv; Descriptio dorsi astrolabii Bη; Dorso astrolabii et primo de circulo altitudinis Xβ; In dorso scilicet astrolabii Bγ(*later hand in marg.*); Opus dorsi astrolabii Cζ Eμ(*marg.*) Eν Mθ Mκ Oκ Oπ Oσ(*later hand*) Sλ Vβ Vσ Vχ; Post hoc in dorso astrolabii Sθ Sι(*om. astrolabii*); Sequitur de compositione limbi Qβ
- 1 astrolabii] arstrolabii Lε; astrolabio Fζ
- 2 *before* Facies *add.* Deinde Pα; *add.* Et in dorso astrolabii Qα; *add.* Hoc facto Cδ; *add.* Post dorsi astrolabii Cθ; *add.* Post hoc in dorso astrolabii Cβ Oμ; *add.* Post hoc in dorso tabule Pφ Facies] Faciesque *many; add.* inde Bγ Cη Eφ Pθ Rδ; *add.* post hoc Bζ circulum] arculum in dorso Pα; *add.* Arietis Lβ; *add.* in dorso tabule Bζ; *add.* post hoc in dorso tabule Dβ Fδ Mγ Oο Rε Vβ Vv tabule] *om.* Mv; eius Dβ Fδ Mγ Oο Rε Vβ Vv; *add. interlin.* id est tabule Vβ dimittesque] dimittens Bκ Rα in quo] *rep.* Wι quo] *om.* Rδ possint] possent Sι
- 2-3 possint scribi] scribantur Bα
- 3 scribi] describi Sκ; inscribi Sθ scribi ... incipies] *om.* Fβ et ... puncto] *interlin.* Sθ litteras] litteram Rδ usque] *corr. from* a puncto Sθ in<sub>2</sub>] *ad many*
- 4 qui est] *corr. from* usque Sθ est] *om.* Nδ significat] signat *many* astrolabio] abstrolabio Pα perficiesque] perficies Nε in<sub>2</sub>] *om.* Rδ
- 5 eandem quartam] eadem Mγ; eadem quarta Rα Sι quartam<sub>1</sub>] *interlin.* Sθ quartam 90 gradus] *om.* Mλ 90] 60 Ev; lxx<sup>mo</sup> Nα; *om.* Bα 90 gradus] *om.* Bγ Bη Eτ Mo Pγ Pθ Pv Rδ Sκ Uα Vα Vσ Wβ Wι gradus] *om.* Cβ Cδ Cε Cζ Cθ Dη Eμ Mθ Oη Sθ; divisiones Dη; *add. in marg.* divisiones Sθ hoc modo] *om.* Bα Nα Oη Vε; *add.* DICIT(DOCET Cζ) MODUM DIVIDENDI PRIMUM CIRCULUM IN DORSO, QUI EST EXTERIOR OMNIBUS, ET DICITUR CIRCULUS ALTITUDINIS Cζ Eμ(*marg.*) Oη Divides] *add.* scilicet *many* quartam] *om.* Sκ 18] 9 Mδ; 80 Rβ divisiones] partes Sλ

<sup>1</sup> Numerous manuscripts continue on from Capitulum 1 without a break and without a heading.

## [CHAPTER 2.] ON THE BACK SIDE OF THE ASTROLABE ; AND FIRST THE CIRCLE OF ALTITUDE

You will make a circle around the edge of the plate and leave a space in which numerals<sup>2</sup> may be written, and you will start to write the numerals from point D, which is at the east, along to point A, which is beneath the armilla,<sup>3</sup> which in an astrolabe indicates the south. And in the same quarter you will complete 90 degrees in this way. You will divide the aforementioned quarter into 18 equal divisions,

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<sup>2</sup> *littere numeri* = the characters or symbols of number.

<sup>3</sup> *armilla(e)*: these are the two suspension rings at the top of the astrolabe. The use of the term here simply indicates that point A is at the top of the astrolabe.

equales, et scribes in prima divisione 5, et in secunda 10, et in tertia 15, atque sic augmentando usque ad 90; et per hanc quartam accipies altitudinem solis atque stellarum. Similiter facies in ceteris quartis.

10 Incipies autem scribere a puncto orientis usque in meridiem, id est ex D in A, ut supra dictum est. Deinde incipies a puncto D et facies similiter usque in C; post hoc ex B in A, ad ultimum vero ex B in C.

- 6 prima] *om.* Pμ 5] 10 Mδ et in secunda 10] *om.* Wα 10] 20 Mδ 10 et in tertia] *om.* Qλ et in tertia 15] *om.* Bι Bκ Dγ Eζ Eτ Mλ Qδ Rα Rβ Sβ Uα Vκ 15 ] 30 Mδ sic] *add.* deinceps Sλ
- 7 augmentando] *add.* per 5 Dη; *add.* per 5 ulterius Qδ Rβ; *add.* per additionem quinarum Qα; *add.* ulterius Bκ Dγ Eδ Eζ Mλ Vκ 90] nonaginta Mγ; 60 *corr. to* 90 Eν; *add.* gradus Fα; *add.* que omnia patent melius in figura pronotata supra Cζ; *add. interlin.* que omnia patent melius in figura pronotata ex alia parte folii Eμ per] *rep.* Qμ hanc] *add.* autem Cζ accipies] accipias Nδ altitudinem] altitudines Rε
- 8 stellarum] *add.* fixarum Rδ Similiter] *add.* autem Sλ quartis] *add.* si placet Qα
- 8-9 altitudinem ... facies] *om.* Nε
- 9 orientis] *add.* D Bγ Bη Cη Eφ Pα Pθ Rδ Wβ; *add.* A Vκ id est] *om.* Oo Vα; scilicet Bκ id est ex D in A] A Bγ Bη Cη Eφ Mθ Pα Pθ Rδ Wβ; ex D id est in A Bι Eδ Lζ; ex D scilicet in A Dγ Sβ Vκ A] *margin.* Sθ
- 9-10 Incipies ... incipies] scilicet Qα id ... est] dictum est ex D id est in A ut super Eζ; dictum est ex D in A ut super dictum est Xα; id est dictum est ex D in A ut super Po; id est ex D scilicet in A ut super Rα ut ... est] *om.* Bα in] *om.* Sκ
- 10 dictum] *om.* Fα dictum est] *om.* Aα Bι Cβ Cδ Cζ Cθ Dβ Dγ Eμ Eν Eo Eν Fδ Lζ Mγ Mδ Mκ Mλ Oα Oη Oκ Oμ Oπ Oσ Po Pφ Rε Sβ Sθ Sλ Vα Vβ(*add. interlin.*) Vε Vν Vπ Vσ Vν Vχ est] *om.* Oo Si deinde] *om.* Si incipies] accipies Rδ; incipies Sθ a] ex Rδ D] *margin.* Nε; *add.* incipies Qδ Rβ et facies similiter] *om.* Qα similiter] *om.* Bα ex] *om.* Qμ
- 10-11 Deinde ... C] *om.* Cι
- 11 ad ultimum vero] et Bη Wβ; ultimo Bκ vero] *om.* Rα Rδ



and you will write 5 in the first division, and 10 in the second, and 15 in the third, and so on increasing up to 90. And with this quarter you will receive [i.e., measure] the altitude of the sun and of the stars. Similarly you will do so in the other quarters.

Now you will begin to write from the eastern point to the southern one, that is, from D to A, as is said above. Then you will begin from point D and make similar [divisions and marks] along to C; after this from B to A; and finally from B to C.

Descriptis litteris<sup>4</sup> iterum facies duos circulos propinquos sibi, inter quos erit modicum spacium, in quo erunt gradus designati, qui gradus, ut supra diximus in litteris, erunt in unaquaque quarta per 18 divisiones distributi, et in unaquaque

- 12 *before* Descriptis *add.* DE CIRCULO SIGNORUM Bγ(marg.) Bι(marg.) Cι Eζ(marg.) Eτ(marg.) Mη Pδ Pτ Qμ Vψ Wι; *add.* DE INSCRIPTIONE SIGNORUM IN DORSO Mο; *add.* DE SPATIO IN QUO SCRIBANTUR NOMINA SIGNORUM Nε; *add.* In alio ergo Dγ Eο Descriptis] Deinde scriptis Eν Vπ; Scriptis Aα Descriptis litteris] DE SCRIPTIS LITTERIS Pγ Descriptis ... iterum] Postea Bα litteris] *om.* Pθ; *add.* numerorum Mθ Oκ iterum] *om.* Sk Wι duos] 2 *many* sibi inter quos] *om.* Nε inter] in Sι
- 12-13 erit ... quo] *om.* Rδ
- 13 modicum] *om.* Pτ modicum ... erunt] *om.* Vν spacium] *om.* Mφ Qλ in ... designati] per (pro Qδ Rβ) gradibus designandis Bι Bκ Dγ Lζ Mλ Qδ Rα Rβ Sβ Vκ; *add.* scilicet distincti Mν designati qui gradus] *om.* Mο Pγ Sk qui] *add.* in marg. per Sθ gradus<sub>2</sub>] *om.* Bγ; *add.* ita Cβ Cθ Eμ Eο Oα Oπ Oσ Vχ supra] *om.* Mγ Rα Rε Sβ supra diximus] prediximus Bκ; supra dicimus Nδ; *add.* omnia ista apparebunt in duabus figuris subscriptis in aliam paginam Fβ in<sub>2</sub>] cum *many*
- 13-14 in litteris] *om.* Bα Cβ Cζ Dβ Eμ Fδ Mγ Mκ Mν Oη Oκ Oμ Oο Pα Pφ Sθ Sι Vα Vν Vσ; *interlin.* Sλ
- 14 litteris ... in<sub>2</sub>] *om.* Dβ erunt] *om.* Sk; distributi et Oμ in<sub>1</sub>] ut Rα unaquaque<sub>1</sub>] qualibet Sλ; *add.* una Rδ unaquaque quarta] undique parte Mγ; utraque parte Oο quarta] *om.* Dγ; *add.* 90 et Eα quarta ... unaquaque<sub>2</sub>] *om.* Qδ; scilicet Sι per ... unaquaque<sub>2</sub>] *om.* Pν 18] *om.* Vε; 9 Mδ; 19 Oπ Vπ; 80 Rβ divisiones] partes Pρ distributi] *om.* Oμ; distincti Cε Pφ; inscripti Bζ(*interlin.*: distributi) distributi ... unaquaque<sub>2</sub>] *om.* Xα et] scilicet Mλ et ... unaquaque<sub>2</sub>] scilicet Xα unaquaque<sub>2</sub>] una Mφ Mν Vι; una scilicet Cβ Cζ Cθ Eν Mθ Mκ Mν Oα Oη Oκ Oπ Oσ Sλ Vα Vσ; *add.* scilicet Aα Bι Cδ Dβ Dγ Eζ Eμ Eο Fδ Lζ Mδ Oμ Oο Rα Rε Vκ Vν Vπ Vν Vχ; *add.* sub Vε
- 14-15 per ... quarta] *om.* Eη Fα Tδ per ... inveniuntur] *om.* Bε distributi ... 5] incipiens a capite signi ita ut in prima divisione sint 5 Eν(= *ll.* 18-19) et ... divisione] scilicet Bα

<sup>4</sup> Several manuscripts read “DE SCRIPTIS LITTERIS” as if it were the heading for this next section. But most manuscripts simply read “Descriptis litteris” (an ablative absolute) referring to the previous section.

Once these numerals have been marked out, you will next make two circles close together between which will be a small amount of space in which the degrees will be marked; these degrees – as we have mentioned above with the numerals – will be distributed over the 18 divisions in each quarter – 5 in each

- 15 divisione 5, ita ut in unaquaque quarta inveniantur 90 divisiones trium signorum; et fiunt omnes 360 gradus, qui sunt gradus 12 signorum. Sub quibus etiam dimittes spacium, in quo describas litteras numeri graduum, qui dividunt gradus uniuscuiusque signi per sex<sup>5</sup> divisiones, incipientes a capite signi ita ut in prima divisione sint 5, et in secunda 10, et sic augmentando usque in 30. Et hec divisiones erunt linee venientes ab
- 15 divisione] parte Pq divisione ... unaquaque] *om.* Mγ divisione ... quarta] *om.*  
 Nα 5] quinque *some*; 10 Mδ; *add.* et in alia divisione 10 Cζ Eμ Mθ Mκ Oη Vσ; *add.* et in alia 10 Oκ ut] quod Cζ Rε Si unaquaque] qualibet *some* quarta] *om.*  
 Pμ quarta ... signorum] divisiones 3 signorum et inveniatur 90 Rβ inveniantur] sint Bα Bι Bκ(sit) Dγ Eζ Lζ Mλ Po Sβ Vκ Xα; sunt Rα 90] *om.* Dη; 19 Vπ; 60 *corr.* to 90 Eν; 98 Mφ Mν Vι; 190 Uα divisiones] gradus Bα Bγ Bη Bι Bκ Cδ Cζ Cη Cθ Dβ Dγ Dη Eζ Eμ Eν Eτ Mγ Mκ Mλ Mν Mo Oα Oπ Oσ Po Qα Rα Rε Sβ Sθ Si Sκ Sλ Uα Vα Vκ Vν Vσ Vυ Vχ Wβ; *add.* gradus Mδ Xα; *add.* id est gradus Aα; *add.* vel gradus Cι Eν Mη Pδ Qμ Vπ trium] *om.* Eζ Lγ Po trium signorum] *om.* Aα Bα Bγ Bη Bκ Cβ Cδ Cζ Cη Cθ Cι Dβ Dγ Eμ Eν Eτ Eυ Mγ Mη Mκ Mλ Mν Nα Oα Oπ Oσ Qα Qμ Rα Rδ Rε Sβ Sθ Si Sκ Sλ Uα Vα Vκ Vν Vπ Vσ Vυ Vχ Wβ; vel g~ terminorum Nε; *add.* fiunt Lβ
- 15-16 90 ... sunt] *om.* Cε Pγ Pτ Pυ Wι
- 16 fiunt] erunt Sλ; sint Bκ Dγ Rα Sβ 360] 60 Xα; 160 Oo gradus<sub>1</sub>] *om.* Mγ Si qui sunt] *om.* Vε qui sunt gradus] *om.* Bη Wβ; scilicet Bα gradus<sub>2</sub>] *om.* Rα Rε 12] xii or duodecim *some*; 3 Sθ signorum] *add.* Docet facere circulum signorum qui est sub circulo abscindens et omnia patent in pronotata figura Cζ Eμ(*marg.*) quibus etiam] quorum quolibet Qδ Rβ dimittes] dimittas Nδ
- 17 in quo] interim Rδ in quo describas litteras] ad scribendum Bα; pro litteris Bι Bκ Dγ Lζ Mλ Rα Sβ Vκ numeri] quinque NαOμ graduum] *add.* signorum Oμ dividunt] dividat, dividant, dividit *many* uniuscuiusque] cuiusque Bα
- 18 per ... signi<sub>2</sub>] in quarta est altitudo poli supra horizontem tanti est distantia cenith ab equinoctiale. Et hoc est latitudo regionis Mη sex] 6 *some*; vi *some*; *om.* Vκ; 30 Bε Eα Eβ Fα Fβ Fζ Lβ Lγ Lε Lη Mo Nδ Oζ Oξ Oτ Ou Pλ Pμ Pν Pρ Qβ Qγ Qδ Qλ Rβ Sδ Tδ Wα Xβ; *marg.* Sθ; 60 Pθ incipientes] incipiendo Oη; incipies Bγ Bη Cη Lβ Pα Pθ Pλ Qδ Rβ Vε Wβ Xα; incipiens Bε Bζ Cε Cι Eα Eδ Eζ Eο Eτ Eφ Fα Fβ Lγ Lε Lη Mo Mν Mφ Nα Oζ Oξ Oτ Ou Pγ Pδ Pμ Pν Po Pτ Pυ Qβ Qγ Qλ Sδ Tδ Uα Vβ Vι Vπ Vψ Wα Xβ; incipites Oμ signi] *add.* quarta est altitudo poli supra horizontem tanti est distantia cenith ab equinoctiale. Et hoc est latitudo Vψ ita] *om.* Nδ; infra Rδ ut] quod *many* 5] quinque *some*
- 18-19 et ... 10] *om.* Bγ Bη Cη Eτ Eφ Mo Nα Pγ Pθ Pυ Qδ Rβ Rδ Sκ Uα Wβ; *add.* in tertia 15 Xα
- 19 10] 20 Oμ in] ad Rε Si 30] *add.* etc. Rδ venientes] invenientes Nε

<sup>5</sup> The confusion here is between dividing a sign into 6 divisions (of 5 degrees) or into 30 divisions (of one degree). Most diagrams show each sign divided into 5-degree sections and these divided into single-degree subsections – so both readings make perfect sense.

division – so that in each quarter the 90 divisions<sup>6</sup> of the three signs are found; and there are created all 360 degrees, which are the degrees of the 12 signs. Beneath these you will also leave a space in which you should write the numerals of the degrees, which divide the degrees of every sign into 6 divisions, beginning from the head of the sign so that there are 5 in the first division and 10 in the second and in this way increasing up to 30. And these divisions will be lines coming from

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<sup>6</sup> Some mss say “degrees”.

20 extremitate tabule, que dividant gradus et litteras superiores.

25 Post hec facies duos circulos, inter quos dimittes spacium quod divides per 12 partes equales, in quibus describes nomina signorum, et omnes isti circuli erunt ex uno puncto, id est habebunt unum punctum, scilicet E, qui est in medio tabule. Et incipies ab Ariete in initio quarte occidentalis et meridiane, qui est punctus B, iens versus meridiem, qui est punctus A; et divides unumquodque signum per 30 divisiones, ut supra.

- 20 extremitate] *add.* circumferencie Qα tabule] *om.* Bα Bζ Mv Oη dividant] dividunt Eζ Mλ Mv Oα Oκ Oπ Pφ Qδ Rα Rβ Vπ Vχ litteras] lineas Eτ Qδ Rβ Tδ; *add.* per Mγ superiores] *add.* 3-line gloss Cζ
- 21 duos] 2 *many*; 3 Eφ duos circulos] *rep.* Rδ quod] quos Si divides] dimittes Nα
- 21-22 per ... equales] *om.* Fζ
- 22 describes] scribes *some* nomina] *add.* 12 Bγ Bη Cη Pα Pθ Rδ Wβ circuli] *add.* isti erunt] *om.* Bε Cε Cι Eα Eη Eτ Fα Lβ Lγ Lε Lη Mη Mv Mφ Oζ Oξ Oτ Ov Pγ Pδ Pλ Pμ Pν Pρ Pv Qγ Qλ Sδ Sκ Tδ Uα Vι Vψ Wα Wι Xβ
- 22-23 erunt ... punctum] exunt ab uno puncto et habebunt punctum Nα; habebunt unum centrum Qα ex uno ... punctum] super idem centrum Vv
- 23 puncto] spatio *corr. to* puncto Oξ; *add.* scilicet centro Bζ Bι Bκ Dγ Eδ Eζ Lζ Mλ Qδ Rα Rβ Sβ Vκ Vπ Xα; *add.* scilicet centro et Aα Eo Ev Po Vπ id est] *om.* Fζ Pδ; et Mv Si Vv; scilicet a centro Re id est ... punctum] *om.* Bα Vψ unum] *om.* Sκ; *add.* et idem Mv habebunt unum punctum] ex uno puncto gredis(?) puncto procedunt Tδ punctum] centrum Bγ Bη Cη Eφ Pα Pθ Rδ Wβ; et idem punctum Mv; punctum, punctum Cβ Cθ; punctum (*corr. to* circulum), punctum Vχ; spatium Oξ; *add.* *interlin.* id est centrum Vβ scilicet E] *om.* Mo Qβ Sκ; G scilicet E Qδ; id est centrum Oη; indelibet E Aα; in se Wι E] *om.* Qμ tabule] *add.* 2-line gloss Cζ
- 23-24 incipies ab Ariete ] *om.* Eα Eη
- 24 Ariete] *om.* Bε; oriente et est Dη in] *om.* Eδ Oπ; et Aα Bα Bγ Bζ Bη Cη Cθ Cι Dβ Eμ Eτ Eφ Lβ Mγ Mη Mθ Mκ Mv Mo Mv Mφ Oα Oκ Oξ Oο Oσ Pα Pγ Pδ Pθ Pρ Pτ Pv Pφ Qγ Qμ Rα Si Uα Vα Vν Vπ Vv Vχ Vψ Wβ Xβ; et Rδ; et est Dη; et in Cε Eα Eβ Eη Fα Fβ Fδ Lγ Lε Oζ Oτ Ov Pλ Pμ Pν Qβ Qλ Sδ Tδ Vβ Vι Wα; et incipies ab Bε; qui est Oη; qui est in Vκ; scilicet Vσ; vel et Ev qui est] *om.* Wα B] D Nδ iens] incis Sκ; ienis Si
- 24-25 B ... punctus] *marg.* Vv; *om.* Pμ Qδ
- 25 punctus] versus Mγ unumquodque] unumque Nε

the edge of the plate, in order to divide the outer<sup>7</sup> degrees and numerals.

After this you make two circles between which you will leave a space which you will divide into 12 equal parts, in which you will write down the names of the signs, and all of these circles will be based on one point, that is they will have one centre, namely E, which is in the middle of the plate. And you will start from Aries at the beginning of the south-west quarter, which is point B, going towards the south, which is point A; and you will divide each sign into 30 divisions, as above.

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<sup>7</sup> *superiores*: the divisions, degrees and numerals in the outer circles.

Post hec ponas regulam super 24 gradum et dimidium ex Geminis (in hoc autem tempore ponatur super 27 gradum et hoc est propter motum octave spere); et iunges eam cuspidi per lineam subtilem. Deinde divides ipsam lineam a cuspidi

- 26 *before* Post *add.* DE INSCRIPTIONE [*illeg.*] Eδ; *add.* DE INSCRIPTIONE CIRCULI MENSIIUM Σκ; *add.* DE INSCRIPTIONE MENSIIUM Βη(*marg.*) Cι(*torn*) Eτ Pδ Nε(*add. et c.*)Qμ Vι Vψ Wι; *add.* DE INSCRIPTIONE MENSIIUM ET DIERUM IN DORSO ASTROLABII Μυ(*marg.*); *add.* DE INSCRIPTIONE 12 MENSIIUM Μο Pτ; *add.* DE PUNCTO ZODIACI INVENIENDO PER LINEAM SUBTILES Αα Eυ(*add. in marg. et de dorso astrolabii*) Μη Vτ; *add.* SCILICET IN DORSO. DE INSCRIPTIONE MENSIIUM Βγ(*later hand in marg.*); *add. in marg.* Docet facere circulum dierum qui debet esse ecentricus a productis circulis Eμ; *add.* SEQUITUR DE INSCRIPTIONES MENSIIUM Dη Post hec] Postea *many* 24] 17 Pτ Vβ(*add. interlin. al' 18*); 18 Bε Dβ Eα Eη Fα Fβ Fδ Fζ Lβ Lγ Lε Lη Mγ Mδ Mυ Mφ Nδ Nε Oζ Oξ Oο Oτ Oυ Pδ Pλ Pμ Pν Pρ Pφ Qβ Qγ Qλ Sδ St Tδ Vι Vν Vψ Wα Xα; 18 vel 24 Xβ; 27 Αα Βγ Cδ Cε Cη Eδ Eο Eτ Eφ Μο Pθ Rδ Uα Vπ; 28 Dη Eζ; 78 Eβ; *add. in marg.* aliqui libri habent 24 et .S. Vβ; *add.* (in hoc ... spere [*ll. 26-27*]) Mν Vα 24 ... Geminis] 12 gradus Cancrī, cum dimidio qui est angulus solis anno 1443 Eū gradum] *om.* Bα Eμ Mθ Mν Pλ Vα; *superscr.* Eμ Sλ Vσ et dimidium] *om.* Bγ Bε Bη Bκ Cε Cη Cι Dη Eα Eβ Eη Eο Eφ Fα Fβ Fζ Lβ Lγ Lε Lη Mθ Mυ Mφ Nδ Nε Oζ Oκ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qα Qβ Qγ Qλ Rα Rδ Sδ St Sκ Uα Vι Vκ Vπ Vψ Wα Wβ Xα Xβ; fere Bι Dγ Lζ Mλ Sβ; scilicet Mθ Oκ; *add.* fere Eδ Eζ Pο Qδ Rβ ex Geminis] *om.* Mγ; Geminorum Bα Bγ Bη Cε Cη Dη Eτ Eφ Pα Pθ Pτ Qδ Rβ Rδ St Uα Vβ Vπ; *add.* Geminorum cuta(!) dimidium esse Geminis Σκ; *add. in marg.* Sed nota quod in hoc tempore ponatur super 27 Geminorum et hoc est propter motum 8° spere qui maior est modo quam tunc fierit 2 gradibus et dimidio fere Eμ
- 26-27 in ... spere] *om.* Αα Βγ Bη Bι Bκ Cβ Cδ Cε Cζ Cη Cθ Dγ Dη Eδ Eζ Eμ Eν Eο Eτ Eυ Eφ Lζ Mθ Mκ Mλ Mο Nα Oη Oκ Oμ Oο Oπ Pα Pγ Pθ Pο Pτ Pυ Rα Rδ Sβ Sκ Sλ Uα Vε Vκ Vπ Xα Wβ Wι; *in marg.* Qα Vσ; *interlin.* Vχ
- 27 27] 7 Lβ; 17 Bε Eβ Eη Fβ Fζ Lγ Lε Lη Mγ Mδ Mυ Mφ Nδ Oζ Oτ Oυ Pλ Pμ Pν Pρ Pφ Qβ Qγ Qλ Sδ Tδ Vι Vχ; 21 St 25 Qα; 27 *corr. to* 17 Qμ gradum] eiusdem Bζ; grado eiusdem Mν; gradu eiusdem Pφ St Xβ; gradum eiusdem Bα Fδ Oα Oσ Qδ Rβ Re; gradus eiusdem Dβ Mγ Qα Sθ Vν Vυ; *add.* Geminorum Vβ
- 28 eam] *add. interlin.* scilicet regulam Vβ cuspidi] *add.* id est centro Qδ Rβ subtilem] *add. interlin.* ut posset deleri Eμ; *add.* Ut posset deleri. Nota quod in hoc tempore ponatur super 27 Geminorum et hoc est propter motum 8° spere qui maior est modo quam tunc fuerit 2 gradibus et dimidio fere Cζ ipsam lineam] *om.* Eφ Μο Nα Pγ Pυ Wι; eam Bγ Bη Cε Cη Dη Eτ Pα Pθ Rδ Sκ Uα Wβ Vι; eam lineam Mφ Vβ(*add. interlin.* ipsum) Vπ; ipsam Vε; illam lineam Vκ; lineam Bε Cι Eα Eβ Eη Fα Fβ Lβ Lγ Lε Lη Mη Mυ Nδ Nε Oζ Oξ Oτ Oυ Pδ Pλ Pμ Pν Pρ Qβ Qγ Qλ Qμ Sδ Tδ Vψ Wα a] *ms* Bθ *begins*



After this you will place the ruler on  $24^{\circ}30'$  of Gemini<sup>8</sup> (at this time, however, it should be placed on  $27^{\circ}$  and this is because of the motion of the eighth sphere);<sup>9</sup> and will join this to the centre with a fine line. Then you will divide this line from the centre

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<sup>8</sup> At issue here is the precession of the solar apsides (about  $1.1'$  per year) and therefore which number to choose. Gemini  $24^{\circ}30'$  would mean that the aphelion would fall around 9 June (Julian calendar); in AD 2000 it fell on 4 July.

The various numbers here may represent attempts to get a correct position for a current date (as with ms Ev: Cancer  $12^{\circ}30'$  in AD 1443) or error and/or confusion in copying, especially because of the ways 4's and 7's could be written.

Julio Samsó (*On Both Sides of the Straits of Gibraltar* [Leiden: Brill, 2020], p. 218) notes that the figure of  $84^{\circ}30'$  for the longitude of the solar apogee is not far off the figure of  $85^{\circ}49'$  established by Ibn al-Zarqāllah using his observations of 1074-1075; and that the figure of  $87^{\circ}$  matches a calculation for the solar apogee (coinciding with the apogee of Venus) in his *Almanac* tables for Venus.

<sup>9</sup> A parenthetical note to correct or update the figures given in the previous line by  $2^{\circ}30'$  or  $3^{\circ}$ , because of the precession of the solar apsides (here associated with “the motion of the eighth sphere”). The insert is found in both early and late manuscripts, and is missing from both early and late manuscripts.

30 usque in circulum sibi propriorem per 32 divisiones, et pones summitatem prime divisionis ex parte cuspidis circuli signorum cuspidem; et accipies ex hac linea 30 divisiones, eritque inter utrasque cuspides una divisio ex ipsis divisionibus, et inter caput lineae altera divisio prohibens eos ne se contingant.

Iterum facies circulum et divides eum per 365 divisiones secundum numerum dierum anni solaris, si fuerit astrolabium magnum; et si fuerit parvum, pones eos binos

- 29 usque] ut Vψ usque ... propriorem] in circulum priorem Pφ sibi] *om.* Bα Cδ Cζ Dβ Eμ Fδ Mθ Mν Oη Oο Pφ Sι Sλ Tδ Vβ Vν Vσ propriorem] priorem Bζ Dβ Eμ Fδ Oη Oο Pφ Vβ(*add. interlin.* id est propriorem vel propinquirem) Vν; propinquirem Aα Bη Bθ Cε Eυ Mδ Nδ Oα Oσ Pα Pρ Qα Qβ Qδ Rβ Sδ Vβ Vε Vπ Vυ Wβ; propinquirem *corr. to* propriorem Mν; *add.* scilicet signorum Oη Sλ(*interlin.*) 32] 12 Vε; 22 Pα; 30 Qα; 31 Mθ Oκ; 33 Mδ Sθ; 33 *corr. to* 32 Pρ et ... divisionis] *om.* Eο Pμ; *add.* equales Sλ pones] pone *some*
- 30 cuspidis] *add.* primi divisione Rβ cuspidem] *om.* Bγ Cη Eφ Fζ Oτ Pα Pθ Qα Rδ Sβ Vε; cuspidem centrum Mθ Oκ; cuspidis Vυ Vψ; id est centrum Oη; scilicet cuspidem Eδ; scupidem Pτ; *add.* scilicet centrum et facies circulum secundum quod centrum Eα accipies] 70 cipies Eζ; excipies Eδ linea] *om.* Bζ Lβ; divisione Aα Bγ Bη Bθ Cη Eφ Eυ Pθ Rδ Wβ 30] 39 Oμ; 130 Pν
- 31 divisiones] *add.* equales *many*; *add. in marg.* et scribes circa circum Sθ eritque] *om.* Vσ; eruntque Nδ inter] *om.* Sθ; *twice* Rα; *add.* has Bγ Cη Rδ utrasque] has Pα; *add.* has Bη Wβ cuspides] *twice* Vσ; divisiones Rε; scupides Pτ una ... divisionibus] *om.* Pγ; *add. 3-line gloss* Cζ; *add. in marg.* scilicet inter circulum claudentem signa concentricum, et circulum mensium ubi describitur dies. Et tunc remanebunt 30 solum divisiones Vβ ipsis] istis *many*; *add.* scilicet 32 Qβ divisionibus] *om.* Sι Vπ; *add.* scilicet 32 Xβ *add. in marg.* scilicet circulum interior cum iam dictum Sθ
- 31-32 ex ... division] *om.* Rδ
- 32 caput] capita *many* linee] *om.* Aα Bθ Bι Bκ Cβ Cθ Dγ Eν Eο Eυ Mλ Oπ Rα Sβ Vε Vπ Wα; *add.* et circuli Eβ Fζ Qδ; *add.* et circuli signorum Cδ; *add.* et circulum Bε Cε Cι Dη Eα Eη Fα Fβ Lβ Lγ Lε Lη Mδ Mη Mφ Nδ Nε Oζ Oξ Oτ Oυ Pδ Pλ Pμ Pν Qα Qβ Qγ Qλ Qμ Rβ Sδ Tδ Vι Vψ Xα Wα; *add.* et circulum signorum Sλ Xβ altera] *om.* Qα; alia Rε eos] *om.* Nδ; circulos Cδ; *corr. to* circulos Sλ contingant] *add. in marg.* Per istas duas divisiones, patet tibi distantia sive elongatio oppositi augies circuli quem describis a primo circulo Vβ
- 33 circulum] *add.* qui est circulus dierum Cζ Oκ et ... eum] *interlin.* Sλ 365] 360 Bη Cθ Fα Wβ
- 34 dierum] *om.* Vψ; *add.* numeri(?) Nε solaris] solis Rδ si ... magnum] *om.* Eζ fuerit;] *add.* astrolabium Bθ Eο Oπ Vπ pones] pone *many*

to the circle nearest to it into 32 parts, and you will create an area [i.e., a circle]<sup>10</sup> with the first division from the centre of the circle of signs as its centre,<sup>11</sup> and you will take along this line 30 divisions [as radius], and there will be between both centres one division from these [32] divisions, and between the end of the line [i.e., the radius] [and the circle of signs] another division preventing them from touching each other.<sup>12</sup>

Once more you will make a circle and divide it into 365 divisions according to the number of days in the solar year, if it is a large astrolabe; and if it is a small one, you will draw them two

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<sup>10</sup> *summitatem*: “surface”, hence figure or area, in this case a circle.

<sup>11</sup> That is, the centre of the new circle is one division (1/32) away from the centre (E) of the circle of signs.

This solar eccentricity of 1/32 is equivalent to 1;52,30 parts (if the radius of the solar eccentric is 60 parts). Since 1;52,30° is the maximum solar equation (rather than the eccentricity) in Ibn al-Zarqāllah, Samsó speculates that the author of our text made an error here in adopting this figure for the wrong parameter. (Samsó, *On Both Sides*, pp. 418-419.)

<sup>12</sup> That is, if the centre of the new circle is one division (out of 32) away from the centre of the circle of signs, and its radius is 30 divisions (out of 32), the new circle will be inside the circle of the signs (at its nearest point) by one division.

35 et binos. Deinde facies sub eo alterum circulum, in quo erit numerus dierum mensium latinorum. Post hec pones regulam super 15 gradus Sagittarii, et iunges eam cuspidi circuli signorum et pones notam in circulo mensium. Eritque hoc initium Decembris; et erunt ab eo usque in punctum C, qui est in septentrione, 15 dies et remanebunt post hoc spacium abscisis 15 diebus Decembris 350 dies, super quos divides reliquam partem  
40 circuli, id est multiples 50 septies, dividendo primo in 7, secundo in 5, tertio in 2,

- 35 et binos] *om.* Bε Eη Mη; *add.* et binos Bι facies] *om.* Wβ alterum] alium *many* circulum] *om.* Bγ Bη Cε Cη Dη Eτ Eφ Nα Pα Pγ Pθ Rδ Sκ Uα Wβ Wι in quo] *om.* Vσ
- 36 latinorum] annorum Mυ Mφ; *add.* et sub hoc alium in quo scribentur nomina mensium latinorum Aα Bκ Dγ Dη Eζ Eο(*om.* latinorum) Eυ Lζ Mλ Pο Qδ Rα Rβ Sβ Vκ Vε(*om.* nomina) Post hec] Postea *many*; Deinde Vχ 15] decimum quintum *some*; 25 Wβ cuspidi] *om.* Pγ Sκ Uα; *marg.* Wι
- 37 et ... mensium] *om.* Mγ Vν notam] nomina Vψ; notas Rα mensium] signorum Bα Bι Bκ Cβ Cδ Cζ Cθ Dγ Eμ Eζ Eν Eο Mκ Mλ Mν Oα Oη Oκ Oμ Oπ Oσ Pλ Pφ Qα Rα Sβ Sλ Sθ Vα Vυ Vχ; signorum mensium Eδ Pο et<sub>2</sub> ... C] *marg.* Cθ
- 38 erunt] *superscr.* Cζ; *add.* anni Bζ C] *illeg.* Nε; s Vψ septentrione] *marg.* Sι 15] 3 Oμ; 10 Mθ; 12 Bη Sι Wβ dies] *om.* Qα; gradu Vε remanebunt] remanebit *many*
- 38-39 dies ... 15] *om.* Bθ Vπ
- 39 abscisis] subtractis Eα; *add.* id est subtractis Bε Cι Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lζ Mδ Mη Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pλ Pδ Pμ Pν Pρ Qβ Qλ Tδ Vι Vψ Wα Xβ 15] 3 Oμ; 12 Bη Sι Wβ; 13 Eμ; 75 Sθ Decembris] *om.* Rε 350] 35 Bα; 352 Eυ; 358 Bα; 365 Eο; *add.* in *marg.* Quia si 350 dividantur per 7, cuilibet parti dabit 50. Postea si divides 50 per 5, cuilibet dabit 10. Postea si 10 per 2, cuilibet dabet 5. Vβ dies] dividens Sι; divisiones Dβ Fδ Lβ Mγ Pφ Vν super] *erased* Sλ
- 40 circuli] *marg.* Sθ id est] et Vχ id est ... 2] Et primo multiples in 7, secundo in 50 in duas Nα multiples ... 7] primo multiples in 7 Bζ Dβ Fδ Mγ Vβ(*add.* *interlin.* id est divides) Vν 50] 5 Oη; 30 *corr.* to 50 Mη; *add.* partes Pα 50 ... primo] *om.* Oο Rε Vπ; septies primo dividendo Bζ(*marg.*) 50 ... secundo] in 7 primo Bθ Eυ septies] sepcies *or* sepcines *some* septies dividendo] *om.* Pυ septies ... primo] *om.* Pυ dividendo] *om.* Bε Cε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Vψ Wα Xα Xβ dividendo ... 7] *om.* Mο secundo] postea Vβ Vπ
- 40-41 50 ... 5] in 7 primo in 5 Aα 50 ... in] *om.* Cζ dividendo ... 5] *om.* Bι Bκ Cβ Cδ Cθ Dγ Eδ Eζ Eμ Eν Eο Eτ Lζ Mθ Mκ Mλ Mν Oα Oη Oκ Oμ Oπ Oσ Pγ Pο Pτ Pφ Qα Rα Sβ Sθ Sι Sκ Sλ Uα Vα Vε Vυ Vσ Vχ Wι; *add.* in *marg.* Mη(*later hand*) Qμ(*om.* dividendo) dividendo ... fuit] *om.* Bα

by two. Next inside this you will construct another circle, in which will be the number of the days of the Latin months. After this, you will place the ruler on  $15^\circ$  Sagittarius<sup>13</sup> and join it to the centre of the circle of signs, and you will make a note [where the line crosses] on the circle of months. And this will be the beginning of December, and there will be from here right up to the point C, which is in the north, 15 days and after this gap with the removal of 15 days of December, 350 days will remain, over which you divide the remaining part of the circle, that is,<sup>14</sup> you will multiply 50 seven times, dividing [the space] first by 7, second [each of these 7 parts] by 5, third [each of these] by 2,

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<sup>13</sup> In 1252, the true position of the sun (from the Tables of Toledo) for the beginning of December was Sagittarius  $15^\circ 45' 37''$ . (See J. Chabás and B. R. Goldstein, *A Survey of European Astronomical Tables in the Late Middle Ages* [Brill: Leiden and Boston, 2012], p. 85: the tables are probably for Cremona, taken from Florence, Biblioteca Nazionale Centrale, ms. Conv. Soppr. J.V.6 [San Marco 189], f. 83v.) [J.C.]

<sup>14</sup> This section (lines 40-41 “*id est ... iterum in 5 / that is ... once more by 5*”) was confusing for many scribes who might not have understood the arithmetic involved, or who were trying to copy from an exemplar whose scribe did not understand the arithmetic. Since the circle of days of the year is difficult to divide by 365, the composer has devised an “ingenious system” whereby 15 days (December 1-15) are first cut off in the circle and then the remaining 350 are divided up by treating it as 7 units of 50; first, this remaining part is divided by 7, the resulting units of 50 by 5, the resulting units of 10 by 2, and finally the resulting units of 5 by 5.

postea iterum in 5; et ideo hoc ingenium inventum fuit quia non erat apta multiplicatio 365.<sup>15</sup>

45 Et scito quod sol ingreditur caput Arietis 14<sup>o</sup> die mensis Martii, et initium Cancrī 16<sup>o</sup> die Junii, et initium Libre 17<sup>o</sup> die Septembris, et initium Capricorni 15<sup>o</sup> die Decembris.

Iterum cum divides annum, pones regulam super centrum signorum et super divisionem dierum semper. Et nota quod circulus mensium potest fieri concentricus circulo signorum et idem est.

- 41 postea] prius Rδ postea iterum in 5] *om.* Bγ Cη Eφ Qδ Rβ Vκ 5] *add.* et tunc erunt 50 septies Aα Bθ Ev Nα Pv Re Vβ Vπ; *add.* septies Bζ Cζ Dβ Fδ Mγ Oo Vv ingenium] signum Cζ multiplicatio] *add.* per Mγ; *add. interlin., later hand* scilicet divisio Uα
- 42 365] 305 Mv; *add.* dies Oη Sθ; *add.* gradus Qδ Rβ
- 43 Et] *add. in marg.* Isti fuit modus. Non tenetur hodie sed quere ipsum in tabula quadrantis. Vβ Arietis] *add.* fixi Qα 14] 4 Xα; 15 Bζ Eo; 19<sup>mo</sup> Oπ; 24 Dβ; *add.* 11 *superscr.* Pq mensis] *om.* Bκ Rδ; *interlin.* Sλ
- 43-44 Cancrī ... initium<sub>2</sub>] *om.* Pμ
- 44 16] 26 Eβ; *add.* 12 *supra* Pq die<sub>1</sub>] *om.* Rδ; *interlin.* Cζ; *add. interlin.* mensis Sλ Junii] Julii Mγ 17]<sup>16</sup> 1 Lβ; 10 Lη Xα; 14 Sι; 16 Oζ Pq; 19 Aα Bε Bγ Bθ Bκ Cη Cθ Dγ Dη Eδ Eζ Eη Ev Eo Et Ev Eφ Lζ Mλ Mo Nα Oπ Pα Pγ Po Pτ Pv Qδ Rβ Sκ Uα Vε Vκ Vπ Vσ Vχ Wι; *add.* 14 *supra* Pq die<sub>2</sub>] mensis Vχ; *add.* mensis Aα Cβ Cδ Cζ Cθ Eμ Ev Eo Ev Mκ Oα Oη Oμ Oπ Oσ Sθ Sλ Vπ Vυ die Septembris] aperlis (?) Sι Septembris] Decembris Vε 15] *add.* 12 *superscr.* Pq; *tercia decima* Qδ; 13 Rβ die<sub>3</sub>] *interlin.* Cζ; *add.* mensis Cβ Cε Cζ Cθ Eμ Ev Eo Mκ Mv Oκ Oμ Oπ Pφ Qα Sθ Sι Vχ
- 44-45 et initium<sub>2</sub> ... Decembris] *om.* Nε Wι
- 46 Iterum] Item P Pμ Vβ Vπ divides] *add.* circulum Eδ Eζ Mλ Rα(*marg.*) Sβ Xα annum] dies anni Bθ Bκ Eo Lζ Qδ Rβ pones regulam] pone unum caput regulae Aα Bθ Eo Ev Vπ centrum] *add.* circuli Qδ Rβ et] *add.* aliud Aα
- 46-48 Iterum ... est] *om.* Bα Bζ Cβ Cδ Cζ Cθ Dβ Eμ Ev Fδ Mγ Mκ Mv Oκ Oα Oη Oμ Oo Oπ Oσ Qα Rε Sθ Sι Sλ Vε Vv Vυ Vχ signorum ... est] *om.* Mλ et ... est] et aliud super divisione dierum Bθ
- 47-48 semper ... est] *om.* Ev Nα Pπ Et nota ... est] *in marg.* Vβ; *om.* Aα Bι Dγ Eo Lζ Pγ Pv Rα Sβ; 16-line gloss Bκ
- 48 est] valet Bε Eη; *add.* etc. Rδ; *add.* Eo fol. 184<sup>va</sup> lines 18-33

<sup>15</sup> Addendum 2-1 material (found here in some mss or at the end of the next paragraph in other mss) describes changes due to the precessing of the equinoxes and attempts to update to AD 1220.

<sup>16</sup> Some of the variance here may derive from a confusion when copying numerals; 7 (written as Λ) can gradually close at the bottom and be mistaken for a 0, a 6 or a 9.

and once more by 5;<sup>17</sup> and this scheme was devised for the reason that multiplication was not appropriate for [the number] 365.<sup>18</sup>

And know that the sun enters the beginning of Aries on 14 March, the beginning of Cancer on 16 June, the beginning of Libra on 17 September, and the beginning of Capricorn on 15 December.<sup>19</sup>

Again, when you divide the year, you will position the ruler on the centre [of the circle] of signs and on the division of the days. And note that the circle of the months can be made concentric with the circle of signs, and it is the same.

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<sup>17</sup> When you divide the remaining arc (350 days) by 7, you produce 7 units each equivalent to 50 days. When you divide each of these units by 5, you produce a total of 35 units each equivalent to 10 days. And when you divide each of these units by 2, you produce a total of 70 units along the arc, each equivalent to 5 days; and these units are easily divided into single-day units, if necessary.

<sup>18</sup> I.e., the dividing up of 365 (into 365 equal units).

<sup>19</sup> Compared to the true position of the sun (from the Tables of Toledo), and allowing for rounding to the nearest degree, these dates differ only slightly from those of 1252. (Chabás and Goldstein, p. 85.) [J.C.] Samsó points out that these positions could also approximate those of around 1132 (*On Both Sides*, p. 419).

The difference between these figures and those we are used to, that is, near the 21st of the months in question, is explained mainly by the accumulation of errors in the Julian calendar system.

## [ ADDENDUM 2-1 ]

*add. after 365 (line 42) Dβ Fδ Mγ Rε Oo Vβ(marg.) Vv*

*add. after Decembris (line 45) Nα Vβ(marg.)*

50 Et nota quod ecentrici solis omnes significationes, scilicet dies et menses, signare  
 potes in concentrico semper regula posita super centrum ecentrici et signum, de quo  
 intendis, usque in completionem omnium dierum et mensium et hoc propter  
 formositatem instrumenti et quadrantis signandi commodum et augmentum. Item sub  
 A ad partem B vel ad partem D sumere potes 5 gradus equipollentes 5 diebus in  
 ecentrico cum regula super centrum et 5 gradus positi. Et residuos 360 dies in residuo  
 55 ecentrici et gradus divides.

50 semper] ipsi Fδ; spamlr Vv; super Mγ Nα posita] imposita Fδ et signum] *om.*  
 Mγ

51 propter] *add.* commoditatem et Nα Rε Vβ

52 quadrantis] quadranti Fδ; quadrati Dβ commodum] quod et Nα

53 equipollentes] equipollentur Dβ Fδ 5<sub>1</sub>] et Mγ

53-54 equipollentes ... ecentrico] *om.* Rε

54 et 5] 25 Dβ Vv Et<sub>2</sub>] Postea et Rε residuos] residuo Vv in residuo] *om.* Dβ

55 et] ut Dβ Fδ Rε Vβ divides] *om.* Rε



## [ ADDENDUM 2-1 ]

And note that you can always show all the indications (that is, the days and months) of the sun's eccentricity by concentricity, having positioned the ruler on the centre of the eccentric [circle] and on the sign, on which you are directing your attention, up to the end of all the days and months, and this is because of the beauty of the instrument and the convenience and enlargement of the quadrant. Likewise from A towards point B or towards point D you can assume 5 degrees as equivalent to 5 days on the eccentric circle with the ruler positioned on the centre and on 5 degrees. And you will divide the remaining 360 days within the remaining eccentric circle and the degrees.

## [ ADDENDUM 2-2: TABULA ]

Bζ Bι(marg.) Bκ Dγ<sup>20</sup> Eδ Eζ Eμ Λε Λζ Μκ Μλ Οα Οξ Ου Ρο Τδ Vκ Wα Xα(later hand)

## TABULA AD SCIENDUM UBI SOL EST IN INITIO CUIUSLIBET MENSIS

MENSES	GRADUS	MINUTIAE	SIGNI
Martius:	16	53	Pisces
Aprilis:	17	36	Aries
60 Maius:	16	13	Taurus
Junius:	16	13	Gemini

56 Tabula ... mensis] Bκ Eζ Λζ Ρο; *om.* Bζ Dγ Eμ Μκ Οα Vκ Wα; *illeg.* Eδ; Tabula ad sciendum nomina mensium Μλ; Tabula loci solis in principio cuius mensis Bι(marg.); Tabula loci solis et punctus cuiuslibet 12 mensium et hec est ascensio solis in initio cuiuslibet mensis Λε Οξ Ου Τδ(*om.* cuiuslibet); *add. in marg.* unus modus locandi menses Λζ

57 Menses ... Signi] Initia dierum mensium signis gradus minutiae Bζ; *om.* Xα; gradus minutiae Eμ Μλ Μκ Οα; menses m. Dγ

58 Martius ... Pisces] Martius [*illeg.*] 53 [*illeg.*] Eδ; initium prime diei Martius Piscium 16 53 Eμ Μκ Οα; puncti prime diei Martius Pisces 16 53 Bζ; 16 Pisces Dγ 16 53] 16 52 Xα

59 Aprilis ... Aries] Aprilis [*illeg.*] 36 [*illeg.*] Eδ; initium prime diei Aprilis Arietis 17 36 Eμ Μκ Οα; puncti prime diei Aprilis Aries 17 35 Bζ; Aprilis 36 Dγ 17 36] 14 35 Bζ; 17 15 Λε Τδ; 17 35 Bζ Bι Eζ

60 Maius ... Taurus] Maius [*illeg.*] 35 [*illeg.*] Eδ; initium prime diei Maii Tauri 16 35 Eμ Μκ Οα; puncti prime diei Maius Taurus 16 13 Bζ; 16 Taurus Dγ 16 13] 16 15 Eζ Οξ; 16 25 Xα; 16 35 Bκ Μλ Οα Ρο

61 Junius ... Gemini] Junius 16 13 [*illeg.*] Eδ; initium prime diei Junii Geminorum 16 13 Eμ Μκ Οα; puncti prime diei Junii Gemini 16 47 Bζ; Junius 13 Dγ 16 13] 16 22 Xα; 16 31 Eζ; 16 47 Bι Λε Τδ Vκ Wα

<sup>20</sup> The table in Dγ is defective, giving only the month plus the minutes, or the degree plus the sign for alternating months. Presumably the scribe intended to insert the missing names and numbers in a different colour of ink, but neglected to do so.

## [ ADDENDUM 2-2: TABLE ]

TABLE: [TO KNOW WHERE THE SUN IS AT THE BEGINNING OF ANY MONTH]

MONTH <sup>21</sup>	DEGREE	MINUTE	SIGN <sup>22</sup>
March:	16	53	Pisces
April:	17	36	Aries
May:	16	13	Taurus
June:	16	13	Gemini

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<sup>21</sup> Compared to the true position of the sun (from the Tables of Toledo) at the beginning of each month for 1252 (and rounding off the seconds to the nearest minute), most of the values here are between 4 and 6 minutes greater. July is 3 minutes greater and August only 1 minute. (See Chabás and Goldstein, p. 85.)

May is 18 minutes less (but its value is suspicious since the degrees and minutes are the same as for June). It would be more in line with the other months if we were to read Taurus 16° 35' as in some variants.

March is 10 minutes less. There is no obvious explanation for this. [J.C.]

Samsó suggests that these dates also correspond to ca. 1132 (*On Both Sides*, p. 419).

<sup>22</sup> The difference between these positions and those which we would use today (about 6 or 7 days) results from the accumulation of errors in the Julian calendar.

	Julius:	14	47	Cancer
	Augustus:	14	27	Leo
	September:	14	35	Virgo
65	October:	14	12	Libra
	November:	15	20	Scorpio
	December:	15	51	Sagittarius
	Januarius:	17	28	Capricornus
	Februarius:	18	53	Aquarius

- 62 Julius ... Cancer] Julius 14 47 [*illeg.*] Eδ; initium prime diei Julii Cancrī 14 47 Eμ Mκ Oα; puncti prime diei Julii Cancrī 14 27 Bζ; 14 Cancer Dγ 14 47] 14 5 Lε Tδ; 14 27 Bι Vκ Wα Xα
- 63 Augustus ... Leo] Augustus 14 Eδ; initium prime diei Augusti Leonis 14 27 Eμ Mκ Oα; puncti prime diei Augusti Leonis 14 30 Bζ; Augustus 27 Dγ 14 27] 14 0 Bι Lε Oξ Oυ Tδ Vκ Wα
- 64 September ... Virgo] September 14 35 [*illeg.*] Eδ; initium prime diei Septembri Virginis 14 35 Eμ Mκ Oα; puncti prime diei Septembri Virginis 14 35 Bζ; 14 Virgo Dγ 14 35] 14 25 Mλ Wα
- 65 October ... Libra] October 14 22 [*illeg.*] Eδ; initium prime diei Octobri Libre 14 12 Eμ Mκ Oα; puncti prime diei Octobri Virginis 15 13 Bζ; October 12 Dγ 14 12] 14 13 Bι Lε Oξ Oυ Tδ Vκ
- 66 November ... Scorpio] November 15 20 [*illeg.*] Eδ; initium prime diei Novembri Scorpionis 15 20 Eμ Mκ Oα; puncti prime diei Novembri Scorpionis 15 30 Bζ; 15 Scorpio Dγ 15 20] 15 30 Bι Vκ Wα
- 67 December ... Sagittarius] December 15 51 [*illeg.*] Eδ; initium prime diei Decembri Sagittarii 15 51 Eμ Mκ Oα; puncti prime diei Decembri Sagittarii 17 52 Bζ; December 51 Dγ 15 51] 15 11 Wα; 15 45 Xα; 15 52 Bι Eζ Lε Oξ Oυ Tδ
- 68 Januarius ... Capricornus] Januarius 17 28 [*illeg.*] Eδ; initium prime diei Januarii Capricorni 17 28 Eμ Mκ Oα; puncti prime diei Januarii Capricorni 17 20 Bζ; 17 Capricornus Dγ 17 28] 17 24 Bι Lε Tδ; 15 34 Wα; 17 34 Vκ
- 69 Februarius ... Aquarius] Februarius 18 53 [*illeg.*] Eδ; initium prime diei Februarii Aquarii 18 53 Eμ Mκ Oα; puncti prime diei Februarii Aquarii 18 53 Bζ; Februarius 53 Dγ 18 53] 18 51 Eζ Vκ; 18 42 Xα

July:	14	47	Cancer
August:	14	27	Leo
September:	14	35	Virgo
October:	14	12	Libra
November:	15	20	Scorpio
December:	15	51	Sagittarius
January:	17	28	Capricornus
February:	18	53	Aquarius

[ FIGURA 2 ]

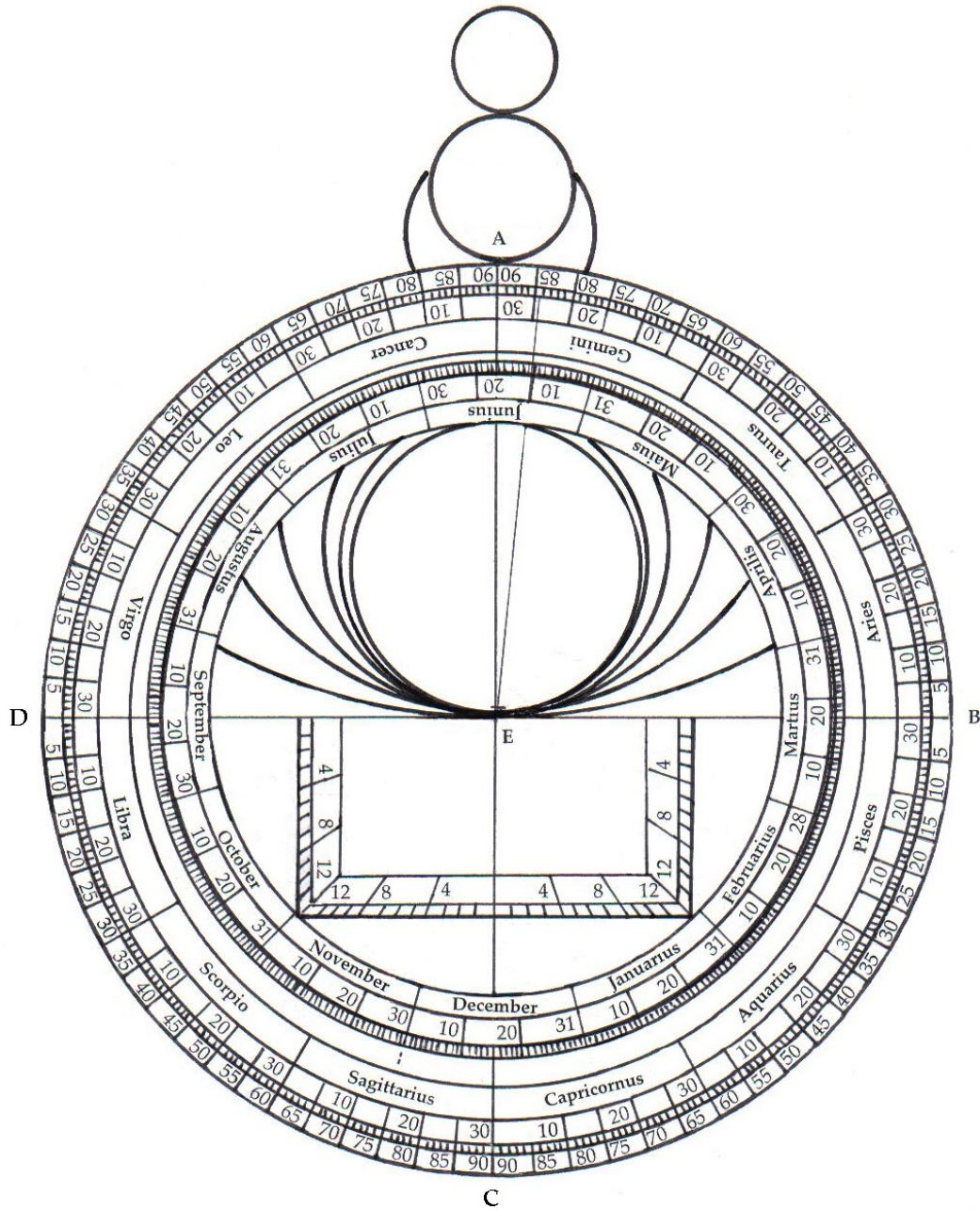


Figura dorsi astrolabii / Figure of the back of the astrolabe

[Complete diagram] Bγ Bε Bζ Bι Bκ Cη Cι Eβ Eμ Eο(fol. 185<sup>v</sup>) Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lζ  
 Lη Mη Mκ Mλ Mν(fol. 41<sup>r</sup>) Mo Ne Oz Ok Ot Ou Pa Pγ Pδ Pλ Pμ Po Pq Pt Pv Qβ Qγ Qδ Qλ Qμ

Rδ Rε Sδ Sθ Σκ Tδ Vκ Wβ<sup>23</sup> Wι

[*Partial diagram*] Bη Bθ Eα Ev Mθ Mu(*fol. 406'*) Nδ Oξ Rα Vι(*fol. 331''*) Xβ

[*Outline, or space only*] Aα Bα Cβ Cε Dγ Dη Eδ Eζ Eη Lβ Mδ Mφ Nα Oα Pν Pφ Qα Rβ Sβ

Uα Vβ Vε Vν Vσ Vχ Vψ Wα

[*No space*] Cδ Cζ Cθ Dβ Fδ Mγ Oη Oμ Oο Oπ Oσ Sι Sλ Vα Vπ Vυ Xα

Pθ: "B"

[*Caption*]

Figura dorsi astrolabii] Cη Cι Ev Eφ Fα Fβ Mη Oτ Pα Pρ Pυ Qβ Qγ Sδ Σκ; *om.* Bη Bθ Eα Eμ Eο Fζ Mθ Mκ Oζ Oκ Oξ Pγ Pδ Pλ Pτ Qδ Sθ Vι Wι; *illeg.* Bε; Dorsum Nδ; Dorsum astrolabii Bκ Lζ; Dorsum matris sive (*or vel*) posteria Bγ Mν Mo Po Vκ; Figura dorsi Lη; Figura dorsi astrolabii cum circulo mensium ecentrico qd' dī (= dorsum?) matris Rε; Figura dorsi astrolabii posterie Bζ; Figura dorsi astrolabii quod antenna<sup>24</sup> dicitur Eβ; Figura dorsi astrolabii quod posteria dicitur Bη Eτ Lγ Nε Rδ Wβ Xβ; Figura dorsi astrolabii quod posteria dicitur sive mater Qμ; Figura dorsi astrolabii scilicet posterie Mλ; Figura dorsi quod posteria dicitur Qλ; Figura dorsi sive matris astrolabii Oυ; Figura exterioris partis matris scilicet dorsi astrolabii B; Figura interioris partis matris id est ant(h)ene Lε Mυ Tδ; Figura interioris partis matris que posteria dicitur Pμ; Figura secundi capituli Bε; *add.* Dorsum astrolabii Pρ

ansa vel alhelka<sup>25</sup> Bκ Lζ armilla Qλ Oυ; armilla perforata Oτ; armilla reflexa Bγ Ev Lε Nε Pa Pμ Qβ Sδ Tδ; armilla rotunda Ev Lε Nδ Ne Pa Qβ Sδ Σκ Vκ; armilla suspensoria Bγ Bκ Lζ; reflexa Nδ Vκ dorsa Po Nota: quod cum quarta da accipitur altitudo solis atque stellarum Pρ

Sint astrolabium / horoscopus / astrolapsum / walzagora / horalogium idem Bκ

[*Lettering on the diagram*]

A] Bγ Bζ Bι Bκ Cη Eβ Eμ Eτ Ev Eφ Fα Fβ Fζ Lε Lζ Mη Mκ Mλ Mν Mo Nδ Ne Oκ Oτ Oυ Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qλ Qμ Re Sδ Sθ Σκ Tδ Vκ Wβ; *om.* Bε Cι Eο Lγ Lη Oζ Qδ Rδ Wι

<sup>B<sup>26</sup></sup> Bγ Bζ Bκ Cη Eβ Eμ Eτ Ev Eφ Fβ Fζ Lζ Lη Mη Mκ Mλ Mν Mo Nδ Ne Oτ Pa Pγ Pδ Pλ Po Pρ Pτ Pυ Qγ Qλ Qμ Re Sδ Sθ Tδ Vκ Wβ; *om.* Bε Bι Cι Eο Fα Lγ Lε Oζ Oυ Pμ Qβ Rδ Σκ Wι; *cut off* Qδ; D Oκ

C] Bγ Bζ Bι Bκ Cη Eβ Eμ Eτ Ev Eφ Fβ Fζ Lγ Lζ Mη Mκ Mo Nδ Ne Oκ Oτ Pa Pγ Pδ Pλ Po Pρ Pτ Pυ Qγ Qλ Re Sδ Sθ Tδ Vκ Wβ; *om.* Bε Cι Eο Fα Lε Lη Mν Oζ Oυ Pμ Qβ Rδ Σκ Wι; *cut off* Qδ Qμ

D] Bγ Bε Bζ Bι Bκ Cη Cι Eβ Eμ Eο Eτ Ev Eφ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mν Mo Nδ Ne Oζ Oκ Oτ Oυ Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Sθ Tδ Vκ Wβ; *om.* Bε Cι Eο Fα Lγ Lε Oζ Oυ Pμ Rδ Qβ Σκ Wι; B Oκ; *cut off* Mλ

E] Bι Cη Eβ Eμ Eτ Eφ Fα Fβ Fζ Lγ Mν Mo Nδ Ne Oκ Oτ Oυ Pa Pμ Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Wβ; *om.* Bγ Bε Bζ Bκ Cι Eο Ev Lε Lζ Lη Mη Mκ Mλ Oζ Pγ Pδ Pλ Po Rδ Sθ Vκ Wι

<sup>23</sup> In ms Wβ the orientation of the armillae, plus the word "meridies" is at about 11 o'clock on the diagram, because of a lack of space in the top margin.

<sup>24</sup> See Fig. 1, note 10.

<sup>25</sup> The Arabic word for "ring": *al-halqa* (الحلقة); in Latin: *armilla suspensoria* or *ansa*. See Kunitzsch, *Glossar*, no. 11, pp. 522-523.

<sup>26</sup> "B" and "occidens" may have been on the diagram at an earlier stage in some manuscripts, but could have been cut off either by rebinding or in the filming (e.g., Qδ).

*[Edge circle]*

D–A: *om.* Eo Mo Nδ; 10, 20, 30, ... 90 Bγ Cη Cι Eβ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lη Mη Mκ Mλ Mν Mυ Nε Oζ Oκ Pγ Pδ Πλ Pο Pρ Pυ Qβ Qγ Qλ Qμ Sδ Σκ Vι Wι; 5, 10, 15, ... 85, 90 Bζ Bθ Bι Bκ Eα Eμ Λε Λζ Oξ Oτ Oυ Πα Pμ Pτ Qδ Re Sθ Tδ Vκ Wβ; 5, 15, 25, ... 85 Bε; 5, 10, 15, ... 35 Rδ; 5, 10 | 90 Bη

B–A: *om.* Eo Mo Nδ Rδ; 10, 20, 30, ... 90 Bε Bγ Cη Cι Eβ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lη Mη Mκ Mλ Mν Mυ Nε Oζ Oκ Pγ Pδ Πλ Pο Pρ Pυ Qβ Qγ Qλ Qμ Sδ Vι Wι; 5, 10, 15, ... 85, 90 Bζ Bη Bθ Bι Bκ Eα Eμ Λε Λζ Oξ Oτ Oυ Πα Pμ Pτ Qδ Re Sθ Σκ Tδ Vκ Wβ

B–C: *om.* Eo Mo Nδ Rδ; 10, 20, 30, ... 90 Bγ Cη Cι Eβ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lη Mη Mκ Mλ Mν Mυ Nε Oζ Oκ Pγ Pδ Πλ Pο Pρ Pυ Qβ Qγ Qλ Qμ Sδ Vι Wι; 5, 10, 15, ... 85, 90 Bζ Bθ Bι Bκ Eα Eμ Λε Oξ Oτ Oυ Πα Pμ Pτ Qδ Re Sθ Σκ Tδ Vκ Wβ; 5, 15, 25, ... 85 Bε ; 5, 10 | 90 Bη; 5, 10, 15 | 90 Λζ

D–C: *om.* Eo Mo Nδ; 10, 20, 30, ... 90 Bγ Bε Cη Cι Eβ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lη Mη Mκ Mλ Mν Mυ Nε Oζ Oκ Pγ Pδ Πλ Pο Pρ Pυ Qβ Qγ Qλ Qμ Sδ Vι Wι; 5, 10, 15, ... 85, 90 Bζ Bθ Bι Bκ Eα Eμ Λε Oξ Oτ Oυ Πα Pμ Pτ Qδ Re Sθ Tδ Vκ Wβ; 5, 10, 15, ... 35 Rδ; 5, 10 | 90 Bη; 5, 10, 15 | 90 Λζ; 5, 15, 25, ... 55, 60, 65, ... 85, 90 Σκ

*[Circle of signs]*

*[Divisions] om.* Bε Eυ Mo Nδ Qδ; 10, 20, 30 (x 12) Bγ Bζ<sup>27</sup> Cι Eβ Eο Eτ Eφ Fα Fβ Fζ Lγ Lη Mκ Mλ Mν Mυ Nε Oζ (*om. Libra*) Oκ Pγ Pδ Πλ Pμ Pο Pρ Pυ Qγ Qλ Qμ Sδ Σκ Vι Wι; 5, 10, 15 ... 30 (x 12) Bθ Bι Bκ Eα Eμ Λε Λζ Oξ Oτ Oυ Πα Pτ Qβ Re Sθ Tδ Vκ Wβ; 15, 30 (x 12) Mη; 5, 10 ... 25, 30 Bη (*Aries, Taurus, Sagittarius, Capricorn only*) Rδ (*Virgo, Libra only*)

Aries, Taurus, Gemini ... Aquarius, Pisces Bγ Bε Bζ Bη Bθ Bι Bκ Cη Cι Eα Eβ Eτ Eυ Eφ Fα Fβ Fζ Lγ Λε Λζ Lη Mη Mκ Mλ Mν Mo Nε Oζ Oκ Oξ Oτ Oυ Πα Pγ Pδ Πλ Pμ Pρ Pτ Pυ Qβ Qγ Qδ Qμ Rδ Re Sδ Sθ Σκ Tδ Vκ Wβ Wι; *om.* Eo Nδ; [*zodiacal signs*] Ϟ ... ϙ Mυ Vι; *add.* [*zodiacal signs*] Ϟ ... ϙ Eμ; *numbered* 1, 2, 3 ... 12 Re

*[Circle of days]*

Januarius, Februarius ... November, December Bγ Bε Bζ Bι Bκ Cη Cι Eα Eβ Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Λε Λζ Lη Mη Mκ Mλ Mν Mo Nε Oζ Oκ Oτ Oυ Πα Pγ Pδ Πλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Σκ Tδ Vκ Wβ Wι; December ... March Bη; *om.* Bθ Eo Mυ Nδ Oξ Sθ Vι

10, 20, 30 | 10, 20, 31 | 10, 20, 28 *etc.* Bγ Bζ Bι Cη Cι Eα Eβ Eο Eτ Eφ Fα Fβ Fζ Lγ Λε Lη Mη Mκ Mλ Mo Nε Oυ Πα Pγ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Sδ Σκ Tδ Wι; 5, 10 ... 30 | 5, 10 ... 31 | 5, 10 ... 28 Eμ Λε Oτ Re Wβ; 10, 20, 30 | 10, 20, 31 | 7, 14, 21, 28 Eο; 10, 20, 30 (x 12) Bκ Mν; 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30 31 Oκ; 5, 10, 15, 20, 31 (*December only*) Bη; *om.* Bε Bθ Eυ Mυ Nδ Oξ Πλ Rδ Sθ Vι

*[Other information]*

*at A add. meridies] om.* Bε Bζ Bι Bκ Cη Cι Eμ Eο Fα Fβ Lγ Λε Mκ Mλ Nδ Oκ Pγ Pτ Qγ Rδ Sδ Tδ Wι  
*at B add. occidentis] om.* Bε Bζ Bι Bκ Cη Cι Eμ Eο Fα Fβ Lγ Λε Oκ Oυ Pγ Pμ Pτ Qβ Qγ Sδ Tδ Wι  
*at C add. septentrio] om.* Bε Bζ Bι Bκ Cη Cι Eμ Eο Fα Fβ Lγ Λε Lη Mλ Mν Oκ Πα Pγ Pμ Pτ Qβ Qγ Sδ Tδ Wι  
*at D add. oriens] om.* Bε Bζ Bι Bκ Cη Cι Eμ Eο Fα Fβ Lγ Λε Mλ Oκ Oυ Πα Pγ Pμ Pτ Qβ Qγ Sδ Tδ Wι

<sup>27</sup> In Bζ the names of the signs and the division into 30 degrees do not always line up with each other or to the division into 90 along the outside.



[Shadow square]

Shadow square below diameter; unequal hour-line arcs above] Bγ Bε Cι Eο Eτ Eυ Eφ Fβ Lη Mη Mκ Mν  
Nδ Oζ Oτ Pα Pγ Pδ Pλ Pρ Qβ Qδ Qλ Rε Sκ

Shadow square below diameter; unequal hour-line arcs below] Cη Eβ Fζ Eφ Lγ Lε Nε Oυ Pμ Qγ Qμ Rδ  
Sδ Sθ(right half only) Tδ Wβ Xβ

Shadow square below diameter; no unequal hour-line arcs] Bζ Bη Bθ Bι Bκ Fα Lζ Mθ Mλ Mo Po Pτ Pυ  
Vι Vκ Wι

No shadow square; no unequal hour-line arcs] Eα Mυ Oξ

Right half of shadow square only; no unequal hour-line arcs] Eμ Oκ

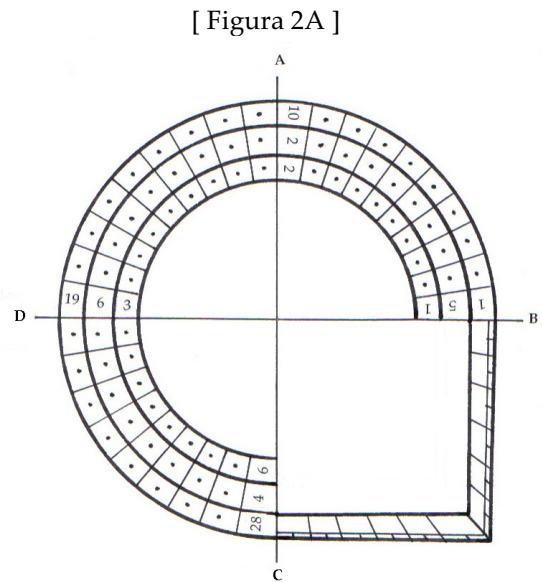
add. extensa<sup>28</sup> | extensa Fζ; add. figura tertii capituli Bε; add. quodlibet illorum latus debet esse  
divisus in 12 puncta et 4 et tria per minuto punctorum Bε; add. umbra versa | umbra recta |  
umbra recta | umbra recta Qμ; add. versa | recta | umbra recta | umbra versa Eβ; add. versa |  
umbra recta sive extensa | versa Pρ;

shadow square numbering] 4 8 12 | 12 8 4 | 4 8 12 | 12 8 4 Cη Eβ Eυ Fα Fβ Fζ Lγ Lε Lη Mη Mλ Mo  
Nε Oζ Oτ Oυ Pα Pδ Pλ Pμ Pρ Qβ Qγ Qλ Qμ Sδ Sκ Tδ Vκ; – | – | 4 8 12 | 12 8 4 Nδ; 3 6 9 12 | 12 9  
6 3 | 3 6 9 12 | 12 9 6 3 Bγ Bι Cι Eτ Eφ Mκ Mν Oκ Pγ Po Pυ Rδ; 2 4 6 8 10 12 | 12 10 8 6 4 2 | 2 4 6  
8 10 12 | 12 10 8 6 4 2 Bκ Eμ Lζ Rε; 2 4 6 8 10 12 | 12 10 8 6 4 | 4 6 8 10 12 | 12 10 8 6 4 2 Bη Pτ Qδ  
Wβ; 2 6 9 12 | 12 9 6 2 | 2 6 9 12 | 12 9 6 2 Wι; 3 6 9 12 | 12 9 6 3 | 4 8 12 | 12 9 6 3 Bε; 2 4 6 8 10 12  
| 12 10 8 6 4 Eμ; om. Bζ Bθ Eο Mυ Oξ Sθ Vι

hour circles numbered] 1 ... 12 Eυ Pγ; 6 ... 1 | 1... 6 Qδ

Eμ] 4 concentric arcs (3/4 circles) in the upper quadrants and lower left quadrant (BADC). Arcs divided  
into 10 sectors (BA) and 9 sectors (AD, DC); boxes filled with 3 series of numbers (see Figure 2A).

1	5	1	15	1	3
2	6	2	16	3	6
3	7	3	17	4	1
4	2	6	18	5	2
5	3	1	19	6	3
6	4	2			
7	5	3	20	1	6
8	7	6	21	2	1
9	1	1	22	3	2
10	2	2	23	4	3
			24	6	6
11	3	3	25	7	1
12	5	6	26	1	2
13	6	1	27	2	3
14	7	2	28	4	6



<sup>28</sup> The umbra recta is referred to as the umbra extensa in the Practica, Cap. 42.

## [CAPITULUM 3.] SCIENTIA IMPOSITIONIS QUADRANTIS UMBRE

5 Cum volueris ponere quadrantem umbre, iunge cuspidem circuli signorum per lineam subtilem et occultam, que vadit per medium quarte occidentalis et septentrionalis equaliter, cuius finis erit circulus mensium. Postea produces ex fine eius duas lineas ad summitatem tabule, et erit quadrans erectis angulis. Deinde facies

- 1 Scientia ... umbre] *om.* Bα Bζ Bη Bι Bκ Cδ Cε Cη Dβ Dγ Eα Eφ Fδ Lζ Mγ Mδ Mν Nα Oα Oη Oξ Oο Pγ Pυ Pφ Qδ Rα Rβ Rε Sβ Sθ St Uα Vα Vε Vκ Vυ Vχ Wβ Xα Xβ; *illeg.* Eδ Eο; De compositione quadrantis Pτ Sκ; De compositione(*corr. from* compositio) quadrantis scilicet umbre in astrolabio Vβ; De compositione quadrantis umbre Pλ Vν; De figuratione quadrantis id est scale altimetre Fα; De impositione quadrantis Dη; De impositione umbre quadrantis c. iii PQ; De inscriptione quadrantis umbre Mο; De positione quadrantis in dorso astrolabii Mθ Oκ; De quadrante Bγ(*marg., later hand*) Cι Eζ(*marg.*) Nε Pθ Po(*marg.*) Qμ Rδ(*add. etc.*) Vψ; De quadrante faciende Wι; De quadrante umbre Qα(*marg.*); De quadrantis compositione Pδ; De quadrantis ordinatione Aα Bθ Mη Vπ(*add. Rubrica*); De quadrantis ordinatione et compositione Eυ; De scientie impositionis quadrantis umbre Fβ; Capitulum 3 De scientia impositionis umbre quadrantis Bε; Opus quadrantis umbre sic est Qα; Opus vel compositio quadrantis umbre Oσ(*later hand*); Opus vel positio quadraturis umbrae Oμ; Opus vel positio quadrantis umbre Cζ(*marg.*) Eμ(*marg.*) Eν Mκ Mλ Oπ Sλ Vσ; Post sequitur positio quadrantis umbre Cβ Cθ; Scala altimeri Eτ; Scientia positionis quadrantis umbre Mν(*diff. hand*) Mφ Vι Scientia] *add.* inventionis et Nδ
- 2 *before* Cum *add.* 3 Bε Cum] *add.* scire Nα Cum ... umbre *om.* Qα ponere] componere Dβ Fδ Mγ Mν Nα Nν Pφ Rε St umbre] *libre corr. to* umbre Wβ; uni hore Nα iunge] *om.* Oμ; *add. interlin.* punctum medium in illa quarta Sλ cuspidem] punctum medium in illa quarta cuspidi Cδ; *add.* umbre iuge cuspidem Tδ signorum] singulorum Vπ
- 3 et occultam] *om.* Bα Dβ Fδ Mγ Rε Vν quarte] *om.* Sκ
- 4 equaliter] *om.* Cζ Eμ Oη; equalitaris(!) Vψ; qualiter Rα equaliter cuius] reliquis Mθ mensium] *om.* Fα; *add.* De quadrante umbre Mγ Postea] Post hoc *some* produces] educes Cθ Oπ
- 5 eius] scilicet ipsis quadrantis Bζ duas] 2 or ii. *some* lineas] *om.* Nα; *add. in marg.* scilicet diametri equidistantes Sλ; *add.* Eo fol. 184<sup>va</sup> line 38 – fol. 184<sup>vb</sup> line 7 summitatem] *asumitate* Eδ; *divisitate* Eα; *summitates* Dγ Mν Oσ Vβ(*gloss*); *add. in marg.* id est ad duas dyametrias Qμ tabule] *om.* Oμ; *add.* id est ad 2 dyametria quartam secantia quam quartam actor hic supponit esse tabulam Qβ Sδ erit] *add.* circulum mensium. Postea produces ex fine eius duas ad summitatem tabule et erit Nα erectis] *om.* Vκ; *erectis* tabulis Oκ; *ex erectis* Bα Cδ Cι Sθ; *exerectis* Mν; *erectis or* *ex rectis* Bζ Cε Dη Dβ Eα Eβ Eη Eο Fα Fβ Fδ Lβ Lγ Lε Lη Mγ Mδ Mφ Mν Nα Nδ Nε Oα Oζ Oξ Oο Oσ Oτ Oυ Pα Pγ Pθ Pλ Pμ Pν Pρ Pτ Qβ Qγ Qδ Qλ Rβ Rδ ε Sδ Tδ Vβ Vι Vν Vσ Vυ Vψ Wα Xβ facies] *facias many*
- 5-6 Deinde ... puncta] *om.* Vε

## [CHAPTER 3.] THE METHOD OF THE ENGRAVING OF THE SHADOW SQUARE

When you wish to include a shadow square<sup>1</sup> [on the back], join the centre of the circle of signs with a faint and hidden line which passes equally through the middle of the north-west quarter, whose end will be the circle of months. Next you will draw from its end two lines to the [radii]<sup>2</sup> of the tabula, and there will be a right-angled quadrilateral. Then,

---

<sup>1</sup> The shadow square and hour lines are similar to what was found on the *quadrans vetus*.

<sup>2</sup> Not the normal meaning for “*summitatem*”, but the only one which makes sense.

post ipsas duas lineas, alteras duas prope eas, inter quas erunt puncta. Item facies duas lineas istis latiores inter quas erunt littere, et divides spacia que sunt inter eas lineas ex utraque parte per 6 divisiones ad litteras. Spacium vero quod est strictius divides per

- 6 post] postquam Bθ Vπ post ipsas] *om.* Cζ ipsas] illas Rε duas<sub>1</sub>] *om.* Wβ; *crossed out* Qμ; *add.* ita quod utraque unam parvam Bζ lineas] litteras *corr.* to lineas Mθ alteras] *om.* Eδ Oπ Vι Vκ; alias Bη Dβ Fδ Oμ Rε; alteras [*illeg.*] Rδ duas<sub>2</sub>] 2 *some; om.* Bγ Bζ Bη Cδ Cη Cι Dβ Eδ Eμ Eφ Fα Fδ Mθ Mκ Mo Nα Oκ Oο Oπ Pγ Pτ Pυ Qα Rε Sκ Sλ Uα Vα Vκ Vν Vσ Vυ Vψ Wι Xα Xβ; *add. interlin.* duas scilicet lineas Vβ; *add.* lineas Bι Bκ Cβ Cθ Eα Eζ Ev Eο Lζ Mλ Mν Oα Oμ Oσ Pγ Po Pφ Sβ Sλ(*interlin.*) Vχ prope ... duas<sub>3</sub>] *om.* Dγ eas] signas Cζ erunt] 12 Vσ; *add.* 12 Cδ Mκ(*marg.*) puncta] puncti *many*<sup>3</sup>; spacia Oξ facies] facias *some; add.* alias Bγ Cη Dη Eφ; *add.* alteras Vκ duas<sub>3</sub>] *om.* Bα Bη Cζ Eμ Mθ Mν Oκ Oμ Vα; *interlin.* Sλ; 2 *some*; 3 Lγ
- 6-7 ipsas ... latiores] *marg.* Bη alteras ... lineas<sub>1</sub>] *om.* Mφ Mυ Oη Vι; *marg.* Rα erunt .... quas] *marg.* Pρ puncta ... erunt] *om.* Wβ duas lineas] *marg.* Sθ
- 7 lineas<sub>1</sub>] litteras *corr.* to lineas Mθ istis] *om.* Bγ Cη Eφ Oμ Sι Sκ; istas Fζ latiores] *om.* Sκ; *corr. from* lineas Sθ erunt] *marg.* Rα littere] linee Mo Vα; numerorum Cζ spacia] *ms* Dβ *ends* sunt] *om.* Bζ eas] *om.* Cβ Cθ Ev Oπ Qα; duas Bα Cδ Cζ Eμ Fδ Mγ Mθ Mκ Mν Oα Oη Oκ Oμ Oο Oσ Pφ Sθ Sι Sλ Vα Vν Vσ Vυ; duas illas Rε; has Bγ Bη Cη Wβ; illas Fβ; istas Cε; *add.* et Bζ lineas<sub>2</sub>] <sup>4</sup> *om.* Mυ Mφ Uα Vι Wα; *illeg.* Cε; litteras Aα Bα Bε Bη Bθ Bι Cδ Cζ Cθ Cι Dγ Dη Eα Eβ Eδ Eζ Eη Ev Eφ Ev Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Nα Oζ Oμ Oξ Oπ Oτ Oυ Pα Pγ Pδ Pθ Pλ Pμ Pν Po Pρ Pτ Pυ Qα Qβ Qγ Qδ Qλ Rα Rβ Rδ Sδ Tδ Vα Vβ Vε Vπ Vχ Vψ Wβ Wι Xα Xβ; litteras *corr. in marg.* to lineas Sλ
- 8 parte] *om.* Aα Pα; *interlin.* Rε; *add.* quadrantis Mθ Oκ; *add.* scilicet quadrantis Cζ Mκ(*interlin.*) Oη ad litteras] *om.* Bε Eα Eβ Eη Fβ Fζ Lβ Lγ Lε Mδ Mυ Mφ Nδ Oζ Oξ Oυ Pα Pλ Pν Pρ Qβ Qγ Qδ Rβ Sδ Tδ Vι Wα Xβ; alias Mθ Oκ vero] sic Nε quod] *marg.* Rα strictius] subterius Bα Cδ Eη Eμ Fδ Mθ Mκ Mν Oκ Oο Oσ Pφ Qα Sθ Sι Vα Vν Vσ Vυ; subterius strictius Bζ; superius Mγ Oα Oη; inter utroque latere superius Cζ

<sup>3</sup> Some scribes treat “point” (*punctum*, -i [n]) as masculine (*punctus*, -i) although the true masculine form is *punctus*, -us (Pliny) meaning a pricking or puncturing. One *ms* (Qβ) even has “*puncta*” with “*al’ puncti*” inserted above.

<sup>4</sup> Even though the majority of manuscripts have “*litteras*,” the meaning of the section requires the reading “*lineas*.” The abbreviations for both words are very similar and can easily be mistaken, one for the other.

after these two lines, you will make another two near to these, between which will be the points. And likewise make two [other] lines further apart than these between which will be the numerals, and divide the spaces which are between these lines on both sides into 6 divisions for the numerals. However, divide the space which is narrower into

- 10 12 secundum numerum punctorum ad unamquamque litteram 2 punctos; et incipies scribere ex diametris. Et si vis in astrolabio duos quadrantes facias in alia quarta septentrionali et orientali, scilicet que est iuxta eam, similiter.<sup>5</sup>
- Potes etiam inter quadrantes duos eosdem inferiores infra circulum mensium constituere lineas horarias, ut fit in quadrante, per quas etiam habebis horas diei naturales in dorso.
- 9 12] 2 Cι<sup>6</sup>; 13 Mδ Sα Sι; 13 *corr. to* 12 Aα punctorum] *om.* Lβ litteram] *om.* Nδ; lineam Mφ Nα Oα Sι Vυ; *corr. to* lineam Mθ; *add.* scilicet Bε Cβ Cδ Cε Cζ Cθ Dη Ev Mθ Mκ Mν Oα Oη Ok Oμ Oπ Oσ Qα Sι Vα Vσ Vυ Vχ 2] duos *many*; *add.* scilicet Aα Bθ Dγ Eμ Eo Ev Lζ Sθ Uα Vβ(*interlin.*) Vε Vκ Vπ punctos] *add.* scilicet Cι Eδ Eζ Eτ Mη Mλ Mo Nα Pγ Po Pτ Qδ Qμ Rα Rβ Re Sβ Sκ Sλ Vι Wι Xα
- 10 diametris] diametro Pτ; *add.* astrolabii Vσ; *add.* dividentes omnes circulos Qα vis] volueris Aα Bζ Bθ Cδ Cζ Cθ Eμ Ev Eo Ev Fδ Mγ Mθ Mκ Mν Oα Oη Ok Oμ Oo Oπ Oσ Pφ Qα Sθ Vα Vβ Vε Vν Vπ Vσ Vυ Vχ; volueris habere Sλ in astrolabio] *om.* Cδ Qα; in astralabio Lε quadrantes] *add.* facere Bε(*marg.*) Bζ Cβ(*interlin.*) Mλ; *add.* componere Qα; *add.* habere Cδ Eμ(*interlin.*) Mκ(*interlin.*) Oη Pφ Sθ(*marg.*) Vσ facias] facies Fζ alia] hac Nδ quarta] ·8· ·4· Nε
- 10-12 duos ... duos] Bε(*marg.*) quadrantes ... duos] *om.* Eη
- 10-15 Et ... astrolabii] *om.* Bα
- 11 et orientali] *om.* Aα Fa et orientali scilicet] scilicet et orientali *some* Bγ Cη orientali] occidentalis Dγ scilicet] *om.* Bε similiter] *om.* Aα Pθ Vε; *add.* De allida comuni. Cum vis facere (*i.e., beginning of Cap. 4*) Wι
- 12 quadrantes duos] duos quadrantes duos Wβ duos] *om.* Fζ; et Mδ eosdem] eiusdem Pν; eodem Nε inferiores *om.* Bα Bζ Bη Cε Cη Dη Wβ; interiores Mη Qδ infra *om.* Dη
- 12-14 Potes ... dorso] *om.* Aα Bα Bθ Bι Bκ Cβ Cδ Cζ Cθ Dγ Eδ Ev Eμ Ev Eo Ev Fδ Lζ Mγ Mθ Mκ Mλ Mν Nα Oα Oη Ok Oμ Oo Oπ Oσ Pγ Pυ Qα Rα Re Sβ Sθ Sλ Sι Vα Vε Vκ Vν Vπ Vσ Vυ Vχ Xα; *in marg.* Po; *in marg. and add.* ut patet in figuris suprahabbitis Bζ; *add. in marg.* "Potes etc." aliqui habent istam litteram pro extenea(?) Vβ
- 13 lineas] sex litteras Qδ Rβ ut fit in] *om.* Eη fit] sic/sit Sκ habebis] *om.* Bγ Bζ Cε Eφ diei] *om.* Eτ Pτ Qμ Sκ
- 14 naturales in dorso] *om.* Wι dorso] *add.* astrolabii Dη Eα Nε; *add.* ut apparet in figura Cε Vβ; *add.* Et hec est figura dorsi Pφ

<sup>5</sup> Scribes were unsure of which phrase was being modified by "similiter" and many use it to begin the next sentence ("Potes etiam ...").

<sup>6</sup> There is a tear in ms Cι at this point, but it does appear that the scribe wrote ".2." rather than ".12."

12 according to the number of points, with two points to each numeral; and you will begin to write these [i.e., the numerals] from the diameters. And if you want two [shadow] squares in the astrolabe, you should make [the second] in a similar way in the other north-east quarter, which is next to it.

And within the same two lower squares inside the circle of the months you will be able to construct the hour lines as is done on a quadrant, through which you will also have the natural hours<sup>7</sup> of the day on the back.<sup>8</sup>

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<sup>7</sup> These are the “unequal” hours which vary according to the length of daylight during the year.

<sup>8</sup> The text suggests that the shadow square(s) be constructed above the horizontal diameter of the astrolabe; or alternatively that they be below that line. Depending on where the unequal hour lines have been engraved, the shadow square could be superimposed on the hour lines. The diagrams of the back vary in this respect (see Figura 2).

15 Et hoc est figura<sup>9</sup> dorsi astrolabii.

15 Et ... astrolabii] *om.* Βκ Cδ Nε Χα; *before ll. 12-14* Ετ Μη Μο Ρτ Ρφ Qδ Qμ Rβ Uα Vβ; Et figura patet proxima etc. Rδ; Et superior est figura astrolabii Nα; ut apparet in figura superiori A septentrionali scilicet orientali qui est iuxta eam similiter Wβ; ut patet in figuris suprahabitis Bγ Cη Εφ; ut patet in figura Βη Dη Et hoc] que Cι dorsi] *om.* Οπ astrolabii] *add.* in precedente pagina Cζ; *add.* quod(quam Mγ) queres in fine Fδ Mγ; *add.* que sequitur in figura latere Eν

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<sup>9</sup> See Figura 2.



And this is the drawing of the back of the astrolabe [Figure 2].

## [CAPITULUM 4.] DE COMPOSITIONE ALLIDADE COMMUNIS, QUE ETIAM REGULA DICITUR

Cum volueris facere allidadam, id est regulam que ponitur supra dorsum astrolabii, fac tabulam angustam in similitudinem regule, cuius longitudo sit ut longitudo tabule et plus per eam quantitatem qua possint abscindi due tabule perforate

- 1 De ... dicitur] *om.* Bα Bε Bζ Bι Bκ Cε Cδ Dγ Eα Eο Lζ Mγ Nα Oα Oη Oο Pγ Po Pφ Rα Sβ Sθ Sι Uα Vα Vε Vυ Xα; *diff. hand* Mυ; *add.* Capitulum Rubrica Qβ; Compositio allidade Vκ; De alidada Rε; De allida communi Wι; De allidada communi Cι Eτ Pθ Pδ Qμ Rδ(*add.* etc.) Sκ Vψ; De allidada componenda Mν; De allidada facienda que regula vel mediclinium dicitur Cη; De allidada id est regula dorsi astrolabii Mλ; De allidada Rubrica Eδ; De allidade sive regula Qα(*marg.*); De allidada vel mediclinio vel linea fiducie Bγ(*later hand*); De compositione allidade communis Fβ Pq(*add.* C. iiiii); De compositione allidade communis sive regule Eφ Xβ(*sive*) id est; De compositione allidade duplicis Aα Bθ Mη Pυ Vπ(*add.* Rubrica); De compositione allidade sive mediclinii communis Pτ; De compositione allidade sive mediclinii id est regule Vβ; De figuracione allidade Fα; De opere regule Cβ Vσ; De ordinatione alidade communis que regula dicitur Lβ; De positione allidade duplicis Eυ; De quadrante Nε; De scientia regule Fδ Vν; Opus haludad' Sλ(*add. in marg. reg<sup>e</sup>*); Opus regule Cβ Cζ Cθ Eμ(*marg.*) Eν Mθ Mκ Oκ Oμ Oπ Oσ(*later hand*) Vχ; Sequitur compositione [*illeg.*] Eζ; Sequitur *before* De] *add.* Sequitur Pν; *add. 2-line gloss* Cζ; *add. marg. gloss* Cζ *etiam*] et Nδ
- 2 *before* Cum *add.* 4 Bε Cum] Si Mγ Oο Sι Vν; *add.* autem Bκ volueris] vis *many* facere] finire Vε; *add. Cap. 3, ll. 12-14, rep.* Cum vis facere Wι allidadam] a dadam Vα; allhadam Fδ; alidadam Rε; alydadam Rβ; hallidadam Sλ; hallidadam Cδ; *add.* communem Bε id est] *om.* Nδ; ad Nα; que est Rε; scilicet Cδ Pq id est regulam] *om.* Tδ; id est regula Dγ; que est regula Aα Bα Bθ Cβ Cε Cθ Dη Eν Eο Eυ Fδ Mγ Mθ Mκ Mλ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pλ Pφ Qα Sι Vα Vβ Vε Vν Vπ Vσ Vυ Vχ; que est regulam Bζ Cζ Eμ; que est tabula Mν ponitur] componitur Qα supra] super *many* astrolabii] *om.* Bα
- 3 fac] *om.* Sι; facies Aα Bα Bζ Bη Bθ Cβ Cδ Cζ Cη Cθ Dγ Eζ Eμ Eν Eο Eυ Fβ Fδ Mγ Mθ Mκ Mλ Oα Oη Oκ Oμ Oο Oπ Oσ Pα Pφ Qα Qβ Qγ Qδ Rβ Rε Sδ Sθ Sλ Vα Vβ Vε Vν Vπ Vυ Vχ angustam] *add. interlin.* ex utraque parte equalem Mγ in similitudinem] *twice* Tδ similtudinem] similtudine *some* regule] *om.* Bθ Eυ sit] *om.* Mφ Vι ut] *om.* Bα Cδ Cζ Eμ Fδ Mγ Mθ Mν Oκ Oο Pα Sι Sλ Vν; *interlin.* Sθ; sicut Bγ Bη Cη Mκ(*interlin.*) Qα Vσ Wβ
- 3-4 sit ut longitudo] *om.* Oη Vα ut ... plus] longior diametro Qα
- 4 longitudo] latitudo Cδ Sλ; *add.* vel latitudo Pδ tabule<sub>1</sub>] *add.* dorsi Aα Bε Cι Eα Eβ Eη Eυ Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mκ(*interlin.*) Mo Mν Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qγ Qδ Qλ Rβ Sδ Tδ Vι Vσ Vψ Wα Xβ; *add.* dorsi astrolabii Vπ; *add.* scilicet matris Eμ(*interlin.*) Eφ(*interlin.*) Oη Vβ(*interlin.*); *add.* matris Mθ Oκ et ... tabule<sub>2</sub>] *om.* Mλ plus] *om.* Vν; prius Rδ; *add.* scilicet Bα per] *secundum* Qδ Rβ eam] eandem Vψ; *add.* quam Sβ possint] possent Sι; possit Vψ; possunt Rδ abscindi] *om.* Oο; *add.* ab ea Fβ due] 2 *many*; *om.* Bζ; et Aα Eυ

[CHAPTER 4.] ON THE FABRICATION OF THE COMMON ALIDADE, WHICH IS ALSO CALLED THE  
RULE

When you wish to make the alidade,<sup>1</sup> that is, the rule which is placed on the back of the astrolabe, prepare a narrow strip like a ruler whose length should be as the width of the back of the disk and more according to that amount from which two perforated vanes can be cut<sup>2</sup>

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<sup>1</sup> The alidade (Arabic: *al-ʿiḍāda*, العَضَادَة; Latin: *allidada*) is a ruler which rotates around the centre of the astrolabe. It has two sighting vanes and together with the rule it is used to read the altitude of the sun and of other stars. See Kunitzsch, *Glossar*, no. 19, pp. 527-528.

<sup>2</sup> Or, “as much more as is required to allow the cutting off of two perforated vanes ....”

- 5 ad accipiendum altitudinem. Et lineabis illam regulam per medium (id est facies in ea lineam bene apparentem dividens eam per medium) in longitudinem et postquam lineaveris ipsam, abscindes de ipsa quantum sufficit ad agendum duas tabulas predictas, et remaneat postea secundum longitudinem tabule vel prope aut paulominus,
- 5 ad] *om.* Cζ accipiendum] accipienda Vσ; accipiendam<sup>3</sup> Aα Bε Cζ Eμ Eο Fδ Mθ Mλ Mν Oη Oκ Vα Vβ Vν Vπ; capiendam Bζ Nδ Oσ Vχ; sciendum Fα altitudinem] latitudinem Eη Xβ; *add.* soli et stellarum. Bα(*marg.*); *add.* soli et stellis Oη illam regulam] eam Aα Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Fδ Mγ Mθ Mκ Mλ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pφ Qα Re Sι Sλ Vα Vβ Vε Vν Vσ Vυ Vχ; eam regulam Bθ Eο Ev Vπ; illam lineam Qβ; istam regulam Bε Nα Vψ; illam quantum *corr. to* illum Pq; *add. interlin.* scilicet regulam Vβ medium] *add.* in longitudine Bζ id est facies] faciens Sι
- 5-6 id est ... medium] *om.* Aα Bα Bγ Bε Bη Bθ Bι Bκ Cε Cη Cι Dγ Dη Eα Eβ Eδ Eζ Eη Ev Eο Eτ Eφ Ev Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mη Mo Mυ Mφ Nα Nδ Nε Oζ Oξ Oπ Oτ Oυ Pα Pγ Pδ Pθ Pλ Pμ Pν Po Pq Pv Qα Qβ Qγ Qδ Qλ Qμ Rα Rβ Rδ Re Sβ Sδ Sκ Tδ Uα Vβ Vε Vι Vκ Vπ Vψ Wα Wβ Wι Xα Xβ
- 6 bene] *om.* Oη Pφ dividens] dimidium Cβ Eμ; dividendo Vχ; divides Mλ Oα Oη Oο Oσ Vν; dividetis Oκ; que dividat Cδ Sλ Vσ in] secundum eius Dη longitudinem] *add.* dierum Pα
- 6-7 et ... ipsam] post Bα postquam ... ipsam] *om.* Qα
- 7 lineaveris ipsam] regulaveris eam Bζ Cβ Cδ Cθ Eμ Ev Fδ Mγ Mκ Oα Oμ Oπ Oσ Pφ Sθ Sι Sλ Vν Vυ Vχ ipsam] eam *some* abscindes] abscinde *many*; abscindens Oη Vβ Vσ de ipsa] ipsam Bγ Bη Cη Eφ ipsam in Bγ ipsa] ea *some* sufficit] *om.* Sι; sufficiente Vα ad agendum] adendum Eζ agendum] *om.* Qα; augendum Pδ; faciendum Bε Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mυ Mφ Nδ Oζ Oξ Oτ Oυ Pα Pλ Pμ Pν Pq Qβ Qλ Qγ Re Sδ Tδ Vι Wα Xβ; habendum Vχ; tingendum Nα duas] *om.* Bα; 2 *many*
- 8 predictas] *add.* cum dentulos [*superscr.* pinnulas] Cδ; *add.* sive dentulos Sλ remaneat] *om.* Fα; *del.* Pq; maneat Aα Bγ Bθ Bι Cη Cι Dγ Eδ Eζ Eο Eτ Ev Eφ Lζ Mη Mλ Mo Pγ Pδ Po Pτ Pv Qδ Rα Rβ Uα Vβ Vε Vκ Vπ Vψ Wβ Wι Xα; re- *superscr.* Bη postea] *om.* Bα; post modo Eδ; *add.* scilicet de regula Cζ Oη longitudinem] *om.* Wι; *add.* diametri Cβ(*marg.*) Cδ Ev Mκ(*marg.*) Oμ Sι Vχ(*interlin.*) Vσ tabule] tabulam Nδ; diametri dorsi Qα; *add.* ipsius Oα Oυ; *add.* matris Eφ Mκ(*interlin.*); *add.* scilicet matris Cζ Eμ(*interlin.*) vel] *om.* *many* vel prope] predicte Pτ prope] fere Bα aut] autem Fβ; et *many*; vel Bι Dη Qδ Rβ Re
- 8-9 aut ... pannis] *om.* Qα

<sup>3</sup> To agree with “*altitudinem*”.

for taking the altitude [of the sun and the stars]. You will draw a line on it along its middle lengthwise (that is, make a very visible line on it which divides it along the middle), and after you have drawn it, you will cut off from it as much as is needed for making the two aforesaid vanes; and afterwards there should remain [a length] of about the dimension of the disk, either nearly or a little less,

- 10 ne accipiatur in pannis. Postea divides eam per medium certissime in duas partes, et pones in medio eius notam super quam erit apertio axis. Deinde abscindes dimidium regule ex una parte, secundum quod notavi tibi, et abscindes eam ex alia parte econtrario; et servabis lineam que est in medio eius que vadit per axem dum
- 9 ne] *om.* Mη Vι Vψ; ut Oο accipiatur] accipiat Aα Bι Bγ Bθ Cβ Cε Cη Cι Dγ Eδ Eζ Ev Eο Eτ Ev Eφ Fβ Lζ Mλ Nα Oμ Oπ Pγ Pδ Pθ Pο Pρ Pτ Pυ Qδ Rα Uα Vβ Vκ Vπ Wβ Xα Xβ; accipiant Rβ Vχ; accipias Vε; habeat Mδ Nδ; *add.* vel adhereat Bγ Bη Cη Eφ Po(*marg.*) Qγ Wβ; *add.* vel hereat Bε Bι Eα Eη Fα Fβ Lβ Lε Lη Mφ Mυ Oζ Oξ Oτ Pα Pλ Pν Pρ Qγ Qλ Vι Wα accipiatur in] hereat (*add. in marg.* alter accipiatur in pannis) Oυ in pannis] se vestibus Fβ; *add.* id est vestibus Eφ(*interlin.*) Vβ(*interlin.*); *add.* vel ne panno inhereat Tδ; *add.* Si ne fuerit allidade longior quam longitudinem matris extremitatis eius capiantur vel(scilicet Eμ) retineantur in pannis tuis cum volueris astrolabium alenare(ellenara Cζ = allinare) aut demittere Cζ Eμ(*interlin.*) Postea] post hoc *many;* *del.* Pρ divides] *rep.* Si certissime] rectissime Eδ; rectissime certissime Eα in duas partes] *om.* Qα duas] 2 *many* partes] *om.* Cε
- 10 pones] ponas Eβ Fα Lγ Lε Mδ Mυ Mφ Nδ Oζ Pα Pμ Qβ Qγ Qλ eius notam] no<sup>a</sup>m Rβ; noni Qδ; *add. interlin.* id est punctum Mγ erit] *om.* Ev apertio] ap(p)aritio / ap(p)aricio<sup>4</sup> Bα Bι Cδ Cι Eζ Fα Fβ Fδ Fζ Lβ Lγ Lη Mδ Nα Nδ Oζ Oη Oο Oυ Pα Pδ Pλ Pο Pρ Pυ Pφ Qβ Rε Sλ Vν Vχ Vσ Vψ; aptatio Mγ Vβ; apuncto Bθ; a puncto Vπ; aspercio Cε Eα; *add. interlin.* al'appari<sup>o</sup> Vβ axis] assis Vπ; *add.* in figura allidade inferiori depicte Bζ; *add. interlin.* id est foraminem Eφ; *add. interlin.* id est foramen Vβ abscindes] abscindens Cθ; abscindens *corr. to* absindes Cβ dimidium] medium Wι
- 10-11 super ... tibi] *om.* Eη dimidium ... alia] medium secundum notaverit ibi ex utraque Qα
- 11 parte<sub>1</sub>] *add.* in longo Bα secundum ... tibi] *om.* Cδ secundum ... tibi] *om.* Sλ secundum ... parte<sub>2</sub>] *om.* Wα notavi] et nota Sι; narraui Sκ; notam docet Oη; notavit Wβ; numeravi Mο Qμ Wι tibi] *om.* Bζ Eα Mν Wβ; in figura Bε abscindes eam] *om.* Bγ Bε Bη Bι Bκ Cη Cι Dγ Eα Eβ Eδ Eζ Eη Eτ Eφ Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mη Mλ Mο Mυ Mφ Nα Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pθ Pλ Pμ Pν Pο Pρ Pτ Pυ Qα Qβ Qγ Qδ Qλ Qμ Rα Rβ Rδ Sβ Sδ Sκ Tδ Uα Vβ Vι Vκ Vψ Wβ Wι Xα Xβ alia] altera Vε; utraque Qα
- 11-12 et ... econtrario] abscindes econtrario aliud dimidium ex alii parte Bα
- 12 econtrario] e converso Fζ Lε Mδ Mφ Mυ Oξ Oτ Oυ Pρ Qγ Sδ Tδ Vι Vψ; *add.* modo Qα servabis] saluãdo Qα; secabis Vε; signabis Bζ que est] exeuntem Nδ in] *om.* Wι eius] *om.* Bα Qλ que vadit] vadens Qα axem] axcem Sκ; *add. interlin.* id est clavem Eμ Mκ Oη dum] cum Fδ Mγ Pφ Vν
- 12-13 eius ... abscinderis] *om.* Aα Bθ dum] cum Sι dum abscideris] *om.* Bα Mν Qα

<sup>4</sup> The abbreviations of *apertio* and *ap(p)aritio* / *ap(p)aricio* are often indistinguishable.

that it may not be caught in one's garments. Afterwards divide it very accurately down the middle into two parts and place in the middle of it a mark on which the opening for the axis will be. Then cut away half of the rule on one side (according to what I have indicated to you) and cut it away on the other opposite side.<sup>5</sup> And you will preserve<sup>6</sup> the line which is in the middle of it which passes through the axis while

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<sup>5</sup> That is, cut away one side (from the edge to the central line) from one end of the strip to its middle point (of rotation), and cut away the opposite side (from the edge to the central line) from the other end of the strip back to its middle point.

<sup>6</sup> Or "you will not damage ...", "you will not cut into ..."; "you will safeguard ...".

abscideris, quia in ea erit fiducia. Et acues summitates regule versus lineam a sursum usque deorsum ut fiat subtilis summitas regule et possint videri gradus.

15

Post hoc compones tabulas super unam longitudinem ab axe et servabis ut lineae que sunt in predictis tabulis cadant super lineam regule. Et perforabis eas ante compositionem earum, et sint foramina unius longitudinis a regula. Sintque ipsa foramina super lineam tabularum equaliter perforata et in unaquaque tabula sint duo

- 13 abscideris] abscindis Or; *add.* eam Fδ Mγ Oo Pφ Rε Sθ(*marg.*) Si Vv erit] *om.* Vψ; est Nδ acues] *om.* Lβ Si; acuas Nα; acuet Pα; accues Mφ Pτ; ames or aines Fζ regule] *om.* Qα versus] usque Nα lineam] *add.* fiducie Bε Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mφ Mv Nδ Nε Oζ Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pv Pρ Qβ Qγ Qδ Qλ Rβ Rδ Sδ Tδ Vι Vψ Wα Xβ sursum] sumo Cδ Sλ
- 13-14 versus ... regule] Mκ(*marg.*) a ... deorsum] *om.* Qα
- 14 usque] versus Bζ; *add.* ad Bε Eα Fζ Lβ Lγ Lη Mγ Mφ Pα Qβ Qγ Qλ Xβ fiat] subtilis scribat Cζ subtilis] *om.* Nε summitas] *om.* Oπ Qα; submitas Fβ regule] *om.* Qα Xα Xβ et] *om.* Cζ Xβ; ut Aα Bα Cδ Eζ Eμ Ev Mθ Mκ Mλ Mv Oα Oη Ok Om Oσ Pφ Qδ Rβ Sθ Vα Vβ Vσ Vπ Vv; et *corr.* to ut Cβ gradus] *add.* *interlin.* qui fuerit in dorso Vβ; *add.* sicut vides in hac figura Cζ
- 15 compones] componas Rα; pones Dκ Nδ Tδ tabulas] gradus tabulas 18 *corr.* to tabulas 18 Pρ; tabulasia Si; *add.* duos or 2 Bε Bη Cε Cι Dη Eα Eη Fα Fβ Fδ Fζ Lβ Lγ Lε Lη Mδ Mη Mv Mφ Mv Oζ Oξ Oo Ou Oτ Pα Pδ Pθ Pλ Pμ Pv Pρ Pφ Qβ Qγ Qδ Qλ Qμ Rβ Sδ Si Tδ Vι Vβ(*interlin.*) Vv Vψ Wα Wβ Xβ; *add.* sive denticulos Cδ Sλ super] *om.* Pv; iux Bη ab axe] axem Vα ab axe et] ut Nα axe] axce Sκ; *add.* tabulas Bγ servabis] *om.* Bζ ut] tunc Lγ
- 15-16 et ... sunt] i<sup>a</sup>ut Qα
- 16 predictis] dictis Bα tabulis] *om.* Pθ Qδ cadant] *add.* orthogonaliter Nε Wβ lineam] *add.* *and del.* tabularum equaliter Sθ regule] recte Bα; tabule Oπ; tabule regule Lγ; *add.* ortogonaliter Bε Bη Cι Eα Eβ Fβ Fζ Lγ Lε Mη Mv Mφ Nδ Oξ Oτ Pα Pδ Pμ Pv Qβ Qλ Rβ Rδ Tδ Vψ Wα; *add.* orthogonaliter Eη Lη Mδ Oζ Ou Pθ Pλ Pρ Qγ Qδ Vι Xβ perforabis] forabis Bα Cε
- 17 compositionem] compones Eδ; positionem Bα earum] *om.* Bα; *add.* vel sicut quibusdam placet: post insertionem ipsarum(earum Cδ) Cδ Sλ; *add.* Immo melior est forte perforare eas post compositionem earum Cζ Eμ(*marg.*) et] ut Sκ unius] omnis Rδ longitudinis] *add.* id est equidistantia Xβ; *add.* sive rationis Mκ(*marg.*); *add.* sive remotionis Cδ Sλ Vσ; *add.* vel altitudinis Bζ a regula] *om.* Pρ ipsa] *om.* Bι Eδ Mγ Rε Vv
- 17-18 unius ... foramina] *om.* Vv ipsa foramina] *om.* Qα
- 18 super] *add.* istam Wα lineam] lineas Aα Bθ Eα tabularum] *om.* Mv Vv; dentulorum Sλ perforata] *om.* Bα; *add.* ita Eφ unaquaque] utraque Bα Cδ Sλ tabula] *om.* Qα; linea Pφ sint] *om.* Vψ duo] 2 many; *om.* Cι



you have done the cutting, because in it will be the fiducial [line].<sup>7</sup> And sharpen the ends of the rule towards the fiducial line, backwards and forwards, so that [each] end of the rule becomes pointed and the degrees can be seen.<sup>8</sup>

After this you will attach the vanes at the same distance from the axis,<sup>9</sup> and ensure that the lines which are on the aforesaid vanes coincide with the [“central”] line of the rule. In addition you will pierce them before attaching them [to the rule] and the holes should be of the same distance from the rule. And these holes should be evenly pierced along the line of the vanes; and in each vane let there be two

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<sup>7</sup> This edge must be very accurate; the measurements “depend” on it.

<sup>8</sup> This interpretation – the angling of the ends to a point in order to read the degrees around the rim more precisely – was suggested by Michael Masi in his notes.

<sup>9</sup> Literally, “at one length” (i.e., the same distance) but each towards opposite ends.

20 foramina, maius scilicet et minus, minus ad accipiendum radios solis in die et maius ad accipiendum stellas in nocte. Nota quod centrum duarum tabularum, que sunt supra capita allidade, et axis allidade debent habere idem centrum, et linea, que est in regula, debet respondere centro dictarum tabularum equaliter, cum collocantur in regula sive in allidada.

Et scito quod armille, per quas suspenditur astrolabium, reflectuntur super

- 19 maius scilicet et minus] *om.* Qα; scilicet Bα; unum maius et alterum minus Pφ scilicet] *om.* Dγ Fα Vκ maius<sub>1</sub> ... minus<sub>2</sub>] unus maius alius minus Pφ minus<sub>2</sub>] *om.* Bκ Cε Eζ Eτ Fδ Mγ Mo Nε Oη Ok Om Pγ Pλ Sκ Uα Vε Wα Wι; *interlin.* Mθ; *add.* autem est Qδ Rβ; *add.* quidam Bε Eβ Fβ Fζ Eα Eη Fα Lβ Lε Lη Lγ Mδ Mu Mφ Nδ Oζ Oξ Oτ Pα Pλ Pμ Pν Pρ Qγ Qλ Sδ Sλ Tδ Wα Wβ Xβ; *add.* *interlin.* scilicet foramen Vβ accipiendum] accipiendas Oη; accipiendos Aα Bθ Cζ Eμ Ev Eo Ev Fδ Mθ Ok Oo Oπ Oσ Sθ Si Vα Vπ Vσ Vυ Vχ; capiendos Bζ Dη; excipiendos Eo radios] radium Eδ et maius] cum minori. Cum maiori vero Pφ maius<sub>2</sub>] minus Cη; minus *corr.* *interlin.* to maius Bθ; *add.* quidam Ov; *add.* *interlin.* scilicet foramen Vβ
- 19-20 radios ... accipiendum] *om.* Sκ
- 20 accipiendum] *om.* Qα; accipiendas Aα Bθ Cδ Cζ Eμ Ev Eυ Fδ Mγ Mθ Oη Ok Oo Oπ Oσ Vα Vε Vπ Vσ Vυ Vχ; accipiendis Cβ Cδ Sβ; accipiendos Bα; capiendas Bζ Dη; excipiendas Eo stellas] *rep.* Rδ in nocte] *om.* Mκ; *add.* et in praedicta pagina est figura regule Ev *add. in marg.* hec est figura Sθ nota] nōndum(?) Sκ centrum] centra Aα Bγ Bη Cη Ev Tδ Vπ duarum] 2 *many*; duo Xβ que] *om.* D; *add.* capita Nα supra] super *many*
- 20-23 Nota ... alidada] *marg.* Vβ; *om.* Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Fδ Mγ Mθ Mκ Mν Oα Oη Ok Oo Om Oπ Oσ Pφ Qα Sθ Si Sλ Vα Vε Vυ Vσ Vυ Vχ
- 21 capita] capud Dη Eβ Lβ Lγ Mu Mφ Oζ Oξ Oτ Ov Pθ Pν Pτ Pμ Qγ Qλ Sδ Uα Vι Xβ; caput Cι Eη Mo Pα Pγ Pδ Pλ Pρ Qβ Tδ allidade<sub>1</sub>] alidade Rβ Rε; alidade Rα axis] assis Vπ; axcis Sκ axis allidade] *om.* Aα Bγ Bθ Cη Eδ Eo Ev Mη Pτ allidade<sub>2</sub>] alidade Rβ Rε Wι debent habere] debet esse Qδ Rβ idem] *om.* Aα centrum] *add.* axis allidade Aα Bθ Eo Ev; *add./rep.* que sunt supra capita allidade debent habere idem centrum Nε in regula] intra Dγ
- 22 debet] *add. and canc.* habere Pα respondere] corespondere Nα centro] *add.* duarum Mη equaliter cum] *om.* Bθ Vπ collocantur] corrigatur Eη
- 23 allidada] alidada Rβ Rε; allilada Rα
- 24 before Et] *add. marg. gloss* Eμ scito] nota Eδ
- 24-33 Et...voluerit] Item quod foramen armille et allidade similiter cadat equaliter super lineam mediatricem proba per filum cum ponderoso alio suspens (!) Qα

holes, that is to say, a larger and a smaller, the smaller for receiving the rays of the sun by day and the larger for receiving the [light of the] stars by night. Note that the centre of the two vanes, which are towards the ends of the alidade, and the axis of the alidade ought to have the same centre and the line which is on the rule ought to correspond to the centre of the aforesaid vanes, equally when they are placed together on the rule or alidade.

And know that the rings by which an astrolabe is suspended are beveled on

25 spinas suas quousque unaquaeque earum currat in alia, quasi super acumen gladii, ne tardetur, et forte erit in sede aliqua declinatio ad aliquam partium. Et si non fuerit foramen in quo est allidadath, que est armilla reflexa, que figitur in matre super lineam

- 25 spinas] pinas Vv earum] *om.* Nδ Wβ; illarum Qδ Rβ Vπ currat] *illeg.* Rδ; et Om in alia] *om.* Pλ alia] aliam Eζ Vβ quasi super] et que Vκ ne] *om.* Mη
- 26 tardetur] tardat *corr. to* tardet Rα; tardatur Eβ Oτ; tardes Vχ; tardet Aα Bα Bθ Bη Bι Bκ Cβ Cδ Cζ Cθ Dγ Eδ Eζ Eμ Ev Eu Fδ Lζ Mγ Mη Mθ Mκ Mλ Mν Mo Nα Oα Oη Ok Om Oo Oπ Oσ Pγ Pδ Pτ Pv Pφ Qμ Rε Sβ Sθ Si Sk Sl Uα Vα Vβ Vε Vκ Vν Vπ Vσ Vυ Wβ Wι Xα; *add.* motus Bζ Dη Ne Rδ; *add.* motus eius Pρ Tδ; *add.* scilicet motus Aα Bγ Bη Bθ Bι Bκ Cε Cη Cι Dγ Eδ Eζ Eο Eτ Eφ Ev Lζ Mη Mκ(*interlin.*) Mλ Mo Pγ Pδ Pθ Po Pτ Pv Qμ Rα Rε Sβ Sk Uα Vκ Vπ Vψ Wβ Wι Xα Xβ; *add.* scilicet motus eius Bε Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mν Mφ Nδ Oζ Oξ Oτ Ou Pα Pλ Pμ Pν Qβ Qγ Qδ Qλ Rβ Sδ Vβ Vι Wα: *add.* secundus motus Nα; *add. interlin. illeg.* Mγ et forte] *om.* Eζ forte] fortasse Cε Vζ Dη Eμ Ev Mθ Oα Oη Ok Om Oσ Sθ Vπ Vυ; fortassis Aα Bζ Bθ Cβ Cδ Cθ Eβ Ev Eο Fδ Mκ Mν Pφ Oo Oπ Rε Si Sl Vα Vε Vν Vσ Vχ; ne fortassis Mγ; *add. interlin.* al' fortassis Vβ; *add. in marg.* Docent qualiter scias recte pendere matram Cζ Eμ erit] *om.* Qμ; esse Si in sede] *om.* Fβ sede] se Bε Cβ Cε Cι Dη Eα Eη Eφ Fα Fζ Lβ Lγ Lε Lη Mγ Mδ Mo Mν Mφ Nα Nδ Ne Oζ Oη Oξ Oτ Ou Pα Pδ Pμ Pθ Pλ Pν Pρ Qβ Qγ Qδ Qλ Rβ Rδ Rε Sδ Tδ Vε Vι Vψ sede aliqua] *om.* Om; alia Xβ aliqua] *om.* Cζ Sθ Sl ad aliquam] *om.* Vψ Et<sub>2</sub>] ut Eφ Cη Et si] cum Bζ Vχ Et si non fuerit] Et non sit Bα Cδ Eμ(*sit corr. to fit*) Fδ Mθ Mκ Mν Oα Oη Ok Om Oo Oσ Pφ Si Sl Vα Vν Vσ Vυ; Et non fuerit Cβ Cθ Oπ; Et si non sit Dη; *add.* non sit Sθ non] *om.* Ev fuerit] *om.* Fα
- 27 foramen] *add.* bene factum or benefactum Bε Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mo Mν Mφ Oζ Oξ Oτ Ou Pα Pθ Pλ Pμ Pν Pρ Qβ Qγ Qδ Qλ Rβ Rδ Sδ Tδ Vι Wα Xβ in<sub>1</sub>] *om.* Vψ allidadath] alhdada<sup>t</sup> Oτ(*add. interlin.* id est); alhlada Cβ; aliclada Rβ; alidada Eα Eζ Pδ Rε; alilacha Cζ; alidada Rδ; alitata Ev; alldad~ Cε; allidada<sup>10</sup> Bα Bγ Bε Bζ Bη Bι Bκ Cη Dη Eβ Eδ Eη Eο Eτ Ev Eφ Fα Fβ Fδ Fζ Lβ Lγ Lε Lη Mδ Mη Mκ Mλ Mo Mν Mφ Nα Nδ Ne Oα Oζ Oη Om Oξ Oσ Ou Pα Pγ Pθ Pλ Pμ Pν Po Pρ Pτ Pv Pφ Qβ Qγ Qδ Qλ Sβ Sδ Sθ Si Sk Tδ Uα Vβ Vι Vκ Vν Vυ Vψ Wα Wβ Wι Xα Xβ; allidada *corr. to* allilata Eμ; allidada *corr. to* hallidada Cδ; allidanda Oo; allidata Aα Mγ Mν Vσ; allidada Cι; allilada Cθ Dγ Lζ Rα; alliladi Vε; allilata *corr. suprascr. to* allidada Mθ; allilata Ok Vα; allilatat Vχ; alsilata Oπ; hallidada Sl; *add.* et Bγ Bη Cη Eφ Wβ; *add.* id est clavus super A literam Cδ Sl allidadath ... est<sub>2</sub>] *om.* Bθ Vπ que<sub>1</sub>] id Bα est<sub>2</sub>] *om.* Mγ Pδ; *add.* ad Bκ armilla] armila Oo; armillaus(!) Pα; mulla Cε; *add.* illius Fζ; *add.* suspensoria Eβ Ou(*and deleted*) reflexa] deflexa Lβ figitur] fingatur Mθ Ok; significat Oη in matre] *om.* Om

<sup>10</sup> Since the *allidada* / *alidada* is the subject of this capitulum, many scribes have erroneously written “allidada” (or a variant) here when it should be “allidadath”. See the note to the English at this line.

their spines [i.e., their inner edges] for as far as one of them runs over the other, as if upon a sword edge, lest [their movement] be impeded and when seated there might perhaps be some leaning towards one side. And if the hole, which is pierced in the mother in which is the ring [i.e. *allidadath*],<sup>11</sup> which is the *armilla reflexa*, is not most accurately along

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<sup>11</sup> The Arabic base word is *al-‘itāqa* (العلاقة) or “a strap” [or the like, for suspending something]. How this becomes transcribed as *allidadath* (and its variants) is not obvious. Not to be confused with the *alidade* (*al-‘idāda*) or rule (see above Cap. 4 line 1 note). See Kunitzsch, *Glossar*, no. 20, pp. 528-530.

The normal Arabic word for the *armilla reflexa* is *‘urwa* (عروة ; “[ring-like] handle”) or sometimes *habs* (حبس ; “holding”). See Cap. 1, figure (variants: *armilla reflexa*).

30 mediatricem certissime, ac propter hoc sit aliqua tortuositas in acceptione altitudinis, quod debes ita probare. Mittes per foramen filum et suspendes de eo aliquid ponderosum, post hec suspendes astrolabium per filum alterum ex eodem foramine. Tunc si abierit filum super filum, et non declinaverit ab eo, erit verax; si vero

28 mediatricem] diametritem Vv; mediam Vε; *add.* scilicet Pθ; *add.* similiter(?) Rδ  
certissime] *ms* Pψ *begins* ac] hac Sι; *add.* si Mγ Oo propter hoc] non Bα;  
tunc Bη sit] fit Dη Eη Mφ Oζ Oτ Sι; fuerit Cβ Cθ Fβ Oπ aliqua] *om.* Mκ; alia  
Mθ; aliquas Oτ; quam Fβ tortuositas] *om.* Sι; dortuositas Pv in acceptione] et  
accipe Pδ; et acceptione Wι altitudinis] latitudinis Sθ

28-30 ac ... foramine] *om.* Bζ

29 quod] *om.* Fζ; hoc Eα Eβ Eη Fα Fβ Lβ Lε Mφ Nδ Oτ Pα Pμ Qβ Qγ Qδ Qλ Rβ Sδ Tδ Vι  
Wα; *om.* Pv; vel Mδ ita] sic Dη probare] proponere Nα mittes] mittas Bε  
Mv Oμ; mitte Bγ Wβ foramen] perforamen Oη filium ... eo] *om.* Vε  
suspendes] suspendas Pφ; suspende Bγ Bε Bη Cδ Cη Eα Eη Eφ Fα Fβ Fζ Lβ Lγ Lε  
Lη Mδ Mo Mv Mφ Oζ Oξ Oτ Ou Pα Pλ Pμ Pv Pρ Qβ Qγ Qλ Rε Sδ Sλ Tδ Wα Wβ Xβ; *add.*  
*in marg.* per filum Sθ de] Vβ(*interlin.*); ad Vv; cum Bα Bη Ev Pλ; ex Bγ Cη Eφ Wβ; in  
Bε Eα Eη Fα Fβ Lβ Lγ Lε Lη Mγ Mo Mφ Mv Oζ Oμ Oξ Oo Oτ Ou Pα Pθ Pμ Pv Pρ Qβ  
Qγ Qδ Qλ Rβ Rε Sδ Tδ Vβ Vι Vv Wα Xβ de eo] *om.* Eo Mδ Nδ; *add.* *interlin.* de  
scilicet filo Vβ eo] *add.* aliud Bη; *add.* *interlin.* scilicet filo Vβ

29-30 de ... suspendes] *om.* Eo Fδ

29-31 et ... filium<sub>2</sub>] *om.* Uα

30 post hec] postea *some* hec] hoc *some*; huius Qδ suspendes<sub>2</sub>] suspendas Fζ Pλ  
Pμ Qβ; suspende Sλ per filum] *om.* Pλ per filum alterum] de manu tua Pφ  
ex] *add.* de Sι

30-31 per filum ... filium<sub>2</sub>] per alterum filum super filum Bη Wβ

31 Tunc si abierit] et si habent Eα si] sic Dγ Rα Wι abierit] abicias Vε;  
abierat Eμ; abierit Sι; habierit Sθ Vα; obiciat Aα Bγ Bθ Bι Dη Dγ Eδ Eζ Eτ Ev Lζ Mη Nα  
Po Pv Rα Sκ Vβ Vκ Vπ Wι Xα; obiciatur Cη Eφ Pγ Pτ; obijciat(!) Rε super filum]  
*om.* Eδ Nδ Nε Pv filium<sub>2</sub>] *add.* scilicet (*or* id est) dyametram Mv Mφ; *add.* immo  
super diametrum Cζ Eμ(*interlin.*) et] *add.* si Bη Bι Cη Cι Eδ Eζ Eτ Eφ Lβ Mδ Mη Mo  
Mv Nα Nδ Nε Pγ Pδ Pθ Pv Qβ Rδ Sδ Sκ Uα Vψ Wβ Wι Xα Xβ et non] id est si non  
Bγ Pτ declinaverit] haberit Eα ab eo] *om.* Bι si vero] sulo Eζ; si non et si  
non Xβ vero] *om.* Dη; autem Bα Bε; non Aα Pγ

31-32 erit...ab eo] *om.* Bθ Cε Lβ Mη Oζ Pλ Vπ; *marg.* Pρ

31-33 et non ... filum] id est sunt illam lineam mediatatem qui est diameter circumdionalis(!) et  
non declaverit (*add.* *in marg.* constitutionem horarum in regula) filum Sθ

the middle line, then because of this there may be some deflection [of the astrolabe] when measuring an altitude. And this you ought to test in this way. Pass a thread through the hole [in the throne] and hang something heavy from it; then hang up the astrolabe by another thread from the same hole. Then if thread lines up<sup>12</sup> on thread and [if there is] no divergence, it is true. But if

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<sup>12</sup> Literally, “if thread falls on thread.” Michael Masi suggested this translation.

declinaverit ab eo, stude tunc adaptare eum removendo foramen ad ipsam partem  
ad quam declinat filum, si deus voluerit.

32 ab eo] *om.* Dη Eα Eζ; *add.* erit fallax Vβ; *add.* male stabis Vα tunc] *om.* Bα Bζ Cι  
adaptare] aptare *some* eum] *om.* Cζ Oμ; ipsum Rε

33 ad quam] in quam partem Bκ declinat] declinaverit Bα Cδ Cζ Dη Eμ Eο Eυ Fδ Mγ  
Mθ Oα Oη Oκ Oμ Oο Oπ Pφ Si Vν Vπ Vυ Vχ; *add. interlin.* al' declinaverit Vβ si ...  
voluerit] *om.* Aα Bα Bγ Bη Bθ Bι Bκ Cε Cζ Cη Dη Eδ Eζ Eυ Eφ Fδ Lζ Mγ Mλ Mo Nα Oο  
Pγ Pο Pρ Pτ Pυ Qδ Qμ Rα Rβ Rε Sβ Sκ Tδ Uα Vα Vε Vκ Vν Vπ Wβ Wι Xα; ut patet Dγ;  
*add.* etc. Rδ



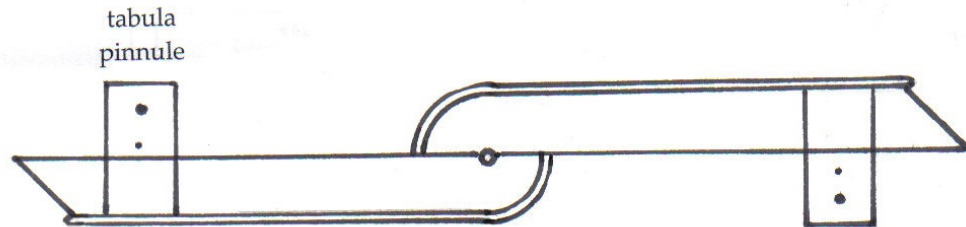
there is a divergence, then study to adjust it by moving the hole towards that side to which the thread diverges<sup>13</sup> (God willing).

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<sup>13</sup> The instructions are too terse at this point. A thread through the hole in the throne is used to suspend the astrolabe, and a second thread with a weight is hung down from the same hole. Due to gravity the threads will always line up with each other, but what surely is really meant is that the thread with the weight hanging down should run along the central vertical line of the astrolabe, that is, along the vertical diameter (usually labelled AC) and across the central hole or axis on which the alidade rotates. If this thread does not line up with the vertical diameter, then the hole in the throne is off centre and needs to be adjusted.

[ FIGURA 4 ]

Allidada – Regula – Mediclinium /  
Alidade – Rule – “Mediclinium”



[Complete diagram] Bε Bη Bκ Cη Eβ Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mθ Mλ Mν  
Mo Oα Oζ Oκ Oτ Oυ Pα Pγ Pδ Pμ Po Pρ Pυ Qγ Qδ Qλ Qμ Rα Rε Sβ Sδ Sκ Tδ Vκ Vχ Wβ Wι Xβ

[Partial diagram] Bα Bθ Bι Cβ Cθ Cι Fδ Oσ Vα Vσ

[Outline, or space only] Aα Vβ Vπ

[No space] Bζ Cδ Cε Cζ Dγ Dη Eα Eδ Eζ Eν Eο Lβ Mγ Mδ Mκ Mυ Mφ Nα Nδ Nε Oη Oμ  
Oξ Oο Oπ Pλ Pν Pτ Pφ Qα Qβ Rβ Sθ Sι Sλ Uα Vε Vν Vυ Vψ Wα Xα

[Combined with Fig. 5 (q.v.)] Bγ Vι

Pθ: “C”

[Caption]

allidada - regula - mediclinium<sup>14</sup> Cη Eβ Eη Eτ Eυ Eφ Fα Fζ Lγ Lε Lη Mη Mλ Mν Mo Oτ Oυ Pα  
Pδ Pμ Po Pυ Qγ Qδ(alidade) Qλ Qμ Rα(allidadach) Rδ(alidade) Rε(alidade) Sβ(allididich?) Sδ Sκ  
Tδ Vκ(alhdada) Wβ Xβ; om. Eμ Fβ Oα Oκ Vχ; allida Wι; allidada Oζ; allidada - regula Bη;  
allidadath(aldidath Bκ) - mediclinium - regula - radius Bκ Lζ; allidada simplex Pγ;  
mediclinium que dicitur | allidada vel regula communis Bε; regula horarum Mθ

[Numbers on the rule]<sup>15</sup>

12 11 10 9 8 | 1 2 3 4 5 6 | 7 Mθ Oα Oκ; gradus latitudinis | 30 20 10 10 20 30 40 50 60 | regula  
fiducia Pρ

[Other information]

pinula Pυ; pinula (twice) Lγ Qδ; pinnula Cη Eβ Eτ Eφ Fα Fζ Lε Lζ Lη Mλ Mo Oζ Oτ Oυ Pα Qγ  
Qλ Qμ Rδ Sδ Tδ Vκ Wβ Xβ; pinnula (twice) Mη Mν Po Pμ Rε Vχ; om. Bε Bη Eη Eμ Eυ Fβ Mθ Oα  
Oκ Pγ Pδ Pρ Sβ tabula Cη Eτ Eυ Eφ Fα Fζ Lγ Lε Mη Mo Oυ Pα Qγ Qλ Qμ Sδ Tδ Wβ; tabula  
(twice) Bη Pμ; om. Bε Eβ Eη Eμ Mθ Mν Oα Oζ Oκ Oτ Pγ Pδ Po Pρ Pυ Qδ Sβ Vχ; capula Xβ; tabella  
Fβ Lη Mλ Vκ; tabula perforata (twice) Bκ Lζ add. almuri (twice) Rε add. clavus Rε  
add. linea fiducie Rε

<sup>14</sup> See *Novum Glossarium Mediae Latinitatis*, ed. Franz Blatt et al. (Copenhagen, 1959-1998) M-N, col.

<sup>15</sup> This reflects the influence of Figura 5.

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## [CAPITULUM 5.] DE CONSTITUTIONE HORARUM IN REGULA, QUE DICITUR ALLIDADA HORARIA

Cum volueris constituere horas in regula, divide longitudinem unius tabularum que sunt in regula, in qua sunt foramina, per 12 divisiones, eritque ipsa tabula status.

- 1 De ... horaria] *om.* Βα Βε Βζ Βκ Cδ Cε Dγ Eα Ev Lζ Mγ Nα Oα Oη Oο Pγ Pφ Rα Sβ Sθ Sι Uα Vα Vε Vι Vκ Vυ Xα; *ms* Wκ *begins*; *diff. hand* Mυ; Constitutione horarum in regula Cβ Cζ Cθ Dη Eμ Mθ Mκ Oμ Oπ Oσ (*later hand*) Pψ Sλ Vσ Vχ; Constitutione horarum in regula. Rubrica Ev Oκ; Constitutione horarum in regula que allidada hoararia dicitur Fβ; De allidada horaria Aα Bθ Cι Eζ Eτ Mη Mν Ne Pδ Pθ Po Pv Qμ Rδ (alidada; *add. illeg.*) Rε (alidada) Vψ Wι; De allidada horaria. Rubrica Eδ Vπ; De compositione allidade horarie Sκ; De compositione allidade per horis naturalibus horis positionis in regula Pτ; De constitutione horarum in allidade Eφ; De divisione allidade: pro horis naturalibus Vβ; De horis constituens in regula Qα (*marg.*); De horis constituendis in regula que allidada horaria dicitur Cη; De horis in regula Mλ; De horis ponendis in regula Bι Fδ Vυ; De inscriptione divisionum horarum in regula Bη Wβ; De regula horaria Bγ (*later hand*); Plo~ a radice tabula scilicet a superfacis regule usque in clavum ipsius concabule(?) Eo [*in a box*]; Rubrica Compositio alidada horarum secundum Messahala Wκ; Sequitur de allidadi horaria secundum 3 modos et primo secundum primum Eφ (*marg.*); Sequitur de constitutione horarum in allidada horaria. De constitutione hararum in allidada horaria Fa in] *om.* Xβ que ... horaria] *om.* Pv Xβ horaria] *om.* Oυ; hora Lβ; *add.* sequitur Mυ
- 2 *before* Cum *add.* 5 Be Cum] *add.* autem Bκ constituere] *om.* Ev; inscribere Eα; institutere Mδ Nδ; ponere Βα in regule] *om* Mφ; *add.* vel allidada horaria Fβ in regule divide] .... Vψ divide] deinde Xα unius] *twice* Nα tabularum] *add.* erectarum Qα; *add.* pinnularum Bη (*interlin.*) Eη Oη; *add.* id est [*illeg.*] a dicte tabule id est a superficie regule usque in similem ipius tabule Bκ; *add. interlin.* id est pinnularum Eμ; *add.* scilicet penule Cζ
- 2-3 divides ... regula] *in marg.* Rβ
- 3 sunt] est Cζ Pq in<sub>1</sub>] *om.* Sι; *add.* reliqua Bζ regula] tabula Oμ; *add. interlin.* sicut vides in haec pinnula regule Eμ in<sub>2</sub> ... formina] *om.* Βα Cβ Cδ Cζ Cθ Dη Eμ Ev Fδ Mγ Mκ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pφ Pψ Qα Sθ Sι Sλ Vα Vε Vυ Vσ Vυ Vχ; *in marg.* Mθ quo] que Sκ sunt] fuerint Qδ Rβ 12] duodecim Sθ Vψ; .r. Mo divisiones] *om.* Cδ Cε Sλ; *add.* sicut vides in hac pinnula regule Cζ eritque] eruntque in Βα Fδ Mγ Pφ Rε Sι Vυ; erunt in Mν status] statuet Cε; *add. interlin.* id est terminabitur in tabula parva Vβ
- 3-4 status ... tabula *om.* Vα Vσ

[CHAPTER 5.] ON THE ARRANGEMENT OF THE HOURS ON THE RULE, WHICH IS ALSO CALLED  
THE “TIME-TELLING” ALIDADE<sup>1</sup>

When you wish to mark the hours on the rule, divide the length of one of the vanes which are on the rule, in which the holes are, into 12 divisions, and the vane itself will be a position.

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<sup>1</sup> Also known as the “horary alidade.”

- 5 Deinde divides similitudinem ipsorum statuum in tabula vel in pergameno, vel in quovis, et divides eam, scilicet similitudinem, per punctos. Post hec ponēs regulam super 15 gradus ex altitudine et scies quantum habebit ex umbra versa. Et eriges circinum super quantitatem ipsorum graduum quos invenisti ad eandem altitudinem,
- 4 Deinde ... tabula] *twice*. Cε similitudinem] *om.* Oμ; similitudines Eη Pφ; similitudines *corr. to* similitudinem Vβ; *add. interlin.* id est portiones Vβ statuum] *add. interlin.* id est divisionum Bη Eμ; *add. interlin.* id est tabularum parvarum in<sub>1</sub>] *add.* ipsa Mγ Oo Rε Vβ(*interlin.*) Vv tabula] tabella Oα Vσ; *add. 1-line gloss* Cζ] *add. interlin.* scilicet lignea Vβ in<sub>2</sub>] *om.* Nδ pergameno] parcameno Pδ Vκ; pergameno Cι Mλ Mv Qβ Pψ Vβ Vv; percameno Cζ Cθ Eμ Ev Oπ; perocameno Oκ vel<sub>2</sub>] ut Sλ
- 5 quovis] quo volueris *many* eam] *om.* Nδ eam scilicet similitudinem] ea Oμ; eam Bα Fδ Mγ Oo Pφ Vα Vv; eas Cβ Cδ Cθ Mθ Mκ Mv Oη Oκ Oπ Oσ Pψ St Sλ Vε Vσ Vv Vχ; eas *corr. to* eam Vβ; eas scilicet in longitudine *corr. to* eas scilicet similitudinem Rα; eas similitudines Bη Dη Eζ Oα(similitudines *interlin.*) Wβ; eas, scilicet similitudines Aα Bγ Bζ Bθ Bι Cε Cη Dγ Eδ Eμ Eo Eτ Ev Eφ Lζ Mη Mλ Mo Nα Pγ Po Pτ Pv Qμ Sβ Uα Vκ Vπ Wι Xα; eos Cζ Ev Qα; eos *corr. to* eas Sθ; *add.* scilicet similitudines *interlin.* Vβ scilicet] secundum Rδ punctos] *add.* divisiones Oη Post hec] Post *many*; Postea *many* regulam] *om.* Nδ Oμ; *add.* id est allidadam Bη(*interlin.*) Cζ Eμ(*interlin.*) Mκ(*interlin.*) Oη
- 6 super] *add.* utrique Eα 15] *om.* Qλ; *marg.* Wα; 12 Bζ; 19 Xα; ab Vε; *add. interlin.* id est super altitudinem 15 gradus Vσ gradus] *om.* Cδ Cε Cθ Dη Ev Mκ Mv Oμ Oπ Oσ Pψ Qα St Sλ Vα Vσ Vv; octlu Oκ; gradum Cι; graduum Eα Xα ex altitudine] altitudinem Oη; altitudinis Bα altitudine] latitudine et dorso scilicet astrolabii Mθ Oκ; *add. interlin.* dorso astrolabii Bη; *add.* id est in dorso astrolabii Cζ; *add.* pinnula Mη; *add.* scilicet in dorso Oη scies] *om.* Uα Vκ Xα; invenies Vε; mox Aα Bθ Bι Bκ Dλ Eδ Eζ Eo Lζ Mη Mλ Mo Nα Pγ Po Pv Rα Sβ Sκ Vπ Vψ Wι; mox iudebis Qδ Rβ; stico Oo; *add.* mox Bε Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mv Mφ Nδ Ne Oζ Oξ Oτ Ov Pα Pδ Pθ Pλ Pμ Pv Pq Qβ Qγ Qλ Qμ(*add. in marg.* scies) Rδ Sδ Tδ Vι Wα Wκ Xβ; *add. interlin.* in dorso scilicet astrolabii Eμ; *add. interlin.* in dorso astrolabii Bη scies quantum] modo Ev habebit] habebis Ov Pφ Qδ Rβ; habebat Pα; *add. interlin.* in dorso Oα versa] *om.* Aα Sι; umbra Oα eriges] eries Wι; erigens Rα; nergens *or* vergens Qδ Rβ; *add. interlin.* scilicet aperies Oα
- 6-10 eriges ... et<sub>2</sub>] *om.* Vα
- 7 circinum] circulum Mγ St Wι; circinum *corr. to* circulum Sθ super] secundum Fδ Mγ Oo Ov Pφ Qδ Rβ Rε St Vβ; *add.* secundum Mv Mφ Vι; *add. interlin.* al' supra Vβ ipsorum] eorum Bι; *add.* punctorum Bγ Bε Bη Cε Cη Cι Dη Eα Eη Eo Eφ Fα Fβ Fζ Lβ Lγ Lε Mδ Mv Mφ Nδ Ne Oζ Oξ Oτ Ov Pα Pδ Pθ Pμ Pv Pq Qβ Qδ Qλ Qγ Rβ Rδ Sδ Tδ Vβ Vι Vψ Wα Wβ Wκ Xβ graduum] *om.* Pδ; graduorum Cε quos] quot Aα Bθ Vε; *add. interlin.* in dorso Oα altitudinem] similitudinem Eδ; *add. interlin.* scilicet 15 graduum Vβ

Then you will divide a diagram of the actual positions on a flat surface or on parchment, or on any surface you like; and divide this (that is, the representation) by points. Next you will place the rule on 15 degrees of altitude [from the vertical] and you will know how much it will have of the reverse shadow. Next you will place a pair of dividers over the distance of the degrees between these points which you have found for that same altitude, and

10 et pones ipsam quantitatem in regula a radice tabule, quam divisisti, quousque pervenerit; eritque hic finis hore prime. Deinde pones etiam regulam super 30 gradus, et scies quantum conveniet etiam ei ex umbra versa, et aperies circinum secundum

- 8 et] ex Nα et pones] ponesque Nδ pones] *om.* Mv; ponens Sθ ipsam] *om.* Cβ; *corr. in marg. to* ipsarum Qμ; ipsarum Mδ Pv Pq Qβ Rβ Sδ Tδ; ipsorum Bε quantitatem ... quousque] usque Vσ in regula] *om.* Eδ; *add. predicta* Nδ regula a] prima Vε a] ad Sβ; si Oμ radice] *add. predicte* Aα Bε Eα Eβ Eη Fα Fβ Fδ Fζ Lβ Lγ Lε Lη Mδ Mφ Nδ Pα Pv Pq Pτ(*interlin.*) Pφ Qα Qβ Qγ Qδ Qλ Rβ Sδ Tδ Vι Vv Wα Xβ tabule] *add. id est pinnule* Bη(*interlin.*) Cζ Eμ(*interlin.*) Oη; *add. dicte* Pλ; *add. predicte* Mγ; *add. interlin. silicet parve* Vβ divisisti] dividisti Po; divisisisti Qβ quousque pervenerit] *om.* Dη
- 9 pervenerit] *om.* Lη; evenerit Aα; perveneris Eα; *add. ad finem umbre* Bε Bη Cδ(*marg.*) Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mφ Mv Nδ Ne Oζ Oξ Oτ Ov Pα Pδ Pθ Pλ Pμ Pv Pq Qβ Qγ Qδ Qλ Qμ(*marg.*) Rβ Rδ Sδ Sλ Tδ Vι Vψ Wα Wβ Wκ Cβ eritque] *add. idem terminus* Rε eritque ... prime] *marg. Cδ; after gradus* Cθ Eμ Ev Mθ Mκ Mv Oα Oη Oκ Oμ Oσ Pψ Qα Sθ(*marg.*) Vσ; eruntque [*lac.*] hore prima Mv hic] *om.* Mγ; hoc Oσ Pψ; idem terminus Cζ finis] *om.* Eη prime] *add. et initium [illeg.]* Bζ; *predicte* Oo Deinde] Postea Bα etiam] *om.* Bα Bζ Cδ Eδ Fζ Mγ Oα Oo Rε Vβ Vκ Vv Vv Vψ Wκ; eam Mv Pφ Si; et Eζ; quam Aα; super Mδ Nδ etiam regulam] in regula Mλ 30 gradus] 20 gradus Ne; zodiacum Vψ gradus] *om.* Aα Bζ Bθ Cβ Cδ Cθ Dγ Eζ Ev Eo Eτ Ev Lζ Mγ Mη Mθ Mκ Mλ Mv Mo Nα Oκ Oo Oπ Oσ Pγ Pψ Qα Rα Sβ Si Uα Vv Ve Vi Vκ Vv Vσ Vχ Xα; gradum Rε; *add. altitudinis* Bα; *add. eritque hic finis hore prime* Sλ
- 9-12 hic ... eritque] *om.* Mv finis ... terminis] *om.* Fβ Wκ; Deinde ... hore] *marg.* Pα Qλ; *after line 20* Qγ; *om.* Wα prime ... finis] *om.* Fβ
- 9-13 Deinde ... hore] *marg.* Cζ
- 10 scies] mox Aα Bθ Bι Bκ Dγ Eδ Eζ Eo Eτ Ev Lζ Mη Mλ Mo Nα Pγ Po Pv Qμ Rα Sβ Sκ Uα Vκ Wι Xα; mox scies Qδ Rβ Vβ; scias Lε Pτ; *add. etiam* Mγ Oo Pφ Si Vv; *add. in* Bζ; *add. interlin. scies* Bθ Qμ; *add. mox* Bγ(*interlin.*) Vπ quantum] quem Oη conveniet] contingit Lε Qβ Tδ; convenit Aα Bγ Bη Cη Eα Eβ Eζ Eη Eφ Fα Lγ Lη Mδ Mφ Oζ Oξ Oτ Ov Pα Pλ Pμ Pv Pq Pτ Qα Qγ Qλ Sδ Vv Wβ; conveniat Qδ Rβ; eveniet Bζ; proveniet Vv; *illeg.* Bε Cβ Lβ etiam] *om.* Aα Bγ Bη Bθ Cη Eα Ev Eφ Fδ Fζ Mγ Mφ Oo Pτ Rε Si Vβ Vψ Wβ; cum Sκ etiam ei ex] de Wκ ei] *om.* Qβ; cia (?) Vε; ea Bθ Bι Dγ Eδ Eζ Eo Lζ Mλ Mo Pγ Po Rα Sβ Sκ Uα Vκ Wι; ea *corr. to* ei Qμ; eis Ov; in ea Aα Bθ Bκ Ev Nα Qδ Pv Rβ Rε ex] *add. ipsa* Vψ umbra] unmbra Sθ versa] *om.* Mγ; umbra Mv aperies] capies Oη; apperies Bκ Dγ Mλ; *add. etiam* Rδ circinum] circulum Si; *corr. in marg. from* circulum Nδ; *communum* Rδ secundum] super Ne; *add. interlin. eamdem* Bγ
- 10-12 conveniet ... pervenerit] *illeg.* Lβ



you will transfer this distance onto the rule [beginning] from the base of the vane, which you have divided, as far as it [i.e., the dividers] will reach. And this will be the end of the first hour. Then also place the rule on 30 degrees and you will know how much the reverse shadow will be consistent with it. And you will open a pair of dividers according to

15 quantitatem eorundem punctorum, et pones ipsam quantitatem in regula a radice predictae tabule, quam divisisti, quousque pervenerit; eritque idem terminus finis 2<sup>e</sup> hore. Item pones regulam super umbram 45, deinde super umbram 60, postea super umbram 75, qui est finis hore 5<sup>te</sup>. Et quod residuum fuerit ex regula erit hora 6<sup>ta</sup>, et non habet finem in regula. Postea revertetur umbra, eritque initium 6<sup>te</sup> hore finis 7<sup>me</sup>;

- 11 quantitatem<sub>1</sub>] *interlin.* Cβ eorundem] *om.* Mv Mφ Vι; dictorum Cε Dη; eorum Bα Bε Bζ Bη Cη Eη Oη Oμ Qα Vε Wα Wβ; eorum *add. interlin.* -dem Bγ; illorum Ov; ipsorum Fδ Mδ Nδ Oo Vv eorundem ... quantitatem<sub>2</sub>] *om.* Nε punctorum] *om.* Mγ pones] *om.* Fζ; ponet Wι ipsam] ipsarum Fζ Pμ quantitatem<sub>2</sub>] *om.* Dη Qα in regula] *om.* Mγ
- 12 predictae] *om.* Bα Mγ tabule] *tabelle* Eμ Vσ; *add. vel* *tabelle* Vα; *add. interlin.* id est pinnule Eμ quam divisisti] *om.* Eo Ev Vπ quam ... quousque] quousque scilicet Aα Bθ quousque] usque Bα Cθ; usque quo Cβ Oα Oπ Oσ Qα Vv Vχ; *add. interlin.* al' usque quo Vβ; *add. scilicet* Ev pervenerit] *add. ad finem* umbre Bε Bη Cι Eα Eβ Eη Fα Fζ Lβ Lγ Lε Lη Mδ Mφ Nδ Oζ Oξ Oτ Ov Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qγ Qδ Qμ(*marg.*) Rβ Sδ Tδ Vι Vψ Wκ Xβ; *add. ad umbre* Nε pervenerit (ad finem)] *ms* Lβ *ends (folio missing), begins again at Cap. 7, line 58 (secundum quantitatem ...)* eritque] eruntque Dγ; *add. hec* Oη idem] *om.* Dη; hic Cε Ev; eidem Wι; ibi Ev terminus] tunc S; *add. se* lxec Bζ 2<sup>e</sup>] *secunde many; 2 some; 4<sup>e</sup> Cε*
- 13 2<sup>e</sup> hore] *om.* Bζ Item] Deinde Rε; iterum Mγ; *add. interlin.* al' iterum Vβ super umbram<sub>1</sub>] *interlin.* Sλ umbram<sub>1</sub>] *om.* Eα; *add.* 60 post super Pν 45] 15 Ev; 42 Cζ Oη; *add. gradus* Eα Fβ Oη Qδ Rβ Rδ Xβ 45 ... umbram<sub>2</sub>] *om.* Eη; *add. interlin.* Bε umbram<sub>2</sub>] *om.* Rδ 60] *add. gradus* Oη Xα Xβ; 6 Dγ postea] deinde Mγ Oo Rε; post Eζ Mφ Oξ Ov Qγ Wι super<sub>3</sub>] *om.* Cη Eφ Rβ; *interlin.* Bγ
- 13-14 45 ... umbram] *om.* Cε 60 ... umbram] *om.* Pρ Pψ 60 ... 75] *marg.* Pλ
- 14 75] 7 Mγ; *add. gradus* Fβ Oη Xβ qui] *add. interlin.* scilicet finimus Vβ hore] *om.* Mδ 5<sup>te</sup>] *quinte many* quod] si Sβ ex regula] *om.* Bε Eα Eβ Eη Fα Fβ Fζ Lε Lγ Lη Mδ Mφ Mv Nδ Oζ Oξ Oτ Ov Pα Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Xβ ex] extra Vψ 6<sup>ta</sup>] *sexta many; 5 Sβ; 8<sup>a</sup> Pμ*
- 14-15 erit ... umbra] *om.* Aα
- 15 in] ex Nε Postea] post hoc or post hec *many*; deinde Fδ Mγ Oo Rε Vv eritque ... finis] *om.* Wι initium] finis Eδ; *add. finis* Qδ 6<sup>te</sup>] *sexte many; om.* Rβ; 8<sup>e</sup> Bκ hore] *interlin.* Mκ; *om.* Aα Bγ Bε Bι Bκ Cβ Cδ Cη Dγ Eα Eβ Ev Eo Ev Eφ Fβ Fδ Fζ Lγ Lε Lζ Lη Mδ Nα Nδ Oα Oζ Oπ Oτ Ov Pα Pθ Pλ Pμ Pν Pυ Pψ Qγ Qδ Qλ Qμ Rα Rβ Rδ Sβ Sθ Sκ Vε Vπ Vυ Vχ Vψ Xα Xβ hore finis] initium Eδ 7<sup>me</sup>] *septime many; om.* Qδ; *interlin.* Sκ; 8<sup>e</sup> Pγ
- 15-16 initium<sub>1</sub> ... 5<sup>te</sup>] *marg.* Oξ 6<sup>te</sup> ... initium<sub>1</sub>] *om.* Dη Eζ 6<sup>te</sup> ... initium<sub>2</sub>] *om.* Cε 6<sup>te</sup> ... initium<sub>3</sub>] *om.* Vα

the distance of [i.e., between] these points, and transfer this distance onto the rule [beginning] from the base of the above-mentioned vane which you have divided, as far as it will reach. And this same terminus will be the end of the second hour. Likewise place the rule on the shadow of 45 [degrees], next on the shadow of 60, after that on the shadow of 75, which is the end of the 5th hour. And what remains on the rule will be the 6th hour and it does not have an end on the rule.

Afterwards the shadow will go back the other way, and the beginning of the 6th hour will be the end of the 7th;

et initium 5<sup>te</sup> finis 8<sup>ve</sup>; et initium 4<sup>te</sup> finis 9<sup>e</sup>; et initium 3<sup>e</sup> finis 10<sup>e</sup>; et initium 2<sup>e</sup> finis 11<sup>e</sup>;  
et initium prime finis 12<sup>e</sup>.

20

Et si volueris extrahere umbras harum altitudinum ex tabula umbre, id est ex tabula altitudinis umbre per quam scitur umbra omnis altitudinis, fac, quia verius erit, si deus voluerit.

Item alia extractio etiam in positione horarum in regula levior prima, et omnes

- 16 5<sup>te</sup>] quinte *many* 5<sup>te</sup> finis] *om.* Pγ; *add.* erit Bγ Cη 5<sup>te</sup> finis 8<sup>ve</sup>] *om.* Pμ 5<sup>te</sup> ... initium<sub>3</sub>] *om.* Nε Wκ 8<sup>ve</sup>] octave *many*; septime Dγ initium<sub>2</sub>] *om.* Pγ; finis Mθ Oκ 4<sup>te</sup>] quarte *many*; *om.* Bα; prime Oμ; *add.* erit Nα finis<sub>2</sub>] initium Mθ Oκ 9<sup>e</sup>] none *many* 3<sup>e</sup>] tertie *many*; secunde Mη 10<sup>e</sup>] decime *many* et initium<sub>4</sub>] *om.* Pθ 2<sup>e</sup>] secunde *many*; *om.* Oπ; prime Vε; 3<sup>e</sup> Xα; 4<sup>te</sup> Oμ finis<sub>4</sub>] *om.* Bθ; *twice* Aα; initium Rδ 11<sup>e</sup>] undecime *many*; 13<sup>e</sup> Aα; linee Nα; *illeg.* Pγ
- 17 et initium<sub>4</sub> ... duodecime] *marg.* Vχ prime] 1<sup>e</sup> *some* finis] *twice* Pα 12<sup>e</sup>] duodecime *some*; 13 · 12 · Nε
- 18 Et] *add. in marg.* Secundus modus divisionis ei per tabulam umbre verse Eφ Et si volueris] *twice* Vv extrahere] *om.* Oμ harum] *om.* Bα Bζ; horarum Bκ Mη Sκ; hore Vv; *add.* horarum Cζ ex] et Sκ ex ... est] *om.* Nδ tabula] tabulis Vv; *add.* altitudinis Mδ umbre] *om.* Si id est] *om.* Ev; prime Aα
- 18-19 id est ... umbre] *om.* Eζ Lγ Mδ Pμ; *marg.* Po id est ... altitudinis<sub>2</sub>] *om.* Bα Cβ Cδ Cζ Cθ Eμ Ev Fα Mγ Mθ Mκ Mv Oα Oη Oκ Oμ Oo Oπ Oσ Pφ Pψ Qα Sθ Sλ Vα Vε Vv Vσ Vv Vχ
- 19 altitudinis] *add. and canc.* fac quia verius erit Vπ per] et Dγ quia] et Rε; quod Dη Fα Fζ Lη Oζ Oτ Ov Qβ Qγ Qδ Rβ Rδ Sλ verius] *corr. from* numerus Wι
- 19- 20 quia...voluerit] *om.* Bα; ut p<sup>ius</sup> Vε
- 20 si...voluerit] *om.* Aα Bα Bγ Bη Bθ Cη Ev Eφ Fδ Lγ Lζ Lη Mδ Oη Oo Pα Po Pq Pτ Pφ Tδ Vβ Vε Vv Vπ Vv Wβ; q~ sic u' equale Rε; si deus vult Rα; si volueris Mv; *add.* et c. Rδ; *add.* *Addendum* 5-1 Oη; *add.* *addendum* 5-2 Rδ
- 21 *before* Item] *add.* Aliud capitulum Cζ; *add.* De eodem per umbram Fδ Pτ Vv; *add.* Rubrica Oκ Oξ; *add.* Rubrica alia glasa Eo; *add. in marg.* Tertius modus divisionis allidada per quarta parte circuli Eφ alia] *om.* Mκ Vσ; *add.* horarum Sβ extractio] tractio Wι etiam in positione] eius impositione Qα; et impositio Bι Eα Eδ; est impositione Pδ; etiam impositione Bκ; etiam in compositione Vε; etiam positione Eζ; impositione Cζ Eμ Eφ Oμ Pα Pτ Pψ Vσ; in compositione Vβ; in impositione Bγ Bη Cη Wβ; ipsarum Sλ in<sub>1</sub>] *om.* Rδ in regula] *om.* Dη Rδ levior] brevior Mφ; deinde Vε; remor Sκ omnes] *om.* Xβ
- 21-22 Item ... eedem]<sup>2</sup> *om.* Bα Bζ Cδ Fδ Oα Oη Oo Oσ Pφ Si Vα Vv; *marg.* Cζ Mγ Sθ; Rubrica. Alia constituto horarum in regula levior prima secundum ad idem reddeunt Mθ Oκ; Sequitur de positione allidada horarie onū maiori omni Mv horarum ... eedom] *om.* Oμ et .. eedem] ad idem tamen rediens Sλ
- 21-23 Item ... tabulas] *marg.* Bθ
- 21-26 Item ... tabule,] *om.* Aα Ev Vπ

<sup>2</sup> Many mss treat this opening sentence as a rubric.

the beginning of the 5th will be the end of the 8th; the beginning of the 4th the end of the 9th; the beginning of the 3rd the end of the 10th; the beginning of the 2nd the end of the 11th; and the beginning of the first the end of the 12<sup>th</sup>.

And if you wish to extract the shadows of these altitudes from a shadow table, that is, from a table of the altitude of a shadow by which the shadow of every altitude is known, do so, since it will be more accurate (God willing).

Similarly, there is also another means of getting the position of the hours onto the rule, easier than the first. They all

25 redeunt in unum et sunt in opere eedem. Cum hoc volueris, scito longitudinem lineae regule, que cadit inter utrasque tabulas, immo solum usque ad clavum, quia convenientius est ut inter clavum sint omnes umbrae, et adde illi longitudini quatuor altitudines sive similitudines totius tabule a superficie regule usque ad summum ipsius

22 redeunt] repondent Vψ in<sub>1</sub>] ad Bθ Cβ Cζ Cθ Eμ Mκ Oπ Qα Qγ Vυ in unum] om. Lη et ... eedem] om. Qγ in<sub>2</sub>] add. eodem Qδ Rβ eedem] eadem Oπ Pψ; eodem Eo Oξ Nδ Pq; heedem Eα Fα Fβ Lγ Oζ Pθ Qβ Qλ Wβ; heedem Cε; regule Nα; add. Alia extractio inpositione horarum in regula Oπ(rubric) Cum] add. ergo Rε volueris] add. facere Bε Bη Cε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lε Lη Mδ Mφ Mυ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Qγ Qδ Qλ Rβ Rδ Sδ Vι Vχ(interlin.) Vψ Wα Wβ Wκ Xβ; add. hoc facere Tδ; add. scire Cη Lγ scito] om. Sι cito Mν lineae] om. Cδ Oη Pυ Sλ Vκ Vσ; hec Bζ; non Pq

22-28 longitudinem ... post hoc] twice in marg. Pq

23 regule] om. Sβ; prime Vε; recte Eα que cadit] om. Cδ Sλ cadit] cadunt Sι; radot Pq inter] in Nα utrasque] add. regulas Cι tabulas] dentulos Cδ Sλ; add. id est longitudo que est inter duas pinnulas regule debet plus [esse quam] quadrupla ad ipsam pinnulam ad unius quadrupla alioque non possunt fieri omne hore in regula Eμ immo] om. Mδ; ymmo many solum] om. Rδn Xα; solis Sβ clavum] om. Vψ quia] quod Dη

23-24 immo ... umbra] marg. Mκ quia ... clavum] om. Eη Pθ Rβ Wι; marg. Bε

23- 26 immo ... tabule,] om. Bα Bζ Bθ Cβ Cδ Cζ Cθ Eμ Ev Fδ Mγ Mθ Mκ Mν Oα Oκ Oμ Oο Oπ Oσ Pφ Pψ Qα Sθ Sι Sλ Vα Vε Vν Vσ Vυ Vχ immo ... plus] om. Oη

24 ut] om. Cε Dη Sκ clavum] add. et tabulam Dη omnes] om. Qβ; add. regule Pμ Pν illi] twice Pγ; ibi Uα quatuor] 4 many; 4<sup>or</sup> some

25 altitudines sive similitudines] longus(?) Eδ sive similitudines] om. Bε Cε Cι Eα Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mo Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pθ Pλ Pμ Pν Pq Qβ Qγ Qλ Qμ Rβ Sδ Sκ Tδ Uα Vι Vψ Wα Wι Wκ Xβ; interlin. Vβ tabule] add. interlin. pinule Bη a superficie regule] om. Nα Pυ Rε; interlin. Vβ superficie] summo Eτ Vα regule] twice Xβ ipsius] om. Bη Vβ; illius Xβ; add. regule Bκ

25-26 a superficie ... tabula,] om. Dη

go back to the same [idea] and work the same. When you wish [to do this], know the length of the line on the rule which falls between both vanes, more precisely only [the length] up to the pin,<sup>3</sup> since it is more fitting that all the shadows should be between the pin [i.e., between one vane and the pin] and add to that length 4 times the height (or the equivalent) of the entire vane from the surface of the rule right up to the top of this

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<sup>3</sup> "*Clavus*" – see Cap. 6, line 1.

tabule et si sit plus quatuor similitudinibus totius tabule cum summitatibus suis, bene est; et si sic non fuerit, non sit minus eis quatuor similitudinibus, quia finis quarte similitudinis est finis hore 5<sup>te</sup>. Post hoc pone ipsam lineam in tabula vel in pergameno

- 26 et sit ... totius] *rep. line 25* (a superficie ... ipsius) Pv et sit ... tabule<sub>2</sub>] *om.* Dγ Xα  
 et si sit plus] et si plus sit *some*; et sic Oμ; et si sic non fuerit non sit unus eius Qδ; sic plus *corr. interlin. to si plus sit* Qμ si] *om.* Aα Bα Bγ Bζ Bθ Bι Bκ Cβ Cζ Cθ Eδ Eζ Eζ Eμ Ev Eo Ev Eφ Fβ Fδ Lζ Mγ Mη Mθ Mκ Mλ Mo Mv Nα Oα Oη Oκ Oo Oq Oσ Pα Pθ Po Pv Pφ Pψ Qλ Rα Rε Sβ Sθ Sι Sκ Sλ Uα Vα Vβ Vκ Vν Vπ Vσ Vυ Vχ Wι sit] *om.* Cι Nε Pδ Qα Vψ Wα Wκ; fuerit Bη Cε Cη Dη Wβ; sic Eo Lζ Mη Mo Nα Pγ; sint Cζ Sι plus] *om.* Oη; *add.* quam Bθ Ev Vπ quatuor] 4 *many*; *iiii<sup>or</sup> some*; *om.* Vσ Wβ similitudinibus] *add.* altitudinis Pq totius] conus Fα Fβ Lε Oζ Ov Pα Pλ Pμ Pq Pψ Qβ Qδ Qλ Rβ; covus Oξ; *add.* id est conus Pθ(*marg.*); *add. interlin.* conus Bε; *add. interlin.* id est pinnule Mκ totius ... summitatibus] *om.* Eo tabule<sub>2</sub>] *om.* Mκ; *add.* id est pinnule Cζ Eμ(*interlin.*); *add.* sive dentuli Cδ Sλ cum] *om.* Mv summitatibus] foraminibus Aα Bε Bθ Cδ Cζ Eα Eβ Eη Ev Ev Fδ Fζ Lγ Mγ Mδ Mθ Mκ Oα Oη Oκ Oμ Oξ Oo Oσ Ov Pθ Pλ Pv Po Pq Pφ Pψ Qα Qγ Qδ Qλ Rβ Sδ Sθ Sι Sλ Tδ Vα Vε Vν Vπ Vσ Vυ Wα; *add. interlin.* in alio foraminibus Mκ Vβ suis] *om.* Qλ Lγ; *add.* id est longitudo que est inter 2 pinnulas regule debet plus esse quam quadrupla ad ipsam pinnulam ad unius quadrupla alioque non possunt fieri omne hore in regula Cζ bene est] *om.* Rε
- 26-27 totius ... similitudinibus] *om.* Pτ cum ... est] *om.* Mv suis ... similitudinibus] et si scito fut ut minus 4 Bα summitatibus ... est<sub>2</sub>] *marg.* Wα bene est] *om.* Aα Bγ Bζ Bη Bθ Bι Bκ Cβ Cδ Cε Cζ Cη Cθ Dη Eδ Eζ Eμ Ev Eo Eτ Ev Eφ Fβ Fδ Lζ Mγ Mη Mθ Mκ Mλ Mo Nα Oα Oη Oκ Oμ Oo Oπ Oσ Pα Pγ Pδ Po Pv Pφ Pψ Qα Qλ Rα Sβ Sθ Sι Sκ Sλ Uα Vα Vβ Vε Vκ Vν Vπ Vσ Vχ Vυ Vψ Wβ Wι Wκ Xα; *marg.* Qμ; bene Bε
- 27 non] noti Aα fuerit] *add.* ut Qδ non sit] *om.* Vε sit] sunt Sι minus] *om.* Eo; minor Cδ Oμ; maius Oη; unus Cη Qδ Rβ Vβ Wβ eis] *om.* Aα Bζ Bθ Bι Cβ Cζ Cθ Dγ Eδ Eζ Eμ Ev Eo Lζ Mθ Mκ Mλ Mv Oα Oη Oκ Oπ Oσ Pτ Pφ Pψ Qβ Vα Vε Vκ Vν Vπ Vσ Vυ Vχ; ei Vπ; ei Vπ; eius Mγ Rα Sλ; eius *corr. to eis* Rβ; *add. interlin.* al' eius Vβ quatuor] *om.* Mγ; 4 *many*; 8 Nα; et Oμ; *add.* eius Aα Bζ Bθ Bι Cβ Cζ Cθ Dγ Eμ Eo Ev Lζ Mθ Mκ Mλ Oα Oκ Oo Oπ Oσ Pτ Pφ Pψ Qα Vα Vν Vσ Vχ; *add.* sanu or sami Wα; *add. interlin.* aliter eius Vβ quia finis quarte] *twice* Pγ finis] *om.* Nε Wκ quarte] 4<sup>e</sup> *many*; quatuor Oη; 5 *corr. from* 4<sup>e</sup> Vπ
- 27-28 quia ... similitudinis] *om.* Vε
- 28 similitudinis] similitudinum Cζ Eμ Mθ Oη Oσ est] *twice* Mη; quia Lη est finis] *om.* Ev Pα est finis horis] *om.* Fβ Qλ; *marg.* Wα finis] linis Pμ 5<sup>te</sup>] prime Vπ; *add.* et parvum plus Cζ Eμ(*interlin.*) Oη Post hoc] Postea *many* pone] *twice* Bι; pones *many*; ponemus Pα; ponis Rδ ipsum] *om.* Xα in] *om.* Rδ pergamenol] parcameno Ev Oη; pargameno Mδ Mη Mλ Qβ Vβ Vν; percamemo Cβ; percameno Cζ Cθ Eμ Mκ Mv Oπ Vκ; percameno Oκ
- 28-29 Post hoc ... volueris] *om.* Pθ in<sub>1</sub> ... lineam] *om.* Mγ



vane, and if it [i.e., the length along the rule] is more than 4 equivalents of the whole vane up to its top, that meets with my approval.<sup>4</sup> And if it be not so, it should not be less than these 4 equivalents, since the end of the 4th equivalent is the end of the 5th hour. After this lay out this line on a surface or on parchment

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<sup>4</sup> This is an awkward way of warning that the last mark will be along the alidade (from the vane) about 4 times the height of the vane, and therefore the height of the vane when made should be less than one quarter of either the length of the alidade between the vanes, or the length of the alidade from the central axis to the sighting vane, in order for the last engraved line to fit onto the alidade or to fit between the vane and the pin, whichever is more convenient.

30 vel in quo volueris. Deinde extrahe ex summitate linee lineam super erectum angulum, et accipe ex eo secundum quantitatem tabule, et scito ipsum punctum et extrahe ex eo puncto lineam super angulum erectum quousque volueris.

Deinde pone punctum qui est finis tabule cuspidem et mensura quamlibet longitudinem quam volueris, et fac quartam partem circuli. Post hec divides ipsam

- 29 vel ... volueris] *om.* Βα vel] aut Cβ Cζ Cθ Εμ Εν Fδ Mθ Μκ Μν Oα Oη Oκ Oμ Oπ Oσ Pφ Pψ Qα Rε Sθ Σλ Vα Vν Vσ Vυ Vχ in quo volueris] *om.* Βα; alio Bκ Cι Dγ Dη Eτ Lζ Mη Μλ Mo Ne Oo Pγ Qμ Rδ Vκ Wι Wκ; in alio Bγ Bη Bι Cε Cη Eδ Eζ Eφ Nα Oμ Pδ Po Pτ Pυ Qδ Qλ Rα Rβ Sκ Vψ Wβ Xα; in alio in quo volueris Bε Eα Eη Lγ Lη Mδ Nδ Oξ Oτ Oυ Pα Pμ Pν Pρ Qβ Qγ Rε Sδ Tδ; in alio quo volueris Eβ Fβ Oζ Πλ Vβ Xβ; in aliquo in quo volueris Fα Fζ Lε Mδ; qua voluerit Ev; in quo Sβ; in quo vis Mυ Mφ Vι extrahe] *om.* Ev ex] *om.* Oη; a Bε Eα Eβ Eη Fα Fβ Fζ Lγ Lη Mδ Mυ Nα Oζ Oξ Oτ Oυ Πλ Pμ Pρ Qβ Qγ Qλ Sδ Tδ Vι Wα summitate] summitatem id est extremitatem Oη; *corr.* to id est extremitate Εμ(*interlin.*); *add.* id est extremitate Μκ(*interlin.*) linee] *om.* Oη Rδ lineam] hanc Bζ erectum] rectum Bζ Cδ Fβ Pν angulum] *add.* ut hic patet Εμ(*interlin.*) Mθ Oκ
- 29-31 angulum ... angulum] *marg.* Vβ
- 30 ex eo<sub>1</sub>] *om.* Ev eo<sub>1</sub>] ea Vχ secundum] *om.* Bζ secundum ... ex eo<sub>2</sub>] *om.* Pμ quantitatem] compositionem Cδ; *add.* regule Xα tabule] *add.* perforate Pφ; *add.* pinule Oκ; *add.* *interlin.* id est pinnule Εμ scito] cito Mν ipsum] *add.* scilicet Rδ punctum] *om.* Eτ Uα extrahe] accipe Cε Dη eo<sub>2</sub>] ipso Bζ Qβ Qγ Sβ Xβ; *add.* scilicet Vβ
- 30-31 et<sub>1</sub> ... erectum] *om.* Nα ex eo puncto] *om.* Cζ Εμ Mθ Μκ Oη Oκ Vσ
- 31 puncto] *om.* Βα Cδ Fδ Mγ Μκ Μν Oμ Oo Oπ Pψ Qα Sθ Σι Σλ Vα Vν; etiam Cβ Cθ Ev Vχ; ibi Oσ Vυ; ibi *corr.* to puncto Oα lineam] *add.* hanc Cζ Εμ Mθ Oη Oκ; *add.* *and del.* hanc Μκ; *add.* unum in continuum et iterum extensverso(?) Tendendo in oppositum regule sed equedistet Σι angulum] punctum Rε erectum] rectum Βα Ev Pν
- 32 pone] ipsum Cδ Εμ Fδ Mθ Μκ Μν Oκ Oμ Oo Pφ Pψ Σι Σλ Vα Vν Vσ; *add.* angulum Pφ; *add.* ipsum Bζ Cζ Oη Sθ punctum] *add.* ipsum Eφ cuspidem] *add.* pone Bζ Cδ Εμ(*interlin.*) Eφ Fδ Mγ Mθ Μκ Μν Oκ Oμ Oo Pφ Pψ Σι Σλ Vα Vσ Vν; *add.* centrum Cζ; *add.* id est centrum Εμ(*interlin.*) Μκ(*interlin.*) Oη mensura] mensurare Cβ Cθ Εμ Eo Mθ Μν Oη Oκ Oπ Oσ Pψ Qα Vα Vε Vκ Vσ Vχ; mensurare *corr.* to mensura Oα quamlibet] *add.* cuitus Lε
- 33 longitudinem] altitudinem Xα; magnitudinem Πλ quam] *om.* Cε Nδ quam volueris] *om.* Pρ Rα volueris] *add.* in linea lineam Ev partem] *om.* Βα Post hec] Post many; Deinde Cδ Σλ; Postea Bε Nα; quam Βα ipsam] *om.* Vσ ipsam quartam] *om.* Βα

or on whatever you wish. Then from the end of the line draw a line at right angles, and take from this, according to the size of the vane, and know [i.e., mark] that point; and draw from this point a line on the right angle as far as you wish.

Then, using this point, which is at [i.e., marks] the end of the vane, as centre, and measuring as much length as you wish [i.e., with any radius] draw a quarter circle. After this you will divide this

35 quartam per 6 partes equales; deinde iunge divisiones punctos scilicet eorum cuspidi, et extrahe lineas quousque perveniant ad dictam lineam linee, id est usque ad regulam, et quocumque se abscondant ipsa erunt puncta horarum: prime videlicet 2<sup>de</sup>, 3<sup>e</sup>, 4<sup>te</sup> ac 5<sup>te</sup>; et initium 6<sup>te</sup> est finis 5<sup>te</sup>, quia 6<sup>te</sup> nullum habet finem. Cumque reversa fuerit umbra,

34 quartam] *om.* Bε Nε Sδ; partem Cε Qβ; *add.* partem Oη Ov Pθ Vκ Vσ Vχ quartam per] in Wκ per] in Bκ; partem in Vα 6] 16 *corr. to* sex Bη; 60 Mγ deinde] dorsi Vε divisiones] *om.* Eα punctos] *om.* Vυ; positiones Eδ; punctis Wβ scilicet] videlicet Aα Bθ Eo Ev Vπ; *add.* circum Mv; *add.* divisiones Eα eorum] earum Aα Bη Bθ Bι Cβ Cζ Dγ Dη Eδ Eζ Eμ Ev Eo Et Ev Fδ Lζ Mγ Mθ Mκ Mλ Mv Mo Nα Oα Oη Oκ Oξ Oo Oπ Oσ Po Pv Pτ Pφ Pψ Qα Qδ Rα Rβ Rε Sλ Uα Vα Vβ Vε Vκ Vv Vπ Vσ Vυ Vχ Wι Wκ Xβ; *add.* iunge Cβ Oα Oπ Oσ Vε Vχ cuspidi] *add.* iunges Eo

35 quousque] *add.* volueris Lγ perveniant] pervendis Eo; pervenerant Bα Bζ Cδ Fα Fδ Lγ Lζ Oη; pervenerat Xβ; pervenerint Bγ Bθ Bι Cε Cη Dγ Dη Eφ Mη Mλ Nα Pγ Pθ Po Pτ Pv Qδ Rβ Uα Vβ Vπ Wβ; pervenerit Bη Eδ Eζ Ev Mo Vε Vκ; pervenerunt Aα Et Pδ; *add. interlin.* al' pervenerint ad linea regule Vβ ad<sub>1</sub> ... regulam] *illeg.* Cι; ad dictam lineam a radice, id est usque ad regulam Pα; ad dictam lineam ad lineam ductam id est ad regulam Bζ; ad dictam lineam id est ad regulam Bα; ad dictam lineam linee et ad regule Mγ; ad dictam lineam linee id est ad regulam Fδ Oo Re Vv Vυ; ad dictam lineam linee regule id est usque ad regulam Qδ Rβ; ad dictam lineam linee regule id est usque ad secundam Pq; ad lineam regule Vχ; item linee regule id est usque ad regulam Ne; linee ad dictam lineam et ad regulam Mθ Oκ Si; linee ad dictam lineam id est ad regulam Cδ Cζ Eμ Mκ Mv Oα Oη Oμ Oσ Pφ Pψ Qα Sθ Vα Vσ; linee ad dictam regulam Cε Dη; linee id est usque ad regulam Rδ Sκ; linee illius id est usque ad regulam Qμ; linee in regula id est usque ad regulam Nα; linee recte id est ad regulam Cβ Dγ Lζ Sβ; linee recte id est usque ad regulam Eδ Pγ Wι; linee regule Bγ(*after* linee *add. interlin.* usque ad) Bη Cη Ev Eφ Oπ Pτ Wβ; linee regule id est ad regulam Bθ Bι Bκ Cθ Eo Ev Mη Mλ Rα Vκ Vπ Vψ; linee regule id est usque ad regulam Aα Eζ Et Mo Pδ Pθ Po Pτ Pv Uα Vβ Xα; usque ad regulam Wκ

36 quocumque] quecumque Mη Mλ Rα Sκ; quodcumque Oη; ubicumque Qδ Rβ Rε; *add.* loco Qα Vχ(*interlin.*) se abscondant] scilicet Sι ipsa] *om.* Mv erunt] *add.* pro Pμ puncta] *om.* Vψ horarum] hore Dη Sι prime] *om.* Cζ Oη Vπ prime 2<sup>de</sup>] scilicet Sι videlicet] *om.* Cδ Cε Dη Mγ Sλ Vv; scilicet Bα Cζ Cθ Eμ Ev Fβ Mκ Mv Oα Oη Oπ Pψ Qα Rε Sθ Vε Vσ Vυ Vχ; *add.* et some 2<sup>de</sup>] secunde some; *add.* et some 3<sup>e</sup>] tertie some; *add.* et some 4<sup>te</sup>] *om.* Bθ Nα Vπ; quarte some ac 5<sup>te</sup>] *om.* Ev Pμ 5<sup>te</sup>] quinte some; *add.* et 6<sup>te</sup> or et sexte Bζ Fβ Fδ Mγ Oo Pα Rε Vv

37 et] item Oπ et ... 5<sup>te</sup>] *om.* Aα Bθ Vπ est] *om.* Wκ quia] *om.* Mη Pq 6<sup>te</sup> 1] sexte some; quinte Nα; *add.* hore Ev 5<sup>te</sup>] quinte some; 7<sup>e</sup> Nδ; et prime Vυ 6<sup>te</sup> 2] sexte some; 8<sup>e</sup> Mδ; gradus Fζ nullum] multam .d. Cθ fuerit] erit Oπ umbra] *om.* Fζ; *add.* ex altiori summitate erit hic finis (*repeat, cf. line 40*) Nα Rε; *ms* Eφ *ends*

37-40 Cumque ... est] *om.* Vπ

quarter circle into 6 equal parts. Then join the division points with their centre [i.e., the centre of the quarter circle] and extend the lines until the lines reach the aforesaid line, that is, as far as the rule. And wherever they cut off, these will be the points [i.e., divisions] of the hours; that is, the first, second, third, fourth and fifth; and the beginning of the sixth is the end of fifth since the sixth has no end. And when the shadow is reversed

40 ostendet tibi reliquas horas. Si autem fuerit linea sicut quatuor similitudines totius tabule, erit finis 5<sup>te</sup> hore apud radicem secunde tabule (et apud clavum, quod convenientius est). Cumque reversa fuerit umbra ex altiori summitate, erit hic finis 6<sup>te</sup> hore et initium 7<sup>me</sup>; et cum reversa fuerit ad finem 5<sup>te</sup>, erit finis 7<sup>me</sup> et initium 8<sup>e</sup>; et cum

- 38 ostendet] ostendetque Rε; ostium debet Mθ [cf. Οκ (ostñ | d3)] tibi] *illeg.* Vψ; *om.* Βα; tibibi Σκ; *add.* regula Rε reliquas] *om.* Σι; alias Eα reliquas horas] reliqua Cζ Sθ Vυ; regula Bζ Fδ Mγ Mθ Oη Οκ Οο Sλ horas] *om.* Βα Bζ Cβ Cζ Ev Mκ Mv Oα Oπ Pψ Qα Vα Vv Vχ Vψ Wι; *add.* post meridiem Bζ Pφ fuerit] *add.* tibi Cβ Cθ linea] *om.* Oη; *marg.* Rα; umbra Βα sicut] sic Bκ quatuor] 4<sup>or</sup> many similitudines] *add.* vel sic si autem fuerit umbra sicut 4 similitudines Βα totius] *add.* *interlin.* id est pinnule Eμ Mθ; *add.* scilicet pinnule Οκ
- 38-40 ostendet ... umbra] *om.* Αα Bθ Ev Vπ
- 39 tabule<sub>1</sub>] tabella Pψ Vχ; umbre Βα; *add.* *interlin.* pinnule Eμ Mκ erit] erunt Pγ Pδ Qμ Rδ Vψ erit ... tabule<sub>2</sub>] *om.* Eζ 5<sup>te</sup>] *quinte many* apud<sub>1</sub>] *om.* Cι Eα Eη Fα Lη Mδ; ad Bε Eβ Fζ Lε Mη Mv Mφ Nδ Oτ Pδ Pθ Pλ Pμ Pρ Qγ Qβ Qμ Rδ Sδ Tδ Vψ Wα Wκ Xβ; *apud some*; aut Oμ secunde] 2<sup>e</sup> *some*; *om.* Bε Eα Eβ Fα Fδ Fζ Lγ Lε Lη Mδ Nδ Oζ Oξ Oτ Oυ Pα Pλ Pμ Pν Qγ Sδ Tδ tabule<sub>2</sub>] *tabelle* Vχ et] et sic Bγ Cη Pτ; *om.* Pμ; vel Bε Bζ Eα Eβ Eη Fα Fζ Lγ Lε Lη Mδ Nδ Oζ Oξ Oτ Oυ Pλ Pν Pρ Qβ Qγ Qδ Rβ Sδ Tδ Xβ apud<sub>2</sub>] hanc Nε quod] *om.* Dη; qui Qλ; qui est Pα; et Eτ Σκ Uα
- 39-40 et ... est] *om.* Βα Cβ Cδ Cζ Cθ Eμ Ev Fδ Mγ Mθ Mκ Mv Oα Oη Οκ Ομ Οο Oπ Oσ Pφ Pψ Qα Sθ Sι Sλ Vα Vε Vσ Vυ Vχ
- 40 reversa] versa Wβ umbra] *om.* Nα; *corr. from* tabula Cζ ex] ac Cη; ab Bγ Bη Wβ erit] erunt Cη hic] *om.* Cζ Eμ Mδ Nδ Oη; hoc *some*; hore Rδ; ibi Pρ; is Vα 6<sup>te</sup>] *sexe many*; 8<sup>e</sup> Αα Eδ Eτ Mv Mo Nα Pγ Σκ Uα Vκ Xα; 8<sup>e</sup> *corr. to* 6<sup>te</sup> Cβ Eζ
- 41 hore] *om.* Αα Βα Fδ Mγ Mv Oμ Oο Sθ Sι Sλ Vv Vυ et<sub>1</sub>] cum Dη 7<sup>me</sup> <sub>1</sub>] *septime some*; 4<sup>e</sup> Sβ; *add.* et initium Xα et<sub>2</sub> ... et<sub>3</sub>] *om.* Cη Wβ; *marg.* Bγ Bη; et Vε cum<sub>1</sub>] *om.* Oπ Xβ reversa] *om.* Bε Cι Eα Eβ Eη Fα Fβ Lγ Lε Lη Mδ Mη Mv Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qγ Qλ Rδ Sδ Tδ Vι Vψ Wα Wκ Xβ 5<sup>te</sup>] *quinte some*; 3<sup>e</sup> Pγ; *add.* hore Qδ Rβ finis] initium Bζ erit] est Lγ Pν Qβ Sδ Wκ; fuerit et Dη 7<sup>me</sup> <sub>2</sub>] *septime some*; *add.* hore Fβ et<sub>3</sub>] cum Dη initium<sub>2</sub>] *add.* 4 erit Pμ 8<sup>me</sup>] *octave some*; 4 Vε
- 41-42 5<sup>te</sup> ... finem<sub>1</sub>] *om.* Tδ 7<sup>me</sup> <sub>2</sub>] ... finis<sub>1</sub>] *om.* Fδ Vα et initium 8<sup>e</sup> ... 8<sup>e</sup>] *om.* Eo et cum<sub>2</sub> ... 8<sup>e</sup>] *om.* Eη; *marg.* Bε
- 41-44 cum<sub>2</sub> ... 12<sup>e</sup>] sic secundum ordinem Bκ

it will show you the rest of the hours. If, however, the line is as 4 equivalents of the whole vane, it will be the end of the 5th hour near the base of the second vane (or near the pin which is more appropriate). And when the reversed shadow is along the upper edge, this will be the end of the 6th hour and the beginning of the 7th; and when the reversed [shadow] is at the end of the 5th it is the end of the 7th and the beginning of the 8th; and when it reaches the end of the 4th it will be the end of the 8th and the beginning of the 9th; and when

pervenerit ad finem 4<sup>te</sup>, erit finis 8<sup>e</sup> et initium 9<sup>e</sup>; et cum pervenerit ad finem 3<sup>e</sup>, erit finis 9<sup>e</sup> et initium 10<sup>e</sup>, et cum pervenerit ad finem 2<sup>de</sup>, erit finis 10<sup>e</sup> et initium 11<sup>e</sup>; et cum pervenerit ad finem prime, erit finis 11<sup>e</sup> et initium 12<sup>e</sup>.

- 42 pervenerit<sub>1</sub>] venerit Rβ ad<sub>1</sub>] *add.* .9. Cι; *add.* none Vψ 4<sup>te</sup>] quarte *some* 4<sup>te</sup>  
 ... ad finem<sub>2</sub>] *om.* Pα Qδ erit] ·0· erit Nε finis<sub>1</sub>] initium Qα 8<sup>e</sup>] octave  
*some; om.* Vε 8<sup>e</sup> ... finis<sub>2</sub>] *om.* Xα et initium 9<sup>e</sup>] *om.* Qβ initium<sub>1</sub>] finis Qα  
 9<sup>e</sup>] none *some; add.* et initium 8<sup>e</sup> Wβ; 7<sup>e</sup> *corr.* to 9<sup>e</sup> Bη pervenerit<sub>2</sub>] venerit Aα Bθ  
 Eυ Rβ Vπ ad finem<sub>2</sub>] *om.* Bα 3<sup>e</sup>] tercię *some; 4<sup>e</sup>* Bθ Vπ
- 42-43 et<sub>2</sub> ... 9<sup>e</sup>] *om.* Pq et<sub>2</sub> ... 10<sup>e</sup>] *om.* Sk 3<sup>e</sup> ... finem] *om.* Cζ Eμ Eτ Mo Pγ Pv Uα Vα Vυ  
 3<sup>e</sup> ... 2<sup>de</sup>] *om.* Nα finis 9<sup>e</sup> et] *om.* Cθ Eν Mθ Mν Oα Oη Ok Om Oπ Oσ Pψ Qα Sθ  
 Wβ
- 42-44 3<sup>e</sup> ... 12<sup>e</sup>] secunde erit initium prime Fδ; secunde prime erit initium Oo
- 42-46 et<sub>1</sub> ... figura] *repeated in marg.* Oo (*fol.* 45<sup>v</sup>)
- 43 9<sup>e</sup>] none *some* 9<sup>e</sup> et] *om.* Cβ et<sub>1</sub>] ad Eζ; cum Dη et<sub>1</sub> ... 10<sup>e</sup><sub>1</sub>] *om.* Mκ  
 10<sup>e</sup><sub>1</sub>] decime *some; 8<sup>e</sup>* Vε Wβ et cum<sub>1</sub>] cum ergo Pα; cum vero Cι Eα Eβ Eη Fα  
 Fζ Lγ Lε Lη Mδ Mη Mυ Mφ Nδ Nε Oζ Oτ Ou Pθ Pμ Pν Pq Qβ Qγ Qλ Qμ Rδ Sδ Tδ Vι  
 Wα Wι; cumque Bα et cum<sub>1</sub> ... 10<sup>e</sup><sub>2</sub>] *om.* Cε pervenerit] venerit Aα Bθ Qδ Rβ  
 Sk Vπ 2<sup>de</sup>] secunde *some; 3<sup>e</sup>* Vπ; octave Eν Oπ erit finis 10<sup>e</sup>] *om.* Qλ; *marg.* Wα  
 finis 10<sup>e</sup> et] *om.* Cζ Cθ Eμ Eν Oα Oη Ok Oπ Oσ Oψ Qα Sθ Vα Vυ 10<sup>e</sup><sub>2</sub>] decime  
*some* et<sub>3</sub>] cum Dη initium<sub>2</sub>] principium Bε Fβ Fζ Lε Lη Mδ Nδ Oζ Oξ Ou Pα  
 Pλ Pμ Pq Qβ Qλ Sδ Tδ Wα 11<sup>e</sup>] undecime *some; secunde* Vψ; 2 *corr.* to 11 Oξ; 13 Oτ  
 et cum<sub>2</sub>] cum vero Aα Bθ Bι Cε Dη Eδ Eζ Eτ Eυ Lζ Mλ Nα Pγ Po Pv Qδ Rβ Sβ Vα  
 Vβ Vκ Vπ Xα; cumque Bα Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mυ Mφ Nδ Nε Oζ Oξ Oτ  
 Ou Pα Pδ Pθ Pλ Pμ Pν Pq Qβ Qγ Qλ Sδ Tδ Vν Wα Wκ Xβ
- 43-44 erit ... ad] *om.* Mη; *marg.* Mκ et initium 11<sup>e</sup> ... prime] *marg.* Wu (*add. in marg.* erit finis  
 11<sup>e</sup>) et cum<sub>2</sub> ... 11<sup>e</sup>] *om.* Sk
- 44 pervenerit] *om.* Oπ; venerit Aα Bθ Qδ Rβ Sλ Vπ finem] faciem Aα; *add.* erit finis Pγ  
 prime] 1<sup>e</sup> *some; 2<sup>e</sup>* Vπ finis] *om.* Nε; *add.* Xα 24 lines (*fol.* 94<sup>ra</sup>), marked "va...cat"  
 finis 11<sup>e</sup> et] *om.* Bζ Cβ Cζ Cθ Eμ Oη Ok Om Oπ Oσ Pψ Qα Sθ Sλ Vα Vυ 11<sup>e</sup>] undecime  
*some; 12<sup>e</sup>* Nα; secunde Pq Vψ et initium] *om.* Eν; *marg.* Sθ 12<sup>e</sup>] duodecime  
*some; om.* Vν; 13<sup>e</sup> Nα; *add.* si deus voluerit Bζ Cβ Cδ Cζ Cθ Eμ Eν Eo Mθ Mκ  
 Mν Oα Oη Ok Om Oπ Oσ Pψ Sθ Sλ Vσ Vχ
- 45 mutabis] circinabis Bα Cδ Eμ Fδ Mγ Mκ Mν Oη Ok Om Oo Pφ Sλ Vν Vσ; circulabis Rε;  
 initiabis Pψ; initiabis scilicet circinabis Oα Oσ Sθ Vα Vυ; sirtinabis Sι; *add.* in Vχ  
 pone] propone Oτ iuxta] circa Vχ



it reaches the end of the 3rd it will be the end of the 9th and beginning of the 10th; and when it reaches the end of the 2nd it will be the end of the 10th and the beginning of the 11th; and when it reaches the end of the first, it will be the end of the 11th and the beginning of the 12<sup>th</sup>.

45 Post hec mutabis horas cum circino in regulam et pone initium regule iuxta radicem tabule, quemadmodum vides in hac figura.

45-46 Post ... figura] *om.* Qα; Sed mutabis horas ex percamento vel aloco in quo eas signasti cum circino in regule sicut sunt in percamento vel alia materia Pδ

46 tabule] tabelle Bγ Bι Bκ Cδ Cε Cθ Cι Dγ Dη Eδ Eζ Ev Eo Eτ Lζ Mη Mo Mv Nε Oπ Pγ Pθ Po Pv Pψ Sι Sλ Uα Vβ Vχ Wκ Xα; *add.* vel tabelle Vα quemadmodum] sic Cε; sicut Aα Bθ Bι Bκ Cδ Cι Dγ Dη Eδ Eζ Ev Eτ Ev Lζ Mη Mλ Mo Nα Nε Pγ Pδ Pθ Po Pv Qδ Qμ Rα Rβ Rδ Sβ Sκ Uα Vκ Vπ Vψ Wι Wκ Xα; *add.* et in regula prefiguratur ut Mθ Oκ quemadmodum ... figura] *om.* Bα quemadmodum vides] ut patet Bγ Bη Cη Pτ Wβ hac] *om.* Aα Bη Bθ Eτ Ev Nα Pδ Uα Wκ; precedenti Rδ; presenti Dη; subiecta Fδ Mγ Oo Rε Vv figura] *om.* Eo; *add.* et cetera Pλ; *add.* et(scilicet Cζ) in regula prefigurata Cζ Eμ Mκ Pψ; *add.* inferius posita Fα; *add.* istius eiusdem facies Fβ; *add.* scilicet in prima prefigurata Oη; *add.* sequenti Pτ; *add.* superiore Eτ Uα; *ms* Wκ ends

After this you will transfer the hours with a pair of compasses onto the rule and place the beginning of the rule [i.e., the scale of hours] against the base of the vane, just as you see in this figure.

## [ ADDENDUM 5-1 ]

Bη(marg.) Εμ(marg.) Μκ(marg.) Οη(after line 20) Οξ(marg.) Ου(marg.) Ρα(marg.) Qμ(marg.)

Nota quod punctus dicitur hic 12<sup>a</sup> pars alicuius diei et cum umbra fuerit 12 punctorum, erit equalis sue diei. Et cum fuerit umbra 6 punctorum erit medietas linee diei et sic de aliis partibus. Intellige super quod umbra fuerit plurium punctorum aut paucorum.

- 47    hic] *om.* Οξ Ου Ρα Qμ            diei] rei diei Qμ; vel Bη            et] unum Οξ Ρα
- 48    sue diei] sue lé lizieí Ρα; sue rei Qμ            Et] Si Qμ            umbra] *om.* Οη Qμ            linee]  
       sue Εμ Μκ Οξ Ου Ρα            diei<sub>2</sub>] rei Qμ
- 48-49    linee ... aliis] suc lineus perconius Bη
- 49    Intellige ... paucorum] *om.* Qμ            super] secundum Bη Μκ Ου Ρα            aut]vel Οξ Ρα  
       paucorum] pauciorum Εμ

## [ ADDENDUM 5-1 ]

Note that here a point is said [to be] a twelfth part of a day, and when the shadow comprises 12 points, it will be equal to the particular day. And when the shadow contains six points, the mid-point of the line will be [the middle point] of the day and so on regarding the other parts. Understand further that the shadow will consist of more or few points.

[ ADDENDUM 5-2: TABULA ]<sup>5</sup>

Bζ Bε Bι Eδ Eζ Eη Eμ Eτ Eυ Eφ Fα(*later hand*) Lε Lζ Mη Mθ Mκ Mλ Mo Oη Oκ Oξ Oτ Oυ Pθ Pλ  
Po Pv Qγ Qδ Qλ Qμ(*marg.*) Rα Rδ Rε Sβ Vβ Vχ Wβ Wκ Xα Xβ

## 50 TABULA UMBRE VERSE PER QUAM CONSTITUES HORAS IN REGULA

	Gradus	Puncta	Minuta
	15	3	13
	30	6	56
	45	12	0
55	60	20	47
	75	44	46
	90	infinita	

50 Tabula ... regula] *om.* Eδ; Tabula umbra recta Bε Tabula] Sequitur tabula Rδ  
umbre] *om.* Rε in regula] *om.* Fα; *add.* [*illeg.*] supra patet Rδ

51 gradus] Ğ or ġ *many*; altitudo Oτ; gradus altitudinis Eμ Mκ Oη Oκ Vβ punta] P<sup>a</sup> or  
p<sup>a</sup> *many* minuta] M<sup>a</sup> or m<sup>a</sup> or mi<sup>a</sup> *many* *add.* 5o<sup>c</sup> [=Hore?] Eη; hō allidade Bε

52 15 44 46 5 Bε Eη

53 30 20 47 4 Bε Eη 56] 16 Wκ; 46 Oη

54 45 12 0 3 Bε Eη 12] 22 Xα 0] 12 Qδ Wκ

55 60 6 56 2 Bε Eη 47] *corr. from* 43 Bζ

56 75 3 13 1 Bε Eη

57 90 infinita] *om.* Bζ Bι Eδ Eζ Eμ Eτ Eυ Eφ Lζ Mη Mλ Mo Po Pv Qμ Rα Rε Sβ Vχ Wβ Xα; 30  
0 0 Pλ; 90 0 0 Fα Lε Oξ Oτ Oυ Pθ Pq Qγ Qδ Qλ Rδ Wκ Xβ; 90 0 0 0 Bε Eη  
infinita] umbra infinita Oκ

<sup>5</sup> Mss Bε Eη: 4 columns; col. 1 normal; col. 2-3 reversed (top to bottom); col. 4 numbered from bottom to top. Ms Pθ: the left column of the table is not visible because of the tight binding.

## [ ADDENDUM 5-2: TABLE ]

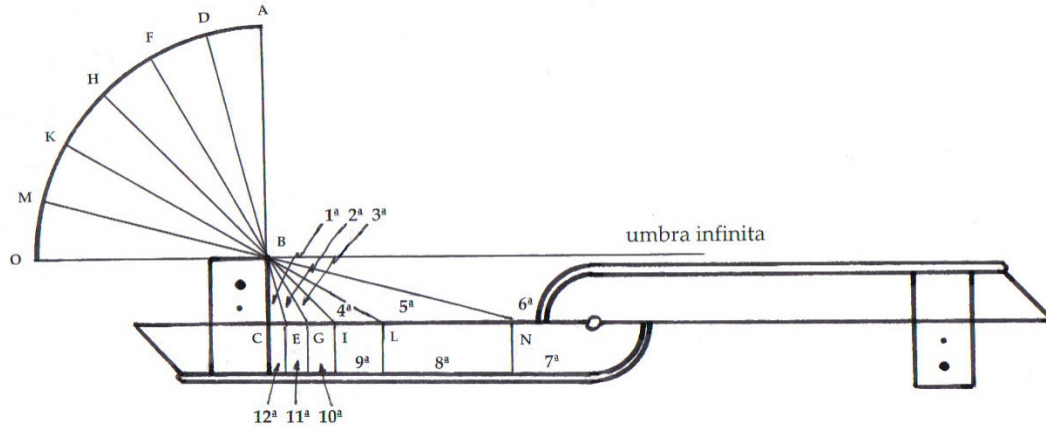
TABLE OF REVERSE SHADOW[S] BY WHICH YOU  
WILL POSITION THE HOURS ON THE RULE

Degrees [of the sun]	Points <sup>6</sup> [along the rule]	Minutes
15	3	13
30	6	56
45	12	0
60	20	47
75	44	46
90	infinite	

---

<sup>6</sup> Each point is one twelfth the height of the vane.

[ FIGURA 5 ]



Allidada horaria / The alidade of the hours

[Complete diagram] Bγ (reversed) Bε Bη Bι Bκ Cη Cι (reversed) Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ  
Lε Lζ Lη Mη Mκ(reversed) Mλ Mν Mο Oα Oζ Oτ Oυ Pα Pδ(reversed) Pλ Pμ Pο Pυ Qβ Qγ  
Qδ(reversed) Qλ Qμ Rα Rδ Re Sβ Sδ(illeg.) Sκ Tδ Vι(fol. 331<sup>v</sup>) Vκ(reversed) Vσ Vχ Wβ Wκ(reversed)

[Partial diagram] Cβ Cθ Eα Ev Eο Pγ Qγ Vε Wα(reversed) Wι Xβ

[Outline, or space only] Bα Dγ Eδ Eζ Fδ Mθ Oκ Oσ Pφ Pψ Vα Vβ Vψ

[No space] Aα Bζ Bθ Cδ Ce Cζ Dη Lβ Mγ Mδ Mυ Mφ Nα Nδ Ne Oη Oμ Oξ Oο Oπ Pν Pτ  
Qα Rβ Sθ Si Sλ Uα Vπ Vυ Vν Wβ Xα

[illeg.] Eβ

Pθ: "D"

[Caption]

Allidada horaria] Bε Bη Cη Eη Eυ Fα Fζ Lγ Lε Lη Mη Oζ Oτ Oυ Pα Pδ Pλ Pμ Pο Qβ Qγ Qδ Qλ  
Qμ Rδ(alidada) Re Sδ Sκ Tδ Vκ Wβ; om. Bι Bκ Cι Eμ Eφ Fβ Lζ Mκ Mο Oα Rα Sβ Vσ Wα Wκ;  
Allidada horaria - mediclinum - regula Pυ; Allidada - regula horaria - mediclinium] Bγ; Allidada  
- regula - mediclinium Vι; Allidada horaria Mλ; Regula horaria Eτ Mν Pο Vχ; add. Exemplum  
descriptionis consequitur ut patet Rδ

add. pinnula Bγ(twice) Vι(twice); add. tabula Bγ(twice) Vι; add. longitudo regule inter duas  
pinnulas eius Eμ Pμ

[Numbers on the rule]<sup>7</sup>

1 or 1<sup>a</sup>] Bε Bγ Bη Cη Cι Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mκ Mλ Mο Oα Oζ Oτ Oυ Pα Pδ  
Pλ Pο Pυ Qβ Qγ Qδ Qλ Qμ Re Tδ Vι Vκ Vσ Vχ Wβ Wκ Xβ; om. Bκ Lζ Pμ Pο Rδ Vε Wα; 7 Bι Rα  
Sβ; illeg. Mν Sδ 2 or 2<sup>a</sup>] Bε Bγ Bη Cη Cι Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mκ Mλ Mο  
Oα Oζ Oτ Oυ Pα Pδ Pλ Pο Pυ Qβ Qγ Qδ Qλ Qμ Re Tδ Vι Vκ Vσ Vχ Wβ Wκ Xβ; om. Bκ Lζ Pμ Pο

<sup>7</sup> The major variation is the lack of the reversed hours on the alidade.



Rδ Vε Wα; 8 Bι Rα Sβ; *illeg.* Mv Sδ 3 or 3<sup>a</sup>] Bε Bγ Bη Cη Cι Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mκ Mλ Mο Oα Oζ Oτ Oυ Pα Pδ Pλ Pο Pυ Qβ Qγ Qδ Qλ Qμ Rε Tδ Vι Vκ Vσ Vχ Wβ Wκ Xβ; *om.* Bκ Lζ Pμ Pρ Rδ Vε Wα; 9 Bι Rα Sβ; *illeg.* Mv Sδ 4 or 4<sup>a</sup>] Bε Bγ Bη Cη Cι Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mκ Mλ Mο Oα Oζ Oτ Oυ Pα Pδ Pλ Pο Pυ Qβ Qγ Qδ Qλ Qμ Rε Tδ Vι Vκ Vσ Vχ Wβ Wκ Xβ; *om.* Bκ Lζ Pμ Pρ Rδ Vε Wα; 10 Bι Rα Sβ; *illeg.* Mv Sδ 5 or 5<sup>a</sup>] Bε Bγ Bη Cη Cι Eη Eμ Eτ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mκ Mλ Mο Oα Oζ Oτ Oυ Pα Pδ Pλ Pο Pυ Qβ Qγ Qδ Qλ Qμ Rε Tδ Vι Vκ Vσ Vχ Wβ Wκ Xβ; *om.* Bκ Lζ Pμ Pρ Rδ Vε Wα; 11 Bι Rα Sβ; *illeg.* Mv Sδ 6 or 6<sup>a</sup> or 6<sup>aa</sup>] Cη Eη Eμ Eυ Fα Fβ Fζ Lε Mλ Oζ Oτ Pα Qβ Qλ Qμ Sδ Tδ Vκ Vχ Xβ; *om.* Bκ Lζ Lη Mο Oα Pμ Pρ Qδ Rε Rδ Vε Vσ Wα; 6 or 6<sup>a</sup> et or + 7 or 7<sup>a</sup>] Bε Eτ Lγ Mη Pλ Pυ Qγ Vι Wκ; 6<sup>a</sup> et 7<sup>a</sup> etiam Oυ; 6<sup>a</sup> et 7<sup>a</sup> hora Mκ Pδ Wβ; 6<sup>a</sup> hora et 7<sup>a</sup> Bη; 6<sup>a</sup> infinita Eφ; 6<sup>a</sup> 7<sup>a</sup> 3w f3? 6<sup>a</sup> non habet fuben Po; hora 6<sup>a</sup> Cι; prima Bι; p<sup>a</sup> Rα Sβ; *illeg.* Mv

umbra infinita] Bε Cη Lζ Eη Eυ Eφ Fζ Lγ Lε Lη Mη Mλ Oζ Oτ Oυ Pα Pλ Pρ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Tδ Vκ Vχ Wβ Xβ; *om.* Bκ Fα Fβ Lζ Mο Oα Vε Wα Wκ; umbra infinita et est finis 6<sup>e</sup> or sexte hore Bγ Mv Pο Pυ Vι; umbra infinita que est finis hore 6<sup>e</sup> Cι Bη Eτ Mκ Pδ Vσ; initium prime hore et finis 12e Bι Rα Sβ; principium prime hore Sκ

7 or 7<sup>a</sup>] Bη Eυ Eφ Fα Mλ Pα Vχ; *om.* Bγ Bκ Cη Cι Eη Eμ Eτ Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mο Oα Oζ Oτ Pδ Pλ Pμ Pο Pρ Pυ Qβ Qγ Qδ Qλ Qμ Sδ Rδ Rε Tδ Vε Vι Vκ Vσ Wα Wβ Wκ Xβ; et 12<sup>a</sup> Rα Sβ; vel 12 Bι; hora sexta non habet finem Oυ; *illeg.* Mv Sδ 8 or 8<sup>a</sup>] Bη Eυ Eφ Mλ Oα Oυ Pα Pο; *om.* Bγ Bε Bκ Cη Cι Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mο Oζ Oτ Pδ Pλ Pμ Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Rε Tδ Vε Vι Vκ Vσ Vχ Wα Wβ Wκ Xβ; 2 Bι Rα Sβ; *illeg.* Mv Sδ 9 or 9<sup>a</sup>] Bη Eυ Eφ Mλ Oα Oυ Pα Pο; *om.* Bγ Bε Bκ Cη Cι Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mο Oζ Oτ Pδ Pλ Pμ Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Rε Tδ Vε Vι Vκ Vσ Vχ Wα Wβ Wκ Xβ; 3 Bι Rα Sβ; *illeg.* Mv Sδ 10 or 10<sup>a</sup>] Bη Eυ Eφ Mλ Oα Oυ Pα Pο; *om.* Bγ Bε Bκ Cη Cι Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mο Oζ Oτ Pδ Pλ Pμ Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Rε Tδ Vε Vι Vκ Vσ Vχ Wα Wβ Wκ Xβ; 4 Bι Rα Sβ; *illeg.* Mv Sδ 11 or 11<sup>a</sup>] Bη Eυ Eφ Mλ Oα Oυ Pα Pο; *om.* Bγ Bε Bκ Cη Cι Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mο Oζ Oτ Pδ Pλ Pμ Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Rε Tδ Vε Vι Vκ Vσ Vχ Wα Wβ Wκ Xβ; 5 Bι Rα Sβ; *illeg.* Mv Sδ 12 or 12<sup>a</sup>] Bη Eυ Eφ Mλ Oα Oυ Pα Pο; *om.* Bγ Bε Bκ Cη Cι Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mο Oζ Oτ Pδ Pλ Pμ Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Rε Tδ Vε Vι Vκ Vσ Vχ Wα Wβ Wκ Xβ; 6 Bι Rα Sβ; *illeg.* Mv Sδ

[Lettering on the diagram]<sup>8</sup>

A] Bγ Bη Bκ Eτ Eυ Lγ Lζ Mη Mκ Mv Mο Pδ Pλ Pο Qβ Qγ Qμ Vι Vσ Wα Wκ; *om.* Bε Bι Cη Cι Eη Eμ Eφ Fα Fβ Fζ Lε Lη Oζ Oυ Pα Pμ Pρ Qδ Rα Rδ Rε Sβ Tδ Wβ; B Vκ; A D Vε; O Pυ Vχ; P Mλ; Z Oα; 90 Pο Pρ Qγ; *illeg.* Qλ Sδ A-D] 1, 12 Bε Eη Oτ Pρ Qγ; 6 Sκ; 6<sup>a</sup>, 7<sup>a</sup> Fα; 90 Rδ Sδ B] Bγ Bη Eτ Eυ Lγ Mη Mκ Mλ Mv Mο Pδ Pλ Pο Pυ Qβ Qγ Qμ Vι Vκ Vσ Vχ Wκ; *om.* Bε Bι Bκ Cη Cι Eη Eμ Eφ Fα Fβ Fζ Lε Lη Lζ Oζ Oτ Oυ Pα Pμ Pρ Qδ Qλ Rα Rδ Rε Sβ Tδ Vε Wα Wβ; C Oα; *illeg.* Sδ C] Bη Bγ Eτ Mκ Mο Pδ Pο Vι Vσ Vχ Wκ; *om.* Bε Bι Cη Cι Eη Eμ Eυ Eφ Fα Fβ Fζ Lγ Lε Lη Mη Mv Oζ Oτ Oυ Pα Pλ Pμ Pρ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Tδ Vκ Wα Wβ; A Oα; B Bκ Lζ Vε; P Pυ; Q Mλ; *illeg.* Sδ D] Bγ Bη Eτ Eυ Lγ Mη Mκ Mv Mο Oα Pδ Pλ Pο Qβ Qγ Vι Vσ Wα Wκ; *om.* Bε Bι Cη Cι Eη Eμ Eφ Fα Fβ Fζ Lε Lη Oζ Pα Pμ Qδ Qμ Rα Rδ Rε Sβ Tδ Wβ; M Pυ Vχ; N Bκ Lζ

<sup>8</sup> While some mss have the series A-O as on the diagram, the most common variation is either to omit all the lettering, or to omit all the lettering along the alidade. The least common variation is a different set of lettering. Note also that some mss have both letters and numbers on the quarter circle, or two sets of numbers (degrees and hours).

MA Vε; 75 Ou Po Pq Qγ; *illeg.* QΛ Sδ Vκ D-F] 2, 11 Bε Eη Ot Pq Qγ; 5 Sκ; 5<sup>a</sup>, 8<sup>a</sup> Fa; 75 Rδ Sδ  
 E] Bγ Bη Et Mκ Mo Oα Pδ Po Qγ Vi Vσ Vχ Wκ; *om.* Bε Bi Cη Ci Eη Eμ Ev Eφ Fa Fβ Fζ Lγ  
 Lε Lη Mη Mv Oζ Ot Ou Pa Πλ Pμ Pq Qβ Qδ Qλ Qμ Ra Rδ Re Sβ Tδ Vκ Wα Wβ; G Vε; M Mλ; N  
 Pυ; P Bκ Lζ; 6 Sκ; *illeg.* Sδ F] Bγ Bη Et Ev Lγ Mη Mκ Mv Mo Oα Pδ Πλ Po Qβ Qγ Vi Vσ Wα  
 Wκ; *om.* Bε Bi Cη Ci Eη Eμ Eφ Fa Fβ Fζ Lε Lη Oζ Pa Pμ Qδ Qμ Ra Rδ Re Sβ Tδ Wβ; κ Pυ Vχ; L  
 Mλ; M Bκ Lζ Vε; 60 Ou Po Pq Qγ; *cut off Vκ; illeg.* QΛ Sδ F-H] 3, 10 Bε Eη Ot Pq Qγ; 4 Sκ; 4<sup>a</sup>,  
 9<sup>a</sup> Fa; 60 Rδ Sδ G] Bγ Bη Et Mκ Mo Oα Pδ Po Qβ Vi Vσ Vχ Wκ; *om.* Bε Bi Cη Ci Eη Eμ Ev  
 Eφ Fa Fβ Fζ Lγ Lε Lη Mη Mv Oζ Ot Ou Pa Πλ Pμ Pq Qδ Qλ Qμ Ra Rδ Re Sβ Tδ Vκ Wα Wβ; κ  
 Mλ; L Pυ; Q Bκ Lζ R Vε; 5 Sκ; *illeg.* Sδ H] Bγ Bη Et Lγ Mη Mκ Mv Mo Oα Pδ Po Pυ Qβ Qγ Vi  
 Vσ Vχ Wα Wκ; *om.* Bε Bi Cη Ci Eη Eμ Eφ Fa Fβ Fζ Lε Lη Oζ Pa Pμ Qδ Qμ Ra Rδ Re Sβ Tδ Wβ; C  
 Vε; G Ev Πλ; I Mλ; L Bκ Lζ; 45 Ou Po Pq Qγ; *cut off Vκ; illeg.* QΛ Sδ H-K] 4, 9 Bε Eη Ot Pq Qγ;  
 3 Sκ; 3<sup>a</sup>, 10<sup>a</sup> Fa; 45 Rδ Sδ I] Bγ Bη Et Mκ Mo Oα Pδ Po Pυ Vi Vσ Vχ Wκ; *om.* Bε Bi Cη Ci Eη  
 Eμ Ev Eφ Fa Fβ Fζ Lγ Lε Lη Mη Mv Oζ Ot Ou Pa Πλ Pμ Pq Qβ Qδ Qλ Qμ Ra Rδ Re Sβ Tδ Vκ  
 Wα Wβ; E Vε; H Mλ; R Bκ Lζ; 4 Sκ; *illeg.* Sδ K] Bγ Bη Bκ Ev Lγ Lζ Mη Mκ Mv Mo Oα Pδ Πλ  
 Po Qβ Qγ Vε Vi Vσ Wα Wκ; *om.* Bε Bi Cη Ci Eη Eμ Et Eφ Fa Fβ Fζ Lε Lη Oζ Pa Pμ Qδ Qμ Ra Rδ  
 Re Sβ Tδ Wβ; F Pυ Vχ; G Mλ; 30 Ou Pq Qγ; *cut off Vκ; illeg.* QΛ Sδ K-M] 5, 8 Bε Eη Ot Pq Qγ;  
 2 Sκ; 2<sup>a</sup>, 11<sup>a</sup> Fa; 30 Rδ Sδ L] Bγ Bη Et Mκ Oα Pδ Po Vi Vσ Vχ Wκ; *om.* Bε Bi Cη Ci Eη Eμ Ev  
 Eφ Fa Fβ Fζ Lγ Lε Lη Mη Mv Oζ Ot Ou Pa Πλ Pμ Pq Qβ Qδ Qλ Qμ Ra Rδ Re Sβ Tδ Vκ Wα Wβ;  
 F Mλ; G Pυ; T Bκ Lζ Vε; 3 Sκ; 5 Mo; *illeg.* Sδ M] Bγ Bη Ev Mη Mκ Oα Pδ Πλ Po Qβ Qγ Vi Vσ  
 Wα Wκ; *om.* Bε Bi Cη Ci Eη Eμ Et Eφ Fa Fβ Fζ Lε Lη Oζ Pa Pμ Qδ Qμ Ra Rδ Re Sβ Tδ Wβ; D Mλ  
 Pυ Vχ; H Vε; N Mo; V Bκ Lζ; 15 Ou Pq Qγ; *cut off Lγ Vκ; illeg.* Mv QΛ Sδ M-O] 6, 7 Bε Eη Ot  
 Pq Qγ; I Sκ; 1<sup>a</sup>, 12<sup>a</sup> Fa; 15 Rδ Sδ N] Bγ Bη Et Mκ Pδ Po Vi Vσ Vχ Wκ; *om.* Bε Bi Cη Ci Eη Eμ  
 Ev Eφ Fa Fβ Fζ Lγ Lε Lη Lζ Mη Mv Mo Oζ Ot Ou Pa Πλ Pμ Pq Qβ Qδ Qλ Qμ Ra Rδ Re Sβ Tδ  
 Vε Vκ Wα Wβ; B Oα; E Mλ Pυ; X Bκ; 2 Sκ; *illeg.* Sδ O] Bγ Et Ev Mκ Mo Pδ Πλ Po Vi Vσ Wα  
 Wκ; *om.* Bε Bi Cη Ci Eη Eμ Eφ Fa Fβ Fζ Lε Lη Oζ Ot Ou Pa Pμ Pq Qβ Qδ Qμ Ra Rδ Re Sβ Tδ  
 Wβ; A Mλ Pυ Vχ; C Lγ Mη; CD Lζ; D Bκ; F Vε; R Qγ; *cut off Bη Vκ; illeg.* Mv QΛ Sδ O B  
*extended]* H Oα; P Et

[ Comment on Capitulum 5:

The drawing of the [unequal] “hours” on the rule or alidade essentially turns one vane on the alidade into a gnomon, whose shadow will indicate the time. The text offers three methods of engraving these hours.

The first (lines 2-17) read off distances on the shadow square (for various elevations of the sun) along the *umbra versa* (reverse shadow) or the *umbra recta*<sup>9</sup> (shadow) scale, which are then transferred to the alidade.

The second (lines 18-20) refers to the use of a table of the shadows cast which can then be marked on the alidade. Such a table is found as Addendum 5-2, which are figures also derivable from the shadow square in the first method.

The third method (lines 21-46) is to construct a full-scale diagram of the alidade and vane with a quarter circle (with its centre at the top of the vane) divided every 15 degrees and to then project lines from these points through the centre (at the top of the vane) down to the alidade where the hour lines across the alidade will lie. These lines are then transferred to the actual metal alidade.

For the use of these lines, see *Practica*, Cap. 11.

For a further discussion of this aspect of an astrolabe see Josefina Rodríguez-Arribas, “A Treatise on the Construction of Astrolabes by Jacob ben Abi Abraham Isaac al-Corsuno (Barcelona, 1378): Edition, Translation and Commentary”, *Journal for the History of Astronomy*, 49 (2018), 27-82, especially p. 33 and notes 31-34 (pp. 71-72), as well as Appendices 1-3 (pp. 76-79) and the accompanying notes.

Rodríguez-Arribas comments (p. 71 note 32) that very few (extant) Islamic and European astrolabes are actually marked with such hour lines on the alidade, referring to studies by David King.

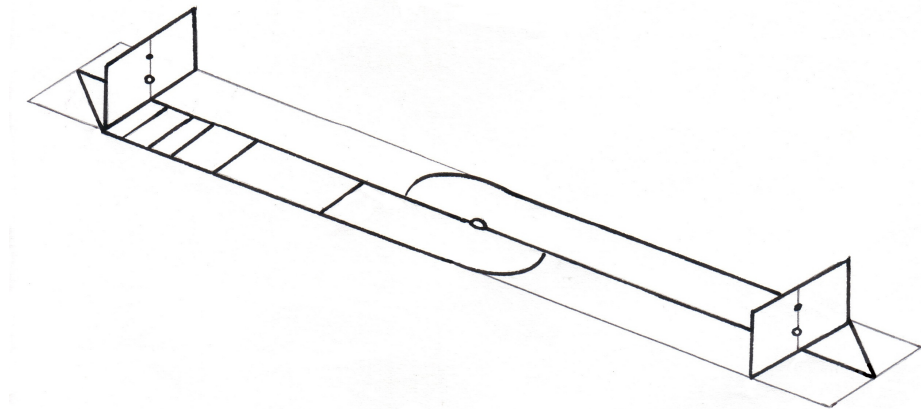


Figure 5A. Perspective view of the Alidade, with hour-lines

Samsó points out that “this kind of alidade, which assumes an increase of 15° in the solar altitude corresponds to the passage of one seasonal hour, is independent of the local latitude. It was known in the Greek and Byzantine world, as well as in early medieval Europe and in early Islamic astronomy, as described by Ḥabash al-Ḥāsib (fl. 831-860) and by Hermann Contractus (1013-1054).” In his footnote he cites David King (2005), pp. 253-255 and continues, “this kind of

<sup>9</sup> *umbra recta*: also known as the *umbra extensa* – see the *Practica* section, Cap. 42.

device was not unknown in the Andalusí tradition. As remarked by Martí and Viladrich (1983, pp. 69-70) a reference to it appears in Ibn al-Şaffār's treatise on the use of the astrolabe: see Millás' Arabic edition (Millás, 1955, pp. 63-64) and his Catalan translation in Millàs, 1931, pp. 39-40."<sup>10</sup> ]

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<sup>10</sup> Samsó, *On Both Sides*, p. 420 and note. The full references for his sources are:

King, 2005 – David A. King, *In Synchrony with the Heavens. II, Instruments of Mass Calculation* (Leiden: Brill, 2005).

Martí and Viladrich, 1983 – Ramon Martí and Mercè Viladrich, "En torno a los tratados de uso del astrolabio hasta el siglo XIII en al-Andalus, la Marca Hispánica y Castilla," in Juan Vernet, ed., *Nuevos Estudios sobre Astronomía Española en el Siglo de Alfonso X* (Barcelona, 1983), pp. 9-74.

Millás, 1955 – José Maria Millás Vallicrosa, "Los primeros tratados de astrolabio en España," *Revista del Instituto Egipcio de Estudios Islámicos*, 3 (1955), pp. 35-49 [Spanish], 47-76 [Arabic].

Millàs, 1931 – Josep M. Millàs Vallicrosa, *Assaig d'història de les idees físiques i matemàtiques a la Catalunya Medieval* (Barcelona, 1931).

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## [CAPITULUM 5 BIS.] DE COMPOSITIONE NOVELLE

Facies etiam aliam regulam, que “novella” dicitur, ut hic patet, que sit divisa per notas secundum divisiones lineae meridionalis tabulae latitudinis tuae regionis per almucantherat et hoc curret super faciem rethis.

Cap. 5 BIS:

[after Cap. 5] Aα Bε Bθ Cε Cι Dη Eα Eβ Eη Eμ(marg.) Eτ Eυ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mo<sup>1</sup> Mυ Mφ Nα Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Po(marg.) Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rβ Rδ Rε Sδ Σκ Tδ Uα Vβ Vι Vπ Vψ Wα Wι Xβ  
[in Cap. 6] Bγ Bη Cη Mκ(marg.) Mo Pτ Wβ  
[in upper marg.] Eδ  
om. Bα Bζ Bι Bκ Cβ Cδ Cζ Cθ Dγ Eδ Eζ Eν Eο Fδ Lζ Mγ Mθ Mλ Mν Oα Oη Oκ Oμ Oο Oπ Oσ Pγ Pφ Pψ Qα Rα Sβ Sθ Sι Sλ Vα Vε Vκ Vν Vσ Vυ Vχ Xα

- 1 De ... novelle] Dη Pλ Vβ; om. Aα Bε Bη Bθ Cε Cη Cι Eα Eβ Eδ Eη Eμ Eτ Eυ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mκ Mo<sub>1</sub> Mo<sub>2</sub> Nα Nδ Oζ Oξ Oτ Oυ Pα Pμ Pν Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rβ Sδ Σκ Tδ Uα Vπ Wα Wβ Wι Xβ; Compositio novelle Pδ Pθ Vψ; Compositio volvelle etc. Rδ; De novella Bγ(marg.) Mυ(diff. hand) Mφ Nε Vι
- 1-3 Facies ... meridionalis] cut off Eδ
- 2 Facies] Fac Oυ; Post facies Fβ etiam] add. si volueris Rε hic] om. Aα que,] om. Cε novella] volvelle Rδ; novella Mφ Σκ ut hic patet] om. Mκ Rδ Wι patet] dicitur Uα sit] est Mκ
- 2-4 Eμ(marg.): Facies regulam que vocatur volnella et divides eam secundum divisiones almutantarath in linea meridionalis ad regionem que volueris et hoc curret super volnellum quemadmodum allidada hoc dorsum. Et est utilis ad multa.
- 3 notas] notam Bθ secundum] om. Eυ divisiones] divisionem Cι Eτ Fα; om. Mo per] om. Cε; et Aα
- 4 almucantherat] almicanch'ach Eτ; almicantarath Dη; almicantarath Eα Rδ; almicantherat Eδ; almicantrath Pλ; almihantha'th Bε; almitanth'ach Uα; almucancha't Po; almucantarath Aα Bθ Eη Mδ Nα Pθ Pυ Rβ Vψ; almucanth' Eβ Pτ; almucanth'ach Wβ; almucantha't Σκ; almucanth'ath Bγ Fα; almucantherach Lγ Mυ Oξ Qμ Xβ; almucantherat Oυ Po Vι Wι; almucantherath Eυ Fε Lε Lη Mη Mo Mφ Mδ Nε Oζ Oτ Pα Pμ Pν Pρ Qβ Qγ Qδ Qλ Sδ Tδ Vβ Vπ Wα; almucantherath Cη; almucantherach Rε; almucantherath Pδ; almucha<sup>at</sup> Bη; almuchachara Cε; almuchancarath Mo; almuchan<sup>rath</sup> Mκ; almuchantarath Fβ; almucantherach Cι hoc] om. Bθ Cε Vπ; hec Po; hic Mφ super] supra Po(marg.) Vβ; secundum Aα Bθ Cε Eυ faciem] formam Eυ rethis] rethcis Po(marg.); retis Bθ Vψ; retis Eα; rethis Rβ; add. etc. Rδ

<sup>1</sup> Ms Mo contains this section twice, once following on Cap. 5 and again as part of Cap. 6.

## [CHAPTER 5 BIS.] ON THE FABRICATION OF THE “NOVELLA”

You will also make another ruler which is called the “novella,”<sup>2</sup> as is shown here, which has been divided by marks according to the divisions of the meridian line by the almucantars of the plate of the latitude of your region. And this will rotate on top of the face of the rete.<sup>3</sup>

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<sup>2</sup> “*Novella*” – something new. Perhaps so named because it seems to be a late addition to astrolabes (it does not seem to be found on Islamic astrolabes).

“*Novella*” is not to be confused with “*volvellum*,” which is another name for the rete. See Kunitzsch, *Glossar*, pp. 515-517.

<sup>3</sup> The obvious implication here is that the novella is valid for only one latitude, i.e., it will work with only one plate (if the astrolabe has more than one plate).

[ FIGURA 5 BIS ]



Novella

[Figure] Bγ Bε Bη Cη Cι Eβ Eδ Eη Eμ Eτ Eυ Fβ Fζ Lγ Lε Lη Mη Mκ Oζ Oτ Oυ Pα Pδ Pλ  
Pμ Po Pυ Qβ Qγ Qδ Qλ Qμ Sδ Sκ Tδ Wβ Xβ

[Figure, but no capitulum] Mν Pγ

[Figure, but no caption] Eδ Rδ

[Caption, but no figure] Aα Bθ Cε Dη Eα Fα Mδ Mo Mυ Mφ Nα Oξ Pν Pρ Pτ Rβ Uα Vβ  
Vι(fol. 331<sup>v</sup>) Vπ Wα

[No figure] Eα Rε Nδ Nε Vψ Wι

Pθ: "E"

[Caption]

Novella] Bε Bη Eβ Eη Eτ Eυ Fζ Lγ Lε Lη Mη Mν Oζ Oτ Oυ Pγ Pμ Po Qβ Qγ Qδ Qλ Qμ  
Rβ<sup>4</sup>(marg.) Sδ Wβ Xβ; om. Cι Eδ Eμ Pυ Sκ Tδ; allidade sive r-a (= regula) Pα; Figura linee que  
novella dicitur Fβ; novella regula Bγ Mκ Pδ; volvella Cη; volvella novella Pλ

<sup>4</sup> Rβ has only the caption "Novella" in the margin, and no actual figure.



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## [CAPITULUM 6.] DE COMPOSITIONE ARCHITOP ET ALFERAZ, ID EST EQUI

Peracta regula facies clavum rotundum et decenter compositum et perforatum et

- 1 De ... equi] Eη Lε Lη Lγ Mδ Mv(*diff. hand*) Mφ Oζ Pλ Pμ Pν Pρ Qδ Rβ Vi; *om.* Bα Bζ Bι Bκ Cδ Cε Cθ Cι Dγ Eα Ev Eo Fβ Fδ Lζ Mγ Nα Oα Oη Oo Oσ Qα Pα Pγ Pφ Rα Sβ Sθ Si Uα Vα Vε Vν Vυ Vχ Xα Xβ; Ad faciendum clavum qui dicitur axis Mλ; De alchithoph Rε; De clave Oμ; De clavo Eμ(*marg.*) Mκ Pυ Pψ Sλ Vκ(*marg.*) Vσ; De clavo faciendo Cζ; De clavo faciendo quod est equus, ar~ vel cavilla<sup>1</sup> Cη; De clavo vel cavilla sive axis Nε; De compositione ar~ Eζ Eτ Mν Pδ Pθ Po Qμ Rδ(*add. etc.*) Sκ Vβ Vψ Wi; De compositione ar~ id est axis Bγ(*later hand*); De compositione ar~ id est axis et al~ id est equi. Rubrica. Dη(*om. Rubrica*) Mθ Oκ; De compositione ar~ al~ id est equi Qγ; De compositione ar~ id est equi Fα Mo; De compositione ar~ et al~ Ou; De compositione ar~ et al~ equi Tδ; De compositione ar~ et al~ sive equi Bη; De compositione ar~ et al~ et etiam de compositione equi Wβ; De compositione clavi sive cunei qui equus dicitur et novelle Pτ; De compositione clavi et cavilla scilicet equi Eβ; De compositione dap(?) archi. Rubrica Eδ; De constitutione clavi rotundi seu caville. Capitulum Qβ; De figuratione clavi Cβ(*marg.*); De fornicacione clavi Aα; De formatione clavi Bθ Ev Vτ; De formatione clavi clavi Mη; Opus clavi Oτ; Rubrica. De compositione ar~ et al~ id est equi Oξ Oτ Sδ Wα; Sequitur capitulum de compositione ar~ et al~ id est equus constugentes (?) Bε; Sequitur de clavo Eμ
- 1 architop (Mv)] alchitop Dη; alchitphot *corr. to* alchitoph Lγ; alchitrop Bγ Eτ; altotob Mθ Oκ; archicoph Mφ; archicophi Pλ; archithob Pν; archithop Vψ; archithoph Wβ; archithophi Pρ; architob Mo Ou Qδ Rβ; architop Eζ Mν Po Wi; architoph Bε Bη Eη Lε Lη Mδ Mv Nδ Oζ Oτ Pα Pμ Qλ Rδ Sδ Sκ Tδ Vβ Vi Wα; arthithop Fζ Pθ; archytop Qμ; arthitob Cη; arthitop Pδ; arthitoph Oξ alferaz] alf' a Pμ; alf' aβ Oζ Oξ Pλ Qγ Sδ Tδ; alf' am Fζ Lγ Pν Pρ; alf' atβ Lε; alfa' Wα; alfarab Mφ Oκ; alfaras Dη; alfas Vι; alferab Bε Eη Lη Mδ Qλ; alferam Mν Nδ; alfora Mv; alforab Oτ Ou; alforac Qδ Rβ; alforas; alfore Mφ; alpherab Wβ; alpheram Bη
- 2 Peracta] Aeracta Fα; Facta Bε Eη; Pertracta *corr. to* Peracta Rα; Post facta Bη; Seracta Mo Peracta ... facies] Post hoc fac Bα facies] *marg.* Eζ decenter] bene Cδ Sλ compositum] appositum Oμ; positum Oκ perforatum] perforamum Nδ et<sub>2</sub>] *om. many*
- 2-3 decenter ... factum] perforatum Bα
- 2-7 Peracta ... equi (sicut patet de utroque)] *repeated in marg.* Oo (*fol. 45<sup>v</sup>*); Peracta regula facies clavum que arabice vocatur alchitop alcoloti quem nos vocamus axem. Et sit perforatus in extremitate inter foramine imponatur tabellula ad modum equi ad tabulas retinendas Qα

<sup>1</sup> For *cavilla*, see the notes to Figure 6.

[CHAPTER 6.] ON THE FABRICATION OF THE “QUṬB”<sup>2</sup> AND THE “FARAZ”,<sup>3</sup> THAT IS, THE  
“HORSE”

Once the rule has been finished, you will make a round pin, both well fashioned  
and pierced,

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<sup>2</sup> The pin which holds all the rotating parts of the astrolabe together has various names in Latin: *clavus* (nail), *axis*, *cavilla* (wooden or metal peg), *vectis rotundus* (round bar). The arabic (القطب, *al-quṭb*) gives rise to a wide range of variants. See Kunitzsch, *Glossar*, no. 40, pp. 545-546.

<sup>3</sup> The wedge (Latin: *cuneus*) which secures the pin in its hole is often in the shape of a horse and so is usually referred to as “the horse” (*equus*). In Arabic it is *al-faras* (الفرس), also meaning “the horse”. See Kunitzsch, *Glossar*, no. 9, pp. 520-521.

- habentem caput bene factum qui clavus sit utilis ad colligendas inter se tabulas, dum perforate fuerint, et vocatur arabice “architop”, quem nos latini vocamus “axem”.
- 5 Facies quoque in modum equi vel cunei sive cuiusvis alterius animalis tabulam parvam
- 3 habentem] habens Aα Bζ Bη Bθ Bι Cβ Cδ Cε Cζ Cη Cθ Cι Dγ Dη Eδ Eζ Eμ Ev Eo Et Eu Lζ Mθ Mκ Mλ Mo Nα Oα Oη Ok Om Op Os Pγ Po Pv Pφ Pψ Rα Sβ Sθ Uα Vα Vβ Vε Vκ Vπ Vσ Vχ Wβ Wι Xα caput] capit Vν; capite Lζ bene] decenter Cδ Sλ bene factum] benefactum *many* qui] que Mη clavus] *om.* Bα Bζ Cβ Cδ Cε Cθ Eμ Ev Fδ Mγ Mθ Mκ Mν Oα Oη Ok Om Oo Op Os Pφ Pψ Rε Sθ Si Sλ Vα Vν Vσ Vυ Vχ; cavilla clavus Cη; clavis Mη ad colligendas] ad quod iungas Ev; ad coniungendes Vκ; *add.* ab Vι inter se] *om.* Bα Cδ Cζ Eμ Fδ Fζ Mγ Mθ Mκ Mν Oα Oη Ok Om Oo Os Pφ Pψ Si Sλ Vα Vν Vσ Vυ; in se Sκ; intra se Bι; infra se Ev; sub se Vχ tabulas] tabellas Bθ Mη Mo Mν Nε Pδ Vβ Vπ; cauillas Ev dum] cum Cζ Mγ Mν Oo Pφ Rε Si Vν
- 4 perforate] forate Bα et] qui Vκ vocatur] *om.* Bα; vocabitur Mη Qδ Qμ Rβ architop] achicof Dγ; albocol Vν; alcatoli Cζ; alchichof Bκ Cθ Lζ Mλ Rα Sβ; alchithop Aα Mη Pγ; alchithoph Rε; alchitof Cβ Eδ Eζ Eo Po Ve; alchitop Bι Vσ; alchitoph Bθ Qμ Vπ; alchitoph *corr.* to alchitroph Bγ; alchitos Xα; alcocoli Bα Cδ Fδ Oo Pφ Pψ; alcotoli Sθ Vα; alcotoli *corr.* to alcotolias Mκ; alcptop *corr.* to alchiptop Mκ; althithof Vκ; althoth Vχ; althothop Oα Os Vυ; althritof O; altitop Qδ Rβ; altitoph Bζ; altochli Ev; altocoli Mγ Sλ; altotoli Eμ Oη Om; archichob Xβ; archichop Pθ; archico Nα; archicop Uα; archicoph Pλ; archithop Cε Nε Pδ Vβ; archithoph Bη Eβ Fζ Lε Lη Oζ Ot Pα Pv Qγ Qλ Qγ Tδ; archithops Pq; architob Ov; architop Dη Et Ev Mν Vψ Wα; architoph Bε Cη Eα Eη Fα Mδ Mν Nδ Rδ Sδ Wι; architophi Pμ; architot Pτ; architrop Mo; arthichoph Fβ; arthithop Cι; arthithoph Oξ Wβ; arthitoph Lγ Mφ Qβ Vι; artithof Pv; atotoh Mθ Ok; catotale Si; *add. in marg.* archicoph Fβ; *add. in marg.* alcitob Sλ; *add. interlin.* id est equus Vβ quem] quamquam Sκ latini] *om.* Bα Bζ Bι Bκ Cβ Cδ Cζ Cθ Dγ Eμ Ev Eo Fδ Lζ Mγ Mθ Mκ Mλ Mν Oα Oη Ok Om Oo Op Os Pφ Pψ Rα Sβ Sθ Si Vα Vε Vκ Vν Vσ Vυ Vχ; latine Aα Bθ Dη Ev Nα Qδ Rβ Xα Xβ vocamus] notamus Vε; vocemus axcemus Sκ axem] *om.* Mγ; axcem Sκ; axens Mη; *corr.* to vectem vel axem Bη; *add.* dum ... axim *twice* Mκ; *add.* id est equi Ot; *add.* DE EQUe VEL CUNEO Vψ
- 5 before Facies] *add.* De equo vel cuneo vel alforaz Nε Facies quoque] Faciesque Bε Bι Pq quoque] *om.* Sβ; ergo Cζ Oη; itaque Vε in ... animalis] *om.* Bζ Bι Bκ Cβ Fδ Mγ Om Oo Pφ Rα Vε Vν Wα; et Cδ Cζ Cθ Dγ Eμ Ev Eo Lζ Mθ Mκ Mλ Mν Oα Oη Ok Os Ot Pψ Sθ Si Sλ Vα Vσ Vυ Vχ; hanc Sβ; in Op modum] eodem Pv modum ... animalis] *om.* Op equi vel] *om.* Eδ vel cunei] scunei Eζ cunei] canei Ev; simeī Bη; stimeī Eδ; symey Xα sive] *om.* Wι cuiusvis] cuius Aα Lη; cuiuscumque Dη alterius] *om.* Eδ Eζ Po Vκ Vψ; altitudinis Qδ; *add.* formi Tδ alterius animalis] axis Xα animalis] *om.* Cε; figure Dη parvam] *om.* Mν Sκ; per unum Mη
- 5-6 Facies ... factam] Fac dictam tabulam parvum Bα cunei ... factam] simel vel equis alterius alis (tabulam parvum [*marg.*]) Bη

having a well-formed head. This pin should be useful for holding the plates together when they have been pierced. And it [the pin] is called in Arabic “al-quṭb”, which we Latins call “the axis.” And you will also make in the shape of a horse or wedge or some other animal a small

et bene factam, quam mittes in foramen axis decenter ita ut retineat tabulas; et dicitur “alferaz” sive “equus,” quia ex consuetudine fit in modum equi.

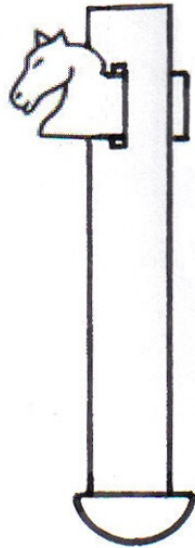
Huc usque intermisimus de diversis tractatibus, sed nunc redeamus ad librum.

- 6 et] *om. many* bene factam] benefactam *many; om. Bη* mittes] mittas Fζ; pones Tδ mittes in foramen] *marg. Oξ* foramen] foramem Mv; foramine Aα Bα Bη Dγ Eζ Mκ Rα Sβ Vβ Vε Vκ Vv Vσ Vχ; *add. interlin. al' foramen Vβ* axis] *om. Pλ Pq;* assis Bθ Vκ; axcis Sκ decenter ita] *om. Bα* ut] *om. Vv* retineat] detineat Pv Rε; teneat Cδ Oμ; retineas Vκ; similiter contineat Fβ; *add. omnes Vε* tabulas] *add. In matre exentes et rethe super ipsas exens Fβ* et] *add. haec tabula Cδ Vσ*
- 6-7 et<sup>2</sup> ... sive] *om. Si*
- 7 alferaz] al' aβ Pθ; alfera β Mδ; alforam Rδ; alforas Bε Cε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mφ Mv Nδ Nε Oζ Oξ Oτ Pα Pδ Pν Pρ Qβ Qγ Qλ Sδ Wα Xβ; alforat Tδ; alphera β Pτ Wβ; alpheram Bη Cη; alphora β Bγ Oυ; alphas Pλ Pμ; *add. in marg. alphorax Fβ*  
alferaz sive] *om. Aα Bα Bζ Bθ Bι Bκ Cβ Cδ Cζ Cθ Dγ Eδ Eζ Eμ Ev Eo Eτ Ev Fδ Lζ Mγ Mη Mθ Mκ Mλ Mv Mo Nα Oα Oη Oκ Oμ Oο Oπ Oσ Pγ Po Pv Pφ Pψ Qδ Qμ Rα Rβ Rε Sβ Sθ Sκ Sλ Uα Vα Vβ Vε Vκ Vv Vπ Vσ Vυ Vχ Xα Wι* sive] *om. Bε Cε Cι Eα Eβ Fβ Eη Fα Fζ Lγ Lε Lη Mδ Mv Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Qγ Qλ Rδ Sδ Tδ Vι Vψ Wα Xβ; id est Qβ* equus] equus *many; add. equi Mv; add. interlin. et alfera β Oα* quia] quare Vσ quia ... equi] *om. Bα* fit] nominatur et sit Ev; sit Aα Ev Pγ Pρ; venit ut sit Bα Bζ Cβ Cδ Cθ Eμ Eo Fδ Mγ Mθ Mκ Mv Oα Oη Oκ Oμ Oο Oπ Oσ Pφ Pψ Rε Sθ Si Sλ Vα Vβ Vε Vv Vσ Vυ Vχ; venit ut ipsa Cζ; venit ut ipsa sit Cδ in] ad Lε Mγ equi] *add. formata Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Fδ Mγ Mθ Mκ Mv Oα Oη Oκ Oμ Oο Oπ Oσ Pφ Pψ Rε Sθ Si Sλ Vα Vβ Vε Vv Vσ Vυ Vχ; add. ut patet in presenti figura Fβ; add. sicut patet de utroque Fδ Mγ Oo Pφ Vv; add. Cap. 5BIS Bγ Bη Cη Mκ(marg.) Mo Pτ Wβ*
- 8 Huc ... librum] *om. Bα Cδ Fδ Oo Pφ Sλ Vv; Hic defininat de interioribus partibus astrolabii Mγ* usque] *add. nos Fβ* de] ex Bζ diversis] diversitatibus Qμ tractatibus] *om. Bε Eβ Eη Fα Fβ Fζ Lγ Lε Lη Nδ Oξ Oτ Oυ Pλ Pμ Pν Qβ Qγ Sδ Tδ Wα Xβ; add. diximus Rε* sed] *om. Bθ Qα Vπ* redeamus] accedamus Fα; deveniemus Qδ Rβ ad librum] *om. Cη Pτ Qα Tδ* librum] limbum Xβ; propositum Dη; *add. etc. Rδ*

well-made piece which you will insert neatly in the slot in the pin such that it holds the plates together. And this is called “al-faraz” or “the horse” since customarily it is made in the shape of a horse.

Up to this point we have interrupted [our text with material] from various treatises; but now let us return to our book.

[ FIGURA 6 ]



alferaz / al-faraz  
 equus / horse  
 cuneus / wedge

vectis rotundus / round bar  
 clavus / nail  
 axis  
 architop / al-quṭṭb  
 cavilla / peg

[Complete diagram] Bε Bη Bι<sup>4</sup> Bκ<sup>5</sup> Eα Eη Eτ Eυ Fζ Lγ<sup>6</sup> Lε Lζ Lη Mη Mκ<sup>7</sup> Mλ Mν Mo Oζ Oτ  
 Ou Pα Pγ Pμ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sκ<sup>8</sup> Vκ Wβ Xβ

[Partial diagram] Cη Eδ Eμ Fβ Pδ Pλ Po Sθ Tδ

[Titling, but no figure] Vι(fol. 331<sup>v</sup>)

[Outline, or space only] Cι Eζ Mθ Pυ Vβ

[No space] Aα Bα Bγ Bζ Bθ Cβ Cδ Cε Cζ Cθ Dγ Dη Eν Eο Fα Fδ Mγ Mδ Mν Mφ Nα Nδ  
 Nε Oα Oη Oκ Oμ Oξ Oο Oπ Oσ Pν Pρ Pτ Pφ Pψ Qα Rβ Sι Sλ Uα Vα Vε Vν Vπ Vσ Vυ Vχ Vψ  
 Wα Wι Xα

[illeg.] Eβ

Pθ: "F"

<sup>4</sup> In ms Bι part of the horse-in-pin diagram is in the gutter of the opening and the labels for the horse are cut off by the tight binding of the leaves. However, there is a second drawing of the horse only, with its labels, at the end of the capitulum.

<sup>5</sup> In ms Bκ, there is a complete diagram but no labels.

<sup>6</sup> The diagrams in mss Lγ and Pδ are partly cut off at the edge, leaving only the beginnings of some of the titling, e.g., "archi-".

<sup>7</sup> The diagram in ms Mκ is partly cut off by the binding, leaving only the endings of some of the titling, e.g., "-hitop".

<sup>8</sup> In ms Sκ, there is a complete diagram but no labels.



## [ PIN ]

vectis rotundus] Bε Bη Bι Eη Eτ Fζ Lγ Lε Lζ Mλ Mν Mo Oτ Ou Πα Qβ Qγ Qδ Qλ Qμ Rα Sβ Vι Vκ Wβ Xβ; *om.* Cη Eυ Mη Pγ Πλ Pμ Po Rδ Re Sδ; vectis Eα Lη Oζ clavus] Bε Bη Bι Eα Eη Eτ Eυ Fζ Lγ Lε Lη Mη Mλ Mν Mo Oζ Oτ Ou Πα Pμ Qβ Qγ Qδ Qλ Qμ Sδ Vι Vκ Wβ Xβ; *om.* Cη Mo Pγ Po Πλ Pμ Re Sδ axis] Bε Bη Eα Eη Eτ Eυ Fζ Lγ Lε Lη Mη Mλ Mν Mo Oζ Oτ Ou Πα Pμ Qβ Qγ Qδ Qλ Qμ Sδ Vι Vκ Wβ Xβ; *om.* Bι Cη Lζ Pγ Pδ Πλ Po Rα Rδ Re Sβ; *add.* vel Wβ  
 architop Bι Eυ Mη Mλ Mν Mo Sβ; *om.* Cη Πλ Po; achitof Rδ; alchithoph vel Re; alchitob Lζ;  
 alchitoph Bη Pγ; archicob Xβ; archipob Vκ; archithop Eα; archithob Lε; architob Eη Fζ Lη Oζ Oτ  
 Ou Πα Pμ Qβ Qγ Qλ Qμ Sδ Wβ; architoph Bε Vι; architrop Eτ; arthitob Qδ; arthitop Rα  
 cavilla<sup>9</sup>] *om.* Bη Cη Mλ Oζ Pγ Πλ Po; cauilla Bι Eα Eη Eτ Eυ Fζ Lγ Lε Lη Lζ Mη Mν Mo Oτ  
 Ou Pμ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Vι Vκ Wβ Xβ; et cauilla id est equus Bε; caiulla Πα  
*add.* almiznir<sup>10</sup> Bι; almiznar Lζ

[ WEDGE ]<sup>11</sup>

alferaz] Wβ; *om.* Cη Lε Lγ Pγ Pδ Πλ Re; *illeg.* Fζ; afferam Rα; alfa<sup>3</sup> Oτ; alf' a β Eτ Mν Qγ Qλ Xβ;  
 alfare Vκ; alfera' Eυ; alferaz Bι; alfera<sup>3</sup> Eη Lη Lζ Mη Oζ Ou Qβ Sβ; alferat Bη; alfesar Mo; alforam  
 Qμ Rδ; alforas Vι; alforris Bε; alpheraz Mλ; alphora<sup>3</sup> Πα Pμ Sδ; alphora<sup>c</sup> Qδ; alphas Eα  
 equus] Bη Bι Cη Eα Eη Eτ Eυ Fζ Lη Lζ Mη Mλ Mν Mo Oζ Oτ Ou Πα Pμ Qβ Qγ Qδ Qλ Qμ  
 Rα Rδ Sβ Sδ Vι Vκ Xβ Wβ; *om.* Lγ Lε Pγ Pδ Πλ Po Re; equus constringentes Bε cuneus] Bε  
 Bη Bι Cη Eα Eη Eυ Eτ Fζ Lζ Lη Mη Mλ Mν Mo Oζ Oτ Ou Πα Qβ Qδ Qγ Qλ Qμ Rα Rδ Sβ Sδ Vι  
 Vκ Wβ Xβ; *om.* Lε Lγ1 Pγ Pδ Πλ Pμ Po Re; *add.* taballus Lζ

<sup>9</sup> “Cavilla” (or “cauilla”) is a medieval Latin word for a (wooden or iron) peg. See J. F. Niermeyer, *Mediae Latinitatis Lexicon Minus* (Leiden: Brill, 1976), s.v. “cavilla.” In the text at line 3, Gunther misread “clavilla” in Cη as “camilla.”

<sup>10</sup> For “*al-mismār*” (العسمار) as another Arabic term for the pin, see Kunitzsch, *Glossar*, no. 30, p. 535.

<sup>11</sup> The drawing of the wedge is one of the few places where some artistic creativity or licence (or lack thereof) appears in the text. One manuscript (Qγ) has an L-shaped geometric shape; several (Cι Mκ Pγ Pδ) have a horse’s head on a straight piece, which is more or less what the actual metal wedge should be. By far the majority of mss (Bε Bη Bι Bκ Cη Eδ Eτ Fβ Fζ Lγ Lε Lζ Lη Mλ Mν Mo Oζ Oτ Ou Πα Πλ Pμ Po Pυ Qβ Qδ Qλ Rα Re Sβ Sδ Sθ Sk Tδ Vκ Wβ Xβ) have an entire horse – head, forequarters and hindquarters – which would be impossible to insert through the pin even if the legs were folded in as if lying down (as in ms Re). One (Eα), however, has only the head and fore legs while another (Mθ) depicts a horse – head and body, fore and hind – but with no legs.

A few mss have other animals – a lion’s head (Vα), a whole lion (Eβ Eη). However, no matter how well a scribe may have copied the text, the range of scribal artistic ability quickly runs from excellent to questionable. Several of the horses look more like donkeys (e.g., Cη Oτ Πα Qβ); the lion in Eη could possibly be a rabbit; the lion in Eβ could be a bear; the horse in mss Bκ and Pμ might be mistaken for a dog; and the horse in Lη might also be a lion or a bear. Perhaps the scribes should have stuck to their letters.

## [ Construction, Section II ]

## [CAPITULUM 7.] PREAMBULUM AD COMPOSITIONEM RETHIS ET TABULARUM LATITUDINIS

Accipe tabulam quam volueris et cuiuscumque quantitatis, et facies in ea circulum, cuius dimidium diametri sit simile dimidio diametri eius quod cadit ex

- 1 Preambulum ... latitudinis] *om.* Bα Bζ Bκ Cδ Cε Dγ Eο Eτ Lζ Mγ Nα Oα Oη Oξ Oο Pγ Pφ Qμ Rα Sβ St Uα Vα Vε Vυ Xα; Capitulum preambulum ad rethe et tabulas Aα(preambulam) Bθ Ev Mη Vπ(*om.* et); Capitulum ad rete et tabulas preambulum Rε; De figuratione tabularum Cβ(*marg.*); De impositione circuli capricorni, arietis, cancri Dη; De inveniende alterius per alterum trium unum circulorum Bι Fδ; De inveniende alterius per alterum trium unum circulorum viz. capricorni et arietis et cancri Vυ; De inventione trium circulorum Mθ Oκ; De reti Vκ; Descriptione trium circulorum scilicet capricorni, arietis et cancri Qα(*marg.*); Inicium operis tabularum Cβ Cθ Ev(*add. illeg.*) Mλ Oμ Oπ Oσ Pψ Sθ Sλ Vχ; Initium operis tabularum. Capitulum preambulum ad rethe et tabulas Vβ; Inicium operis tabularum et primo de reti Cζ Eμ(*marg.*) Mκ Vσ(*om.* et primo); Secunda pars Mυ; Sequitur secunda pars Bγ Eδ Eζ Po Wι; Sequitur secunda pars et est capitulum preambulum ad rethe et alias tabulas Nε Pδ Pθ Sκ Vψ; Sequitur secunda pars et est preambulum ad rethe et de aliis tabulis Rδ Preambulum] Capitulum in preambulum Bε; Capitulum. Preambulum Lη rethis] *om.* Mυ Mφ Qδ Vι Wα et ... latitudinis] *om.* Pυ Rβ Xβ tabularum] tabule Fβ(*text & marg.*); tabulas Pυ latitudinis] *om.* Oυ Pυ; altitudinis Oζ; *add.* Capitulum 7<sup>um</sup> Bε; *add.* Rubrica Qβ; *add.* De compositione circulorum Capricorni, Ariethis et Libre et Cancri Bη; *add.* vel secunda pars de inscriptione circuli capricorni Mυ Vι
- 2 Accipe] accipies *many*; Recipies Rε quam ... cuiuscumque] qualibet Bα; quamcumque et qualiscumque Cδ Sλ cuiuscumque] cuiuslibet Mυ Qδ Rβ; qualiscumque Bζ Cβ Cζ Cθ Eμ Ev Mγ Mθ Oη Oκ Oμ Oο Oπ Oσ Pφ Pψ Qα Rε Sθ St Vα Vυ Vυ Vχ et<sub>1</sub> ... quantitatis] in qualicumque quantitate volueris Vε quantitatis] *add.* fuerit Bα Bζ Cβ Cζ Cθ Eμ Eο Ev Fδ Mγ Mθ Mυ Oα Oη Oκ Oο Oπ Oσ Pφ Pψ St Vα Vβ Vυ Vυ Vχ; *add.* fuerit *and erased* Mκ ea] *add.* unum Pφ
- 2-14 Accipies ... circuli] *repeated in marg.* Oο (fol. 45<sup>v</sup>)
- 3 cuius] eius Xα dimidium] *om.* Ev sit simile] *om.* Mυ; *twice* Bθ; *add.* scilicet equale Vσ(*interlin.*) sit ... diametri<sub>2</sub>] *om.* Aα simile] sicut Mγ Oο Vυ; ilic Nα dimidio] *om.* Mo Uα; *marg.* Wι diametri] diametrique Sβ quod cadit] *om.* Bη Wβ cadit] accidit Cι Pθ Rδ; cecidit Bα Cβ Cδ Cθ Eμ Ev Fδ Mη Mθ Mκ Mυ Oα Oη Oκ Oμ Oπ Oσ Pφ Pψ Qα Sθ St Sλ Vα Vε Vυ Vσ Vυ Vχ; occidit Eο Oο; tendit Bζ; vadit Aα ex] *om.* Rδ; in Bι Sκ

[ *Construction, Section II* ]

[CHAPTER 7.] PREAMBLE TO THE CONSTRUCTION OF THE RETE AND OF THE LATITUDE PLATES

Take any plate you wish and of whatever size, and on it make a circle whose radius should be similar to the radius of the one which falls on the

5 matre infra limbum. Et cum feceris circulum, abscindes quod superfluum fuerit extra ipsum circulum de tabula preter quendam locum quem, ibi dimittes in modum denticuli ut intret in limbo in foramine ad hoc constitutum et bene factum. Cum intraverit tabula in matrem et ipse denticulus fuerit in suo foramine, ut non possit predicta tabula huc vel illuc moveri. Et cum hec feceris, extrahe diametra eiusdem

- 4 infra] id est PQ; in Xβ limbum] *om.* Pτ; *add.* 2-line gloss Cζ feceris] fecerit Sκ  
 abscindes] abscindas Uα; abscindens Cε; abscindensque Nα Nδ; abscindet Oη; *add.*  
 de eo/ea Bζ Fδ Mγ Oο Pτ Rε Vβ Vν; *add.* -que Eα Eβ Eη Fα Fζ Lγ Lε Lη Mδ Mφ Oζ Oξ  
 Oτ Oυ Pλ Pν Qγ Qλ Sδ Tδ Uα Vι Wα quod] *om.* Sκ; *add.* aliquam Nα  
 superfluum] perfluum Oη extra] ex Pν
- 4-5 abscindes ... circulum] *marg.* Eδ
- 5 ipsum] *om.* Mγ Oμ Oο Rε Vν circulum] *om.* Bα Vν; *add.* in tabula vel Dη de] in  
 Cε Pγ Sκ Uα Wι de tabula] *om.* Qα Vν quendam] *corr. from* quem Mδ; quem  
 Nδ ibi] *om.* Bα Cε Rε; in Dγ; sibi Bζ Lη Qδ Rβ dimittes] dimittas Oη; mittes  
 Dγ in] per Bζ; ad Qγ in modum] *om.* Sβ
- 6 denticuli] tau(?) Sι; tenticuli Vπ; *corr. in marg. from* circuli Wβ ut] ubi Rδ ut  
 intret] *om.* Xβ; intret] *corr. from* intrent Pγ; inde Oκ; inde *and add. interlin.* intret Mθ;  
*add.* denticulus Fβ limbo] limbum Aα Bα Mν Vβ Vπ Wι; *add.* scilicet Bα limbo  
 ... constitutum] *add. interlin.* al' in limbo in foramine ad hoc constituto Vβ in<sub>2</sub>] intra  
 hoc Bζ foramine] foramen *some* hoc] *om.* Vε constitutum] restitutum Nα  
 et bene factum cum] *om.* Cη bene factum] benefactum *many; om.* Aα Bγ Bη Bθ  
 Bι Bκ Cε Dγ Dη Eδ Eζ Eτ Eυ Lζ Mλ Mo Nα Pγ Po Pτ Pυ Qδ Rα Rβ Rε Sβ Sκ Uα Vβ Vκ  
 Vπ Vχ Wβ Wι Xα; bene dictum Bζ; bene suum Fζ; *add.* ut Bζ Cβ Cδ Cζ Cθ Eμ Eν Fδ Mγ  
 Mθ Mκ Mν Oα Oη Oκ Oπ Oσ Pφ Pψ Sθ Sι Sλ Vα Vε Vν Vυ; *add. in marg.* ut Vσ ut  
 cum] *twice* Eζ cum] *add.* scilicet Fβ
- 6-8 constitutum ... moveri] factum ut non moveatur tabula huc et aliie Bα
- 6-7 et ... foramine] *om.* Qα
- 7 tabula] tabulem Aα; tabulam Vπ; denticulus Qβ matrem] *blank* Xα denticulus]  
 tenticulus Bθ Vπ suo] *om.* Vν; ipso Bε Eα Eβ Fβ Fζ Lγ Lε Lη Mδ Mφ Nα Nδ Oζ Oξ  
 Oυ Pα Pγ Pλ Pμ Pν Pρ Qβ Qλ Sδ Tδ Wα Xβ; sui Cδ Cθ Eμ Eν Fδ Mν Oα Oμ Oπ Oσ Pφ Sι  
 Vα Vν Vυ Vχ ut] *om.* Bζ Cβ Cδ Cζ Cθ Dη Eμ Eν Fδ Mγ Mθ Mκ Mν Oα Oη Oκ Oμ  
 Oπ Oσ Pφ Pψ Rε Sθ Sι Sλ Vα Vε Vν Vυ Vσ Vχ; et] Mυ
- 8 predicta] *om.* Bε Eη vel] et *many; om.* Qα et cum hec feceris] deinde Bα  
 cum] *om.* Pψ Qλ hec] hoc *many; om.* Aα Sκ; is Vα feceris] fuerit Mν Sι;  
 factum fuerit Mγ Pφ Rε extrahe] *om.* Bθ Vπ diametra] diametrum Aα Bι Dγ  
 Mo; *add.* ABCD. Deinde facies circulum Capricorni (= line 10) Oμ eiusdem] *interlin.*  
 Vβ; eius Bε; cuiusdem Pμ; eius de Xα; illius Cδ Sλ; ipsius Nδ

mother within the limb. And when you have made the circle, cut away from the plate what is superfluous outside the circle itself except for a certain portion which you will leave there in the form of a small tooth in order that it may project into a hole in the limb located for it; and [it should be] well crafted. When the plate sits in the mother, and the small tooth itself is in its hole, so that the aforesaid plate cannot be moved one way or another, and when this has been done, extend the diameters of this same

10 circuli in directo quousque se abscindant super E cuspidem erectis lineis, et ista erunt diametra AC, BD. Deinde facies circulum Capricorni et circulum Arietis et Libre et circulum Cancri. Circulus autem Capricorni est circulus ABCD.

9 in directo] *om* Qα directo] recto Xα quousque] *rep.* Wι se] *om.* Nε  
 abscindant] abscinderit Mγ E] *om.* Aα Bγ Bη Bθ Bι Bκ Cβ Cη Cθ Dγ Eδ Eζ Ev  
 Eo Et Mλ Nα Oπ Pγ Po Pτ Pv Rα Sθ Sκ Uα Vβ Vε Vκ Vπ Vχ Wβ Xα cuspidem]  
 cuspidis Cι erectis] rectis CζEμ erectis lineis] *om.* Bα; *add. interlin.* id est secant  
 ibi circulum ad angulo rectas Oα; *add.* id est super E cuspidem erectis angulis Vβ; *add.*  
*interlin.* id est dividendo circulum per quartas Vβ; *add. (later hand) in marg.* orthogonaliter  
 Qδ lineis] *om.* Qδ; angulis Fδ Mγ Re Vv; *add. in marg.* Ego Iohannes de Calomonte:  
 Ista littera “Id est super e cuspidem erectus angulis” rarissime invenitur in exemplarium  
 nisi fora tamquam glosa vel tamquam litteram alterius positionis Vβ<sup>1</sup> ista] hec Bα;  
 illa Eo; ipsa Pφ; ita Sι ista erunt diametra] sunt Qα erunt diametra] esset  
 diametrum Mθ; essent diametra Oκ

10 diametra] *ms* Oμ *ends* AC, BD] ABCD Aα Bγ Bε Bη Bζ Bθ Bι Cβ Cη Cθ Cι Dη Eα Eβ  
 Eδ Eζ Eη Ev Eo Et Ev Fα Fβ Fδ Fζ Lγ Lε Lη Mγ Mδ Mη Mλ Mo Mv Mφ Nα Nδ Nε Oζ  
 Oξ Oo Oπ Oτ Ov Pα Pγ Pδ Pθ Pλ Pμ Pv Po Pτ Pv Pφ Qα Qβ Qγ Qλ Qμ Rα Rβ Rδ Re Sβ  
 Sδ Sκ Tδ Uα Vβ Vε Vι Vκ Vv Vπ Vψ Wα Wβ Wι Xα Xβ; *corr. from* ABCD Qδ; *add.* per 360  
 sitque omnis quarta circuli (*repeat of line 14*) Bζ; *add. interlin.* id est circuli Capricorni Vβ  
 Deinde] Post Bα Deinde ... circulum<sub>2</sub>] *om.* Et Sκ facies] *fac many*  
 circulum Capricorni et] *om.* Bγ Cε Mo Pγ Pτ Pv Vβ Wι circulum<sub>2</sub>] signum Cε  
 et Libre] *om.* Uα

10-11 Deinde ... ABCD] *om.* Cη EvNα Vv

10-12 Capricorni ... circulum<sub>1</sub>] *om* Dη

10-12 et<sub>3</sub> ... id est] *om.* Cε

11 circulum] *om.* Bζ Mv Sι Cancri] *add.* id est per quam vadit capud Cancri Eα Dη  
 Pτ(*marg.*); *add.* per quam vadit capud Cancri Bζ Circulus<sub>1</sub> ... ABCD] *om.* Pα; Est  
 autem Capricornus circulus ABCD Bε Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mv Mφ Nδ Oζ Oξ  
 Oτ Ov Pλ Pμ Pv Pφ Qβ Qγ Qλ Sδ Tδ Vι Wα Xβ autem] *om.* Bα Mv Capricorni]  
*om.* Vκ circulus<sub>2</sub>] *om.* Bα Et Pφ

11-13 Circulus<sub>1</sub> ... id est] *om.* Bζ

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<sup>1</sup> Iohannes de Calomonte: unidentified. In the explicit to the *Practica*, Iohannes identifies himself as from Calomonte, Flanders. I have not been able to glean further information about “Calomonte” or “Calomonte.”

circle in a straight line all the way until they intersect at right angles at centre E, and these will be diameters AC, BD. Then you will make the circle of Capricorn and the circle of Aries and Libra and the circle of Cancer. The circle of Capricorn, however, is circle ABCD.

- Cumque volueris facere circulum Arietis et Libre, id est circulum per quem vadit caput Arietis et Libre, et circulum Cancri, id est per quem vadit caput Cancri, divide circulum ABCD per 360 partes, sitque omnis quarta circuli ex 90 partibus. Deinde pone arcum AZ similem numero graduum totius declinationis, que est secundum
- 12 Cumque] cum Bγ Cη Fβ Lε Qλ; cum autem Bκ; *add. in marg.* De Circulo Arietis et Libre Vυ Cumque ... id] Deinde fac signum [*illeg.*] et hoc Cε facere] *add.* circulum Capricorni et Eυ circulum<sub>1</sub>] *om.* Pτ Arietis ... circulum<sub>2</sub>] *om.* Qα et Libre] *om.* Bε Bι Bκ Cθ Cι Eβ Eτ Dγ Eδ Eη Eο Fβ Fζ Lγ Lε Mδ Mη Mλ Mο Mυ Mφ Nα Nδ Nε Oζ Oξ Oπ Oτ Oυ Pγ Pδ Pθ Pλ Pν Pυ Qβ Qγ Qλ Qμ Rα Rδ Sδ Sκ Tδ Uα Vβ Vε Vι Vκ Vχ Wα Wι Xα Xβ id est] *om.* Lγ Rε Sλ Vχ; et Fζ Oο Pθ circulum<sub>2</sub>] *om.* Bγ Bη Cη Rδ Wβ quem] *add.* scilicet Sλ
- 12-13 Cum ... Cancri<sub>2</sub>] *om.* Bζ
- 12-13 id est ... Libre] *om.* Bα Bθ Mν Oη Pμ Pρ Vπ
- 13 Arietis ... caput<sub>2</sub>] *om.* Aα Pτ Sλ et Libre] *om.* Bε et circulum ... Cancri<sub>2</sub>] *om.* Fδ Mγ Oο Vυ Cancri<sub>1</sub> id est] *om.* Qα Rβ id est] *om.* Cζ Eν Tδ; *add.* circulum Sκ id est per quem] per quem scilicet Cβ Cδ Cθ Eμ Eο Mθ Mν Oα Oκ Oπ Oσ Pφ Pψ Sθ Sι Vα Vε Vσ Vυ Vχ id est ... Cancri<sub>2</sub>] *om.* Bα Eδ Oη Pλ Pρ; *marg.* Mκ vadit<sub>2</sub>] *om.* Nδ Cancri<sub>2</sub>] Capricorni Mθ(*interlin.*) Oκ
- 14 divide] deinde Vυ divide circulum] *om.* Dγ circulum] *om.* Vσ; *add.* dyametri Vε circulum ... sitque] *interlin.* Vψ 360] *add.* ut Vκ; 60 *corr. to* 360 Po partes] *om.* Bζ Eτ Pγ Uα Vκ Wι; divisiones Fδ Mγ Mδ Mν Mο Nα Nδ Oο Pυ Pφ Sι Sκ Vν; divisiones equales Rε; divisiones per partes equales Vβ; gradus Bγ Bη Cη Pτ Wβ; *add.* equales Bε Cδ Cε Cι Dη Eα Eη Fα Fβ Fδ Fζ Lγ Lε Lη Mγ Mδ Mη Mκ(*interlin.*) Mυ Mζ Nδ Nε Oξ Oο Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rβ Rδ Sδ Sι Sλ Tδ Vι Vσ Vν Vψ Wα Xβ partes ... 90] *om.* Dγ sitque] sicque Pρ Qμ; sit Wι sitque ... partibus] *om.* Dγ; ita quod qualibet quarta habet 90 partes equales Cδ Cε Dη Sλ(*om.* equales) omnis] *om.* Qδ; qualibet Bα; *add.* gradus Vψ quarta] 4<sup>2</sup>/4<sup>1a</sup> many; *om.* Lγ; *add.* eiusdem Pφ circuli] *om.* Bα Qδ Rβ; *add.* *interlin.* erunt Pρ; *mss* Fδ Oο *end* ex] est Aα; est ex Bζ; per Qδ Rβ 90] Item Eν; nonaginta Vα partibus] partes equales divisa Qδ Rβ; *add.* equalibus Bε Bη Cι Eα Eη Fα Fβ Fζ Lε Lη Mδ Mκ(*marg.*) Mυ Mφ Nδ Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qγ Qλ Rδ Sδ Tδ Vι Vσ Vψ Wα Wβ Xβ; *add.* *interlin.* id est gradibus Vβ
- 15 pone] pones *some* AZ] A Rε; A2 Fζ; A4<sup>o</sup> Vκ; ad Wβ; 13 Vε<sup>2</sup>; A *lac.* Vα; A *et or* A ct Mγ Mυ Mφ Nα Pλ Vι; Z *and erasure* Pρ; scilicet Oη similem] *om.* Pψ; *interlin.* Sλ; simile Cη Mν Pρ; *add.* a Pδ; *add.* in Fζ simile numero] *om.* Sι declinationis] *add.* eius Bη Wα(*marg.*) est] sunt Bθ Vπ
- 15-16 totius ... gradus<sub>1</sub>] *marg.* Bγ; *om.* Cη

<sup>2</sup> The scribe of Vε is almost random in this section in his use of numbers and diagram lettering. Most of the lettering used is confused and/or erroneous. The scribe of Nα also does not seem to know what he is copying, often misreading the lettering, or omitting it, or substituting letters that make no sense.



And when<sup>3</sup> you wish to draw the circle of Aries and Libra, that is the circle through which the beginnings of Aries and Libra travels, and the circle of Cancer, that is through which the beginning of Cancer travels, divide circle ABCD into 360 parts, and each quarter of the circle should consist of 90 parts. Then set arc AZ similar to the number of degrees of the entire [obliquity of the ecliptic]<sup>4</sup> which, according to

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<sup>3</sup> The first section of this chapter, lines 12 to 43, describes how to draw the circle of Aries/Libra and the circle of Cancer, working from the given circle of Capricorn around the outer edge of the plate.

<sup>4</sup> The Latin properly reads “whole [or entire, *i.e.*, maximum] declination,” that is, the maximum number of degrees of the sun’s position measured from the celestial equator. I have substituted “obliquity [of the ecliptic]” for “declination,” as a more familiar term to the modern reader. However, this is actually a different concept (the angle of the ecliptic to the celestial equator at the equinoxes) although the value is exactly the same. Those wishing to be more precise in their translation can substitute “declination” for my “obliquity.”

Ptholomeum 23 gradus et 51 minuta, et secundum Albategni 23 gradus et 36 minuta,

- 16 Ptholomeum] Aα Bα Bε Bζ Bι Cβ Cδ Cε Cζ Cι Dγ Dη Eδ Eμ Eο Eτ Eυ Fα Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mο Nα Nδ Nε Oζ Oη Oσ Oτ Pα Pγ Pδ Pθ Pλ Pμ Pν Pρ Pψ Qβ Qδ Qλ Qμ Rα Rβ Rε Sδ Sθ Tδ Uα Vβ Vι Vσ Vυ Wα Wβ Wι; Phm Vκ; Phtolomeum Vπ; Ptolomeum Bγ Bη Bκ Eβ Eζ Eη Eν Fβ Mγ Mυ Mφ Mν Po Pφ Qγ Sβ Sλ Vε Vχ Vψ; Tholomeum Cθ Eα Oα Ok Op Pt Pv Qα Rδ Si Va Vv Xβ; Tolomeum Oξ Xα; Tpholomeum Bθ Sk Ptholomeum ... et<sub>2</sub>] *om.* Ou 23] *om.* Cη; 32 Xβ; 33 Pμ gradus<sub>1</sub>]<sup>5</sup> *illeg.* Pψ; *om.* Va; gradus Bι Cθ Eο Eμ Eν Op Ou Pψ Vε Vκ; g<sup>a/u</sup> Bα Bε Cδ Cι Dγ Eα Eβ Eζ Fα Fβ Lγ Lε Lζ Lη Mδ Mη Mλ Mο Mυ Mφ Nα Oζ Oη Oξ Oτ Pγ Pδ Pθ Pμ Pν Po Pρ Pφ Qγ Qλ Sδ Tδ Vι Wα; graduum Aα Bγ Bζ Bη Bθ Cβ Cε Dη Eδ Eη Eτ Eυ Mγ Mθ Mκ Ok Oσ Pα Pλ Pτ Pv Qα Qβ Qδ Rβ Rε Sk Uα Vβ Vν Vπ Vσ Vυ Wβ Wι Xα; gradibus Mν Oα Xβ; gradibus *corr.* to gradus Vχ 51] li Ev; *interlin.* Mθ; *om.* Eη; 15 Aα Mφ Qβ Sδ; '1'51' Vε; 15 *corr.* to 51 Mυ; 36 Xβ; 52 Pθ 51 ... gradus<sub>2</sub>] *om.* Cε Eη; *marg.* Bε Op; et 51 minuta Mθ(*interlin.*) minuta<sub>1</sub>] *om.* Va; minutorum Bε Cε Dη Mγ Mο Oξ Pα Qδ Rβ Rε Vβ Vν; minuti Aα Pv et secundum] *marg.* Eο; secundum aliter Cδ; que secundum Pρ et<sub>2</sub> ... minuta<sub>2</sub>] *om.* Cε Oξ Op; *marg.* Eμ Oξ Albategni] Bγ Bη Bθ Cζ Cι Dγ Dη Eβ Eδ Eζ Eμ Eο Eτ Eυ Fα Fζ Lγ Lε Lζ Lη Mγ Mδ Mκ Mλ Mν Mυ Mφ Oα Oζ Oη Ok Oσ Oτ Ou Pα Pγ Pδ Pθ Pλ Pμ Pν Po Pρ Pτ Pv Pφ Pψ Qα Qβ Qδ Qλ Rβ Rδ Rε Sδ Sθ Sk Tδ Uα Va Vβ Vε Vι Vκ Vν Vπ Vσ Vυ Vχ Vψ Wα Wβ Xβ; Ablbategni *corr.* to Albategni Rα; Albadegni Mη; Albag *corr.* in *marg.* to Allutegni and *corr.* *interlin.* to Albitegni Wι; Albaregni Aα; Albatagni Bε; Albateg' Cδ Fβ Mo Qμ; Albategñ Cθ; Albatēni Bζ; Albatengni Bι; Albatesi Nα; Albateum Bα; Albath~ Ne; Albathegni Xα; Albetagni Eα; Albetegñ Cβ Sλ; Albitē Ev; Albitegni Cη Qγ; *add.* et ista melior est que est Qδ Rβ 23] xxiii Ev; *om.* Cε Eη Mθ; 33 Sθ Uα gradus<sub>2</sub>] Bζ Cθ Eμ Eν Eο Mν; *om.* Oη Va Vε; g<sup>a/u</sup> Aα Bα Bε Bθ Cδ Cι Dγ Dη Eα Eβ Eδ Eζ Eτ Eυ Fα Fβ Lγ Lε Lζ Lη Mδ Mη Mκ Mλ Mο Mυ Mφ Nα Oζ Oσ Oτ Ou Pα Pγ Pδ Pθ Pμ Pν Po Pρ Pφ Pψ Qβ Qα Qγ Qδ Qλ Rβ Sδ Tδ Vι Vκ Vπ Wα Xα Xβ; graduum Bγ Bη Bι Cβ Cη Mγ Oα Ok Pλ Pτ Pv Rε Uα Vβ Vν Vσ Vυ Wβ Wι; gradibus Xβ; gradibus *corr.* to gradus Vχ 36] *om.* Eο Nα; 26 Wα; 6 *corr.* to 36 Sλ minuta<sub>2</sub>] *om.* Va; minutorum Bθ Bι Dη Eβ Eη Eυ Fα Fζ Lγ Lη Mγ Mδ Nδ Oζ Pμ Pν Pρ Pv Qδ Qλ Rβ Rε Sδ Sk Vβ Vν Wα; minutorum et sicut habemus Aα
- 16-17 36 ... et<sub>1</sub>] *om.* Eο

<sup>5</sup> Here and elsewhere there is great confusion over which case to use for *gradus* and *minuta*; some use the plural accusative (treating the number as an adjective), others use the plural genitive modifying the number as if the latter were a noun. Still other manuscripts simply abbreviate *gradus* and *minuta* without making the case explicit.

Ptolemy is 23 degrees 51 minutes,<sup>6</sup> and according to Albategni<sup>7</sup> 23 degrees 36 minutes,

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<sup>6</sup> Ptolemy, *Almagest*, I, 12.

<sup>7</sup> Al-Battānī (Abū ʿAbd Allāh Muḥammad ibn Jabir al-Battānī; Latin: Albategnus), c. AD 858-929.

sed etiam in diebus Almeonis invenerunt observatores 23 gradus et 33 minuta et, sicut habemus ex Indis pervenit hec declinatio ad 24 gradus. Accipe ergo hanc declinationem secundum quem volueris, quia non erit ibi sensibilis discordia.

- 20 Cum igitur volueris extrahere circulum Arietis, divide circulum Capricorni, id
- 17 etiam] *om.* Βα Βη Βι Cε Εβ Εη Ev Fa Fζ Λη Fβ Λε Μγ Μδ Νδ Νε Οπ Πα Ρο Qα Rε Sθ Σλ Vε Vι Vκ Vσ Vυ Wα Xβ in diebus] in die Qλ; tempore Qδ Rβ Almeonis] Aα Βα Βγ Βη Βθ Βε Βι Cε Cη Cι Dη Εβ Εη Ετ Ev Fa Fβ Fζ Λγ Λε Λη Μδ Μη Μκ Μο Μυ Μφ Να Oα Oζ Oξ Oτ Oυ Πα Ργ Ρδ Ρθ Ρλ Ρμ Ρν Ρο Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Ρβ Rδ Sδ Σκ Tδ Vβ Vι Vπ Vσ Wα Wβ Xβ; Albumazar Bζ; Alemenō Cβ; Almемam Cθ Eζ; Almeman Bκ Sβ Xα; Almemaυ Dγ Eα Eδ Lζ Po Rα Uα; Almeni Ev; Almeniam Oπ Vχ; Almeniau Mλ Vκ; Almenō Cδ: Almenōn Oκ; Almeō Si Ve; Almeom Qα; Almeon Eμ(*interlin.*) Μγ Mθ Mv Oα Oσ Pφ Sθ Σλ Vα Vv Vυ; Almeori Cζ Oη invenerunt] notaverunt Bθ Vπ observatores] conservatores Aα; *add. interlin.* conservatores Oα; *add.* et hoc numero reputatur Xβ 23] *illeg.* Μκ; *om.* Eo gradus] graduum Aα Bθ Βι Vβ gradus et 33] *om.* Μγ 33] 23 Eα Eδ Eζ Mη Mo Na Ne Pγ Po Pv Ra Sβ Σκ Vψ; 36 Oπ; 33.36 Ρμ minuta] minorum Aα Fβ Vβ; *add.* sicut in diebus Na et] que Ρο sicut] *om.* Aα; S<sup>d</sup> *and add in marg.* sicut Sθ
- 18 habemus] habuisti Cη; *om.* Bζ; pervenit Qα habemus ex Indis] *repeats interlin.* Βη ex] *om.* Sθ; ab *some*; *add.* diebus Eζ ex Indis] *om.* Mv; per indos Oη Indis] Indith Mη; Yndis *some*; hyndis Ρμ Pv pervenit] pervenitque Eβ hec] *om.* Βα Cδ Σλ declinatio] *om.* Βα Vι; *add. interlin.* maxime solis Ρο; *add.* usque Cδ Σλ 24] 34 Λγ Mθ Oκ Ρμ Pv Qλ Vψ; 34 *corr. to* 24 Fβ gradus] *om.* Fa ergo] *om.* Sθ; igitur *many* hanc] *om.* Eα Mv
- 18-19 hanc ... secundus] *om.* Βα
- 19 quem] quod Cθ Dγ Πα Ργ Ρ Qα Σκ Vβ Vι; *add.* auctorem Qα quia] et Rδ quia ... discordia] *om.* Βα erit] est Pφ Qδ Rβ Si Vα Vε Vπ; ē Bθ Ev ibi] *om.* Bζ Cε Pφ Qα Si Ve Vι; in Eβ; sibi Mκ Σκ; tibi Eα Na
- 20 igitur] ergo *many*; vero Aα Bθ Dη Ev Qδ Rβ Vπ volueris] vis *many*; *om.* Ργ Ρψ extrahere] *om.* Mθ; distrahere Cε Arietis] *add.* et Libre Qδ Rβ Rδ Arietis ... circulum<sub>2</sub>] *om.* Ne Pl Pq divide] deinde Cη
- 20-21 id est circulum] *om.* Be Bi; et circulum Ve; in circulum Cη; qui est Cδ Σλ; qui est circulum Fβ; scilicet Βα

but even in the days of al-Mā'mūn<sup>8</sup> observers found 23 degrees 33 minutes, and just as we have from the Indians, the [obliquity] approaches 24 degrees. Therefore take this [obliquity] following whom you wish, since there will be there no perceptible disagreement.

When, therefore, you wish to draw the circle of Aries, divide the circle of Capricorn, that

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<sup>8</sup> Al-Mā'mūn (Abū Ja'far Abdullāh al-Mā'mūn ibn Harūn, AD 786-833), Abbasid caliph, AD 813-833. His Latinized name, Almeonis, can be found in Campanus of Novara, *Theorica planetarum*, and in Kepler. Gunther erroneously identified Almeonis as "The son of Albumazar."

est circulum ABCD, per 360 divisiones. Et accipe ex eis secundum predictam declinationem ex puncto A versus D, et pone ibi aliquam notam. Et si volueris, divide ipsam quartam per 15, et accipe ex eis 4 ex parte A versus D, et pone ibi notam; et vide

- 21 circulum] *om.* Eα ABCD] Capricorni Nα; *add. ll. 12-13 (repeat: Cumque ... Cancr<sub>2</sub>) Mη* 360] 36 Uα; 60 *corr. to* 360 Cβ divisiones] *om.* Mγ Mν Vε Pλ Pρ Pφ Vν; partes  
equales Rδ; *add. equales* Fβ ex] *om.* Mθ; ab Bζ Eη; *add. interlin. gradibus* Oα ex  
eis] *add. 24 gradus* Qα secundum] *om.* Mφ Oζ Pμ Pν Pρ Qγ Qλ Vι Vκ  
predictam] *om.* Bη Vψ Wβ; dictam Bα Cε Dη
- 21-22 Et ... declinationem] *om.* Eα
- 22 declinationem] *add. scilicet 24 gradus vel circa* Xβ ex] *add. P Vε puncto] parte*  
Eα versus D] *om.* Cβ Cζ Cθ Eμ Mθ Mν Oη Oπ Oσ Pψ Qα Vα Vν Vχ; *marg.* Mκ;  
*interlin.* Oα pone] fac Bα; ponetes Nα ibi] *om.* Eν aliquam] *om.* Bγ Bε Bη  
Cδ Cη Pα Pτ; *interlin.* Rε; aliquantulum Vπ notam] *add. Z Cι Vκ; add. interlin. ut Z*  
Oα Et<sub>2</sub>] vel Bα Bε Dη Eη Fζ Lγ Lη Mγ Mδ Nδ Oζ Oτ Oυ Pμ Pν Pρ Qβ Qγ Rε Sδ Tδ  
Vι Xβ; et *corr. to* vel Mκ; *add. interlin. vel* Vβ Et si volueris] *om.* Qλ Wα; vel Mν Mφ  
volueris] *vis many* divide] dividere Bα Bζ Cη Dη Mη Nε Pδ Qα Wβ
- 22-23 ibi ... ibi] *om.* Nα 22-23 Et si volueris ... notam] *om.* Pα Vν
- 22-24 Et si vis ... equales] *marg.* Cβ
- 23 ipsam] *om.* Mλ Pα; aliquam per Bα; unum Oπ; *add. in* Uα; quartam] 4<sup>am</sup> *many; om.*  
Mν; *add. circuli* Oα(*interlin.*) per] *twice* Vκ; ex Oη; partem Rβ; partes Qδ *and add.*  
*suprascr. in per 15] om.* Sβ 15] iii Cθ; 5 Mθ Oκ; 12 Rε ex<sub>1</sub>] *add. in alio* Eο  
ex eis] exis Sκ 4] 4<sup>or</sup>/iiii<sup>or</sup>/quat(t)uor *some; xi* Cθ Oπ; 24 Qμ; 34 Mη; *add.*  
declinationem *corr. in marg. to* divisiones Fβ; *add. divisiones* Bζ Bη Cε Cι Dη Eα Eβ Eη  
Eμ(*interlin.*) Eν Fζ Lγ Lε Lη Mγ Mδ Mκ(*interlin.*) Mο Mφ Nδ Nε Oζ Oξ Oτ Oυ Pδ Pθ Pλ  
Pμ Pν Pο(*interlin.*) Pρ Pφ Qβ Qγ Qδ Qλ Rβ Rδ Sδ Sθ Tδ Vν Vψ Wα Wβ Xβ; *add.*  
divisiones quarum qualibet habet 6 gradus Mν Mφ Vι; *add. partes and interlin. al'*  
divisiones Vβ 4 ... D] quartam partem Vε ex<sub>2</sub> ... ibi] fac Bα versus D] *om.*  
Cδ Cζ Cθ Eμ Eν Mγ Mκ Mν Oα Oη Oκ Oπ Oσ Pφ Pψ Qα Sθ Si Sl Vα Vσ Vν Vχ(*interlin.*)  
ibi] *om.* Mν; *add. aliquam* Fβ Rε notam] *add. ex hiis 15 accipe 4 versus A Mη*  
Qμ; *add. s; [= scilicet z?] Sθ; add. scilicet z* Bε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mθ  
Mν Nδ Nε Oξ Oτ Oυ Pδ Pθ Pλ Pμ Pν Pο(*interlin.*) Pρ Qβ Qγ Qλ Qμ(*marg.*) Rδ(R) Sδ Tδ Vι  
Vψ Wα Xα; *add. versus z* Cε; *add. z* Eμ Qδ Rβ et<sub>2</sub>] sed Aα Bζ Bθ Cθ Dγ Eμ Eν Eυ Lζ  
Mκ Mλ Mν Oη Oκ Oσ Pο Pυ Pφ Qδ Rε Sβ Si Vα Vκ Vν Vσ Vχ Xα; *add. interlin. al' sed* Vβ  
et vide] divide Sθ; et divide Xβ; hoc divide Vε; sit inde Aα
- 23-24 et<sub>2</sub> ... equales] *om.* Bα Si

that is circle ABCD, into 360 divisions. And take of these, following the abovementioned [obliquity], from point A towards D, and set there some mark. And if you wish, divide this very quarter by 15, and of these take 4 from A towards D and place there a mark;<sup>9</sup> moreover see

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<sup>9</sup> 90 divided by 15 equals 6, and 4 times 6 equals 24, an approximation of the obliquity of the ecliptic.

- 25 ut sint quarte equales. Et si volueris, divide quartam per 3<sup>a</sup> et iterum divide ipsam tertiam, que fuerit iuxta A, per 5, et ex ipsis 5 accipe 4, que fuerint ex parte A, et ibi pones notam. Si autem certius volueris dividere, fac sicut dicemus. Postquam diviseris
- 24 ut] que Eδ; si Qα; ut ibi Rδ; *add.* ibi Bε Cε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lγ Lη Mδ Mη Mφ Nδ Nε Oξ Oτ Pδ Pμ Pν Pρ Pυ Qβ Qγ Sδ Tδ Vψ Wα Xβ; *add.* ubi Pθ Vι sint] sicut Pγ quarte] 4<sup>e</sup> many; *om.* Eο equales] *om.* Cζ et<sub>1</sub>] vel Bα Cδ Sλ Vσ; *et corr. to* vel Mκ volueris] vis many divide<sub>1</sub>] dividere Bζ Cη Cι Dγ Mη Mo Mυ Mφ Nε Oη Pθ Pτ Vι Wβ; divides Fβ; *add.* ipsam Cβ Eα Sι quartam] 4<sup>am</sup> many; *om.* Mδ quartam ... divide<sub>2</sub>] *marg.* Rα 3<sup>a</sup>] tria/3 many; tres Oη Qβ; tertiam Pφ divide<sub>2</sub>] *om.* Pφ ipsam] *om.* Bα Bκ Cδ Cζ Eδ Eμ Mγ Mκ Mυ Mφ Oη Oκ Pφ Qα Sθ Sι Sλ Vα Vν; illam Mν
- 25 tertiam] 3<sup>am</sup> many; 3 some; *om.* Mν; quartam Bθ Eυ Vπ; *add. interlin.* partem Oα; *add.* per ipsam Mφ; *add.* per partem Mυ que fuerit iuxta] versus Bε Eα Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mυ Mφ Nδ Oξ Oξ Oτ Oυ Pλ Pμ Pν Pρ Pυ Qβ Qγ Qλ Sδ Sι Sλ Tδ Vι Vν Wα Xβ fuerit] fuit Aα Oη Rε iuxta] infra Dη Pδ Pθ; in parte Cε; in quarta / 4<sup>a</sup> Eδ Eζ Mη Po Mo Nα Pγ Pδ Qμ Rα Rε Sβ Sκ Wι Xα; oc<sup>u</sup> or x<sup>u</sup> Eν; versus Aα Bθ Eυ Qδ Rβ Vπ A<sub>1</sub>] *om.* Mη Mν; *interlin.* Vσ; *add.* versus Eδ per 5] per quinque alii; per 4 Xα; per 5 divisiones Bζ Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mγ Mδ Mυ Mφ Nδ Oξ Oτ Oυ Pλ Pμ Pν Pρ Pτ Pφ Qβ Qγ Qλ Rε Sδ Tδ Vβ(*interlin.*) Vι Vν Wα Xβ; per i Eν; *add.* per divisiones Bε et ex ipsis 5] *om.* Vυ Sκ; ex extrahe 5 Vε ipsis] *interlin.* Rα; eis Cζ Oη 5<sub>2</sub>] *om.* Nα; quintis Pφ; quinque Pρ; *add.* divisiones Sι accipe] twice Pγ 4] 4<sup>or</sup>/iiii<sup>or</sup>/quat(t)uor some; *add. in marg.* scilicet qui valent 24<sup>or</sup> gradus Vβ que] tunc Sκ que fuerint] *om.* Bα; divisiones Cε que<sub>2</sub> ... parte] versus Cδ Sλ fuerint] *illeg.* Eη; fiunt Vκ Vν Wβ; fuerit Eζ; fuerunt Oα; sunt Bε Eβ Fα Fζ Lγ Lε Lη Mγ Mδ Mκ Mυ Mφ Nα Oξ Oη Oξ Oτ Oυ Pα Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vβ Vι Vχ Wα Xβ ex<sub>2</sub>] a many ex parte] a capite Aα Bθ Eυ Vπ; iuxta Qα Vχ A<sub>2</sub>] *add.* versus D Cε ibi] twice Pψ; sibi Nε
- 25-26 et<sub>2</sub> ... notam] fac Bα
- 26 pone] pones some notam] *om.* Xβ; notas Bη; *add.* scilicet Z Bε Cε Eα Eβ Eη Fα Fβ Lγ Lε Lη Lδ Lφ Mυ Nδ Oξ Oξ Oτ Pα Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Wα Xβ; *add.* scilicet 2 Fζ; *add.* Z Oα(*interlin.*) Oυ Qδ Rβ Vκ Si] Sed Sβ; *add. in marg.* Alter modus extrahendi predictos circulos arietis scilicet et cancri per circulum Capricorni Lζ certius] tertius Aα Nα Wβ; cercinus Pγ volueris] vis many; *om.* Vπ dividere] facere Bζ dividere ... dicimus] fac sic Bα; procedere in dividendo fac sic Cδ Sλ sicut dicemus] hoc sicut tibi narrabimus Bζ Cβ Cζ Cθ Eο Eμ Eν Mγ Mθ Mκ Mν Oα Oη Oκ Oπ Oσ Pφ Pψ Qα(*om.* tibi) Rε(*om.* tibi) Sθ Sι Vα Vβ(*om.* tibi; *add. interlin.* al' dicemus) Vε(*om.* tibi) Vν Vσ Vυ Vχ; nd(?) dicemus Cε; sic Bα Cδ; sicut narrabimus Qα; sicut diximus Vπ; sicut diximus *corr. from* sicut dicemus Bθ; ut dicam Bγ Bη Cη Pτ Wβ; ut dicemus Dη Mυ; *add. Addendum 7 (ll. 62-67) Wι*



that the quarters are equal. And if you wish, divide the quarter by 3 and again divide that third, which will have been next to A, by 5, and then from these fifths take 4, which will have been next to point A,<sup>10</sup> and place there a mark. If, however, you wish to divide [it] more precisely, do just as I will say. After you have divided

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<sup>10</sup> 90 divided by 3 equals 30, and 30 divided by 5 equals 6; 4 times 6 [i.e., a fifth of 30] equals 24, an approximation of the obliquity of the ecliptic.

30 tabulam per diametra et equales feceris quartas scripserisque litteras super capita  
diametrorum, utpote in superiori parte tabule que est sub armilla et signat meridiem A;  
et in occidente B, in septentrione C, et in oriente D, divides unam quartarum, scilicet ex  
A in D in 90 gradus, et accipies 23 gradus et 51 minuta secundum Ptholomeum, quia

- 27 et ... quartas] *om.* Bα; in equales quartas Bε Eα Eη Fζ Lε Lη Mδ Mφ Mv Nδ Oξ Oτ Oυ Pζ  
Pλ Pμ Pν Pρ Qβ Qγ Sδ Tδ Vι; in 4<sup>or</sup> 4<sup>as</sup> equales Fβ quartas] 4<sup>as</sup> many; *add.* si Nα  
scripserisque] scribensque Oσ: scribesque Vυ: scripsens Pψ: scripsensque Bζ Cβ Pτ  
Qλ: scripsisque Oη: scripterisque Aα: *add.* lineas et Mδ Nδ litteras] *add.* A,B,C,D  
Oα(*interlin.*); dyametra Uα super capita] *om.* Vε
- 28 diametrorum] eorum Rδ; ipsorum Eδ utpote] ut Bα Ev; et pote Mv; ut pone Bθ Vπ;  
ut poste *corr. to* ut Sι; ut puncta Vν; *add. interlin.* al' puta Vβ superiori] inferiori Cη  
parte] *om.* Ev; *add.* meridiei Vν tabule] *twice* Mη; *om.* Mλ Oυ Qλ Vι Vν Wα;  
*marg.* Mκ; meridiei Rε; *add.* meridies Bζ Mγ que] eque Qδ est] *om.* Sθ; *add.*  
quasi Qα sub] *om.* Vσ; super Oη armilla] *add.* A Oη et] que Bα  
signat]<sup>11</sup> significat Cη Dγ Lε Mγ Mθ Oα Oη Oσ Pγ Pρ Pτ Pφ Rε Tδ Vψ; sicut Nα  
A] *om.* Eυ
- 29 et<sub>1</sub>] quod Pρ B] s Xβ; *add.* et many C] *om.* Nε Qδ; o Nα oriente] occidente  
Vε D] *om.* Eβ divides] *illeg.* Qλ; divide Cδ Ev Xβ; dividens Bγ Bι Cη Eδ Pγ Pο  
Pτ Pυ Uα Vν Wβ Wι; dividies Aα unum] numquam Aα unum quartarum]  
unamquamque Pρ unam ... scilicet] id est quartam Bα quartarum] 4<sup>arum</sup> alii;  
quartam Bε Cδ Cε Dη Eα Eβ Eη Eτ Ev Fα Lγ Lη Lε Mδ Mθ Mv Mu Mφ Nα Oζ Oη Ok Oτ  
Oυ Pα Pδ Pλ Pμ Pν Pτ Pφ Qβ Qγ Qλ Sδ Vβ Vι Vν Vσ Vυ Wα Xβ; quartam *corr. to*  
quartarum Oα; *add.* tam partium Cε scilicet] ut pote Bζ Cβ Cζ Cθ Eμ Ev Mγ Mκ Oα  
Oη Ok Oπ Oσ Pφ Pψ Qα Rε Sθ Sι Vα Vε Vν Vσ Vυ Vχ; ut pone Mv
- 30 in D] *om.* Dγ 90] lx Ev gradus,] gradibus Eo et<sub>1</sub> ... gradus,] *marg.* Cβ  
accipies] accipie Cδ; *add. interlin.* ex eis Bγ 23] *om.* Oπ 51] hi Mθ; 15 Pν  
Qβ Sδ; 33 Sι; 33 *corr. to* 51 Vα Vπ; 33 minuta et 51 Bε; 33 minuta pro certo 51 Aα  
minuta] minutum Sκ Ptholomeum] Ph'm Vκ; Phtolomeum Bκ Ok Vπ;  
Potholomeum Eζ; Ptholoiom Sθ; Ptolomeum Bη Bι Eη Ev Fβ Mv Mu Mφ Pφ Qμ Rδ Sλ  
Vα Vε Vχ Vψ; Tholomeum Bζ Eα Cθ Oξ Oπ Pυ Qα Sι Vν Xβ; Tolomeum Oα;  
Tpholomeum Sκ quia] qui Bζ Mγ
- 30-31 23 ... moderni] *om.* Wβ; quia ... habeant] et fac notam Bα

<sup>11</sup> Besides the listed mss which read *significat*, seven mss have *signat* (Bκ Cζ Pα Pδ Vα Vβ Vι), and one has the abbreviation *st* (Bε). All the rest – the vast majority – have the abbreviation *sigt*, which could be an abbreviation of either word.

the plate by its diameters and made the quarters equal, and after you have inscribed the letters at the ends of the diameters, as one would expect in the upper part of the plate, which is below the armilla/ring and signifies the south A, and in the west B, in the north C, and in the east D, you will divide one of the quarters, that is, from A to D into 90 degrees, and take 23 degrees 51 minutes according to Ptolemy, since

magis autenticus est, licet moderni sapientes 23 gradus et 33 minuta pro certo habeant.

Accipe igitur in predicto numero, ut diximus, notam et scribe super eam Z, eritque arcus AZ tota declinatio. Deinde iunges Z cum B per lineam ZB, abscindetque

- 31 magis] in A Oη autenticus est] autenticum Rα est] *om.* Qμ Sκ moderni] *om.* Rε 23] 22 Mο; 32 Eδ Po Pυ Rα Sβ Xα; 33 Mη Sθ gradus] *om.* Bζ; *corr. from* gradibus Eο 33] triginta 3 Bζ; *interlin.* Mθ; *blank* Eζ; *om.* Oκ; 23 Pψ Vα Vψ; 51<sup>a</sup> 32 Nε pro certo] *om.* Bη habeant] acceperint Bγ Bη Cη Pτ Wβ; accipiant Mν Pα Rε Sι Vν; *add.* Hoc levissime facies sic. Protrahe lineam a nota Z usque ad centrum E secundo circulum Arietis, et ubi secat, pone notam M, et sic habes in circulo Arietis similem declinationem arcus, scilicet MH, et posthac fac ut docet littera. Oη<sup>12</sup>; *add.* 3-line gloss Cζ habeant] *add.* Adendum 7 (ll. 62-67) Bγ Bε Bη Cε Cη Cι Dη Eα Eβ Eη Eτ Fα Fβ Lγ Lε Lη Mδ Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pν Pμ Pρ Pτ Qβ Qγ Qλ Rδ Sδ Sκ Tδ Vβ Vι Vψ Wα Wβ Xβ; *add. in marg.* Ego Iohannes de Calomonte.<sup>13</sup> Nota que aliqui libri non habent istam litteram, scilicet, “Vel divides sic” usque ad litteram exclusum subsequentem, “Accipe ergo in predicto numero” [*i.e.*, *Addendum* 7] nisi pro extranea; tamen est valde, utilis et bona. Vβ
- 32 Accipe] Accipies Rε Sλ Accipe ... diximus] *om.* Bα igitur] ergo *many*; quoque Vν in ... numero] *om.* Mγ predicto] *om.* Vι; dicto Tδ; *add.* etiam Fβ numero] *om.* Cθ; puncto Eα; *add.* accepimus Eη ut diximus] *om.* Cδ Sλ diximus] prediximus Bγ Bη Cη Mγ Pα Pτ Pφ Rε Sι Vν Wβ; diximus *corr. to* prediximus Vβ notam] *om.* Bγ Cη Pα Pτ notam ... Z] super Z Cε et scribe super eam] *om.* Pλ super] *om.* Sβ Vε eam] earum Qγ; lineam eam Eν; *add.* notam Bγ Bε Cη Eα Eη Lε Mδ Mυ Mφ Nδ Oζ Oξ Oτ Oυ Pα Pμ Pν Pρ Pτ Qβ Qγ Qλ Wα Wβ; *add. interlin.* id est notam Vβ eam Z] quam scribe Xβ Z] *om.* Qγ; et Mν; R Rδ
- 33 eritque] *om.* Cε; erit Nε(*add. interlin.* -que); eruntque Bθ eritque arcus AZ] *om.* Vα; A et Nα; 82 Oη arcus] *and elsewhere* archus Sι arcus AZ] AR Rδ; A et Mγ; A et Z Vκ; A arcus Xα; arcus A ad Z Rε tota] *om.* Uα tota ... B] *om.* Cι declinatio] *add.* circulo(*expunged*) solis Mθ; de circulo Vψ; de circulo solis Oκ iunges] *om.* Mλ Vψ Z cum B] B cum Z Bα Bζ Cδ Eμ Mθ Mκ Mλ Oα Oη Oκ Oσ Pψ Qα Sθ Sλ Vα Vν Vυ; BZ or ZB Aα Bγ Bι Bκ Cζ Cη Cθ Dη Eδ Eζ Eν Eο Eτ Lζ Mη Mο Mφ Nα Oζ Oπ Pγ Po Pτ Pυ Rα Sβ Sι Uα Vβ Vε Vχ Wι Xα; B cum Z *corr. to* ZB Vσ; R cum B Rδ; Z et B Vκ Vπ; AB Bθ Sκ; B Dγ; B cum C Mν; ZCB Vψ per lineam ZB] *om.* Bε Dη Eη lineam] littera *and add. interlin.* lineam Mθ; *add.* rectam Sκ ZB] *om.* Aα Bθ Bι Bκ Cη Eδ Eζ Eτ Eυ Mη Mο Nα Pγ Po Pτ Pυ Qμ Sβ Uα Vβ Vπ Wι Xα; *erasure* Rα; AB Dγ Lζ Sκ; BZ Mθ; EB Mν Vκ; et B Mγ; RB Rδ abscindetque] *corr. from* abscindesque Oα; et abscindet Bα Bι; abscindeque Pμ; abscindesque Oκ; abscindentque Mδ; abscindes Oη; abscindesque Eν Mθ Mν Vχ; scindetque Dγ; ascinditque *corr. to* scindet que Qδ

<sup>12</sup> This additional material was included by Gunther as part of his text (pp. 149, 203), but in fact it appears in only this one manuscript.

<sup>13</sup> See note to Cap. 7 line 9 (var.).

he is more authoritative, although modern learned men know for certain it is 23 degrees 33 minutes.

So take the mark for the abovementioned number [for the obliquity], as we have said, and write on it Z, and arc AZ will be the entire [obliquity]. Then join Z with B by line ZB, and it will intersect

- 35 lineam AC super punctum H; tunc pones ei punctum E cuspidem, et fac circulum secundum quantitatem longitudinis EH (id est, pones circinum ex una parte super E et ex alia super H) et fac circulum qui erit HTKL, et ipse erit circulus, per quem vadit caput Arietis et Libre.
- 34 lineam] *om.* Qλ; *marg.* Wα AC] AD Vε; A Pα; ut Nα; *add.* id est Sι punctum<sub>1</sub>] *om.* Mθ H] *om.* Nα; B Ne tunc] Item Mv; et Eδ pones] pedes Bη; *add.* ex Bα Cβ Cδ Cθ; pedes cercini immobile super Bη; *add. and canc. by later hand* circulum ex una parte super Eδ ei punctum E] *marg.* Wα ei<sup>14</sup>] *om.* Aα Bγ Bε Bη Bθ Bι Bκ Cη Dγ Eα Eβ Eδ Eζ Eη Eτ Eυ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Nα Nδ Oζ Oξ Oτ Oυ Pγ Pλ Pα Pμ Pν Po Pq Pτ Pυ Qβ Qγ Qδ Qλ Rα Rβ Sδ Tδ Uα Vβ Vκ Vπ Vυ Wβ Wι Xα Xβ; eius Sι; super ei Bζ; *add.* H Oα(*interlin.*); tunc pones Sκ punctum E] *marg.* Qλ E] *om.* Cι; G Vε cuspidem] *add.* ei(?) Rε; *add.* sibi Dγ Eζ Po Rα Sβ
- 35 secundum] super Bα quantitatem] quadrantes Xα EH] E ex H Bκ Cβ Cθ Dγ Eδ Eζ Eν Eο Lζ Mλ Oπ Po Qμ Rα Sβ Vε Vκ; et ex hoc Mη; CH Mv; E et H Vκ; E Nα; EB Ne id est] *om.* Sκ; A Pγ; et Eη Rε; idem Pλ; tunc Eτ id est pones] ponendo Vυ circinum] circulum Bγ Bζ Cη Cθ Eδ Eν Mθ Mo Oκ Pγ Po Pυ Pτ Uα Xα; *corr. from* circulum Qδ; tertium Vκ una] *om.* Oη super] *interlin.* Wι
- 35-36 id est ... H] *om.* Qα id est ... circulum] *canc.* Pq ex<sub>1</sub> ... erit<sub>1</sub>] scilicet Bα ex<sub>1</sub> ... circulum<sub>1</sub>] *om.* Bζ E ... alia] *om.* Vα E ... super] E cuspidem et fac circulum secundum quantitatem longitudinis *marked "va...cat"* Vπ
- 36 alia] *add.* parte Bε Cβ Cδ Cε Dη Eη Lγ Nα Mv Oη Qγ Qδ Rβ Sι Sλ Vκ Vυ; *add. interlin.* scilicet parte Vβ H] B Cη Ne et<sub>1</sub>] id est Pγ fac] facies Cδ Sλ fac ... erit<sub>1</sub>] sit circulus Qα qui] quod Cβ qui erit] *om.* Bκ Cδ Dγ Eδ Eζ Mλ Sβ; *del.* Mκ; *add.* circulus Cζ Cθ Eμ Eν Mθ Oα Oκ Oσ Pψ HTKL] HI et TL Bζ; H.CBA Vε; HCKL Sι; HIKL Eδ; HKL Vψ; HTHL Xα; BCL Nα; BCKL Ne; KL Rβ HTKL ... erit<sub>2</sub>] *om.* Oπ ipsi] *om.* Vε erit<sub>2</sub>] est Mγ Pφ circulus] *om.* Pτ per] super Sι per ... caput] *om.* Qα quem] *interlin.* Rε caput] capud *many*
- 37 Libre] *add.* 3-line gloss Cζ; *add.* Addendum 7 (ll. 62-67) Qδ Rβ

<sup>14</sup> The most common version here is “pones (ei) punctum E cuspidem” with *ei* appearing in about half of the mss. At line 41 the text is “pones (ei) punctum E (eius) cuspidem” with *ei* appearing in about half of the mss and *eius* in about half (although some mss have neither). Perhaps some scribe(s) might have expanded *ei* to *eius* in order to give it meaning. In this phrase at lines 52 and 59, neither *ei* nor *eius* appear.

the line AC at point H; then you place point E on it [i.e., line AC] as the centre and make a circle with radius EH (that is, you will set a compass with one part [i.e., leg] on E and the other on H); and you make the circle, which will be HTKL and this will be the circle along which the beginnings of Aries and Libra travels.

40 Iterum divides istum circulum per 360 aut quartam eius, ut supra, et pone super numerum graduum predicte declinationis, ut supra dictum est, notam et scribes super eam M, et iunges M cum T per lineam MT; et abscondet linea MT lineam AC super

- 38 istum] illum Bγ Cη Nα Wβ circulum] *om.* Mθ Qα Vα; *add. interlin.* scilicet capitis Arietis et Libre Vβ; *add.* Arietis quod docuit invenire Sι per] *om.* Tδ 360] *add.* divisiones Bζ Mγ Qα Rε Vκ Vν; *add.* gradus Bε Cδ Cι Dη Eα Eβ Eη Fβ Lγ Lη Mδ Mη Mκ(*marg.*) Mν Nδ Nε Oζ Oξ Oτ Oυ Pθ Pλ Pμ Pα Pρ Pφ Qβ Qγ Qδ Qλ Rβ Sβ Sδ Vι Vσ Wα; *add.* gradus et/vel divisiones Mν Sι; *add.* partes Oσ Vυ; *add.* vel divisiones Pφ; *add. interlin.* scilicet divisiones Vβ aut] sit autem Oη; vel Bα; *add.* per Bθ Mδ(*interlin.*) Oπ Vπ; et Dη eius] *add.* per 90 Rε; *add. interlin.* per 90 scilicet Cβ supra] dictum est in 90 gradus Mδ Nδ; *add.* dictum est Cε Cι Dη Eα Nε Pδ Rδ Vψ; *add.* dictum est in 90 gradus Bε Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mν(*om.* gradus) Mφ Oζ Oξ Oτ Oυ Pα Pλ Pμ Pν Pρ Qβ Qγ Qδ Qλ Rβ Sδ Tδ Vι Wα Xβ et pone super] *om.* Nα
- 38-39 ut ... declinatione] *om.* Bη Vε Wβ et<sub>2</sub> ... supra] *om.* Pθ et<sub>2</sub> ... est] *om.* Eα
- 39 declinationis] *add.* totius Pα ut ... est] *om.* Pτ Rδ supra] *om.* Bι Rα Vκ; dictum est Lζ notam] de quibus accipies 24 gradus Bη; *add. illeg.* Pρ scribes] scribe many; scribetur Nα super] *om.* Dγ; *add.* notam sive Bα
- 39-40 notam ... lineam<sub>2</sub>] *marg.* Mθ(iunges ... per lineam *cut off*)
- 40 eam] notam Bη M<sub>1</sub>] *om.* Mν M<sub>1</sub> ... lineam<sub>1</sub>] *om.* Pμ Pφ M<sub>1</sub> ... MT<sub>1</sub>] minut c (?) *canc. and add. suprascr.* M et per lineam MT Pρ et iunges M] *marg.* Cβ Vσ; *om.* Xα iunges M] iungendo Vε M<sub>2</sub>] eam Dη Wι M cum] in eam Cε T] de Bα per] cum Mγ Vν per lineam MT] *om.* Oκ Pδ per ... lineam<sub>2</sub>] cum Sι lineam<sub>1</sub>] *add.* hoc Wβ; *add. interlin.* subtilem Vβ MT<sub>1</sub>] MF Vε; in T Eδ; M et T Pλ et<sub>2</sub>] *add.* illa Nα Qα; vel Mo Pγ Wι et<sub>2</sub> ... MT<sub>2</sub>] *om.* Mλ Uα et<sub>2</sub> ... AC] *om.* Dη abscondet] abscondat Wι; absinde de Vπ; abscondes Oκ Pρ; abscondit Mη Qμ linea] *om.* Cζ Eμ linea MT] *om.* Bζ Bη Mν Pρ Qα MT<sub>2</sub>] inter Mν Wβ; ā Xα lineam AC] *om.* Pτ AC] AC et HK Aα Bθ Bι Bκ Cβ Cθ Dγ Eδ Eζ Eο Eυ Lζ Mλ Oπ Po Rα Vκ Vπ; AC et lineam HK Cδ; ACHK Eν; AE Fβ; AT Pα; AT et HK Sβ; AT et HZ Vε; MC et HK *corr. ad* AC et HK Vχ; *add. interlin.* et HK Vσ; *add. interlin.* scilicet HK Vβ; *add. 1-line gloss* Cζ



Once more divide this circle into 360 or a quarter of it as above, and place above the number of degrees of the aforementioned [obliquity], as described above, a mark and write on it M, and join M with T by line MT; and line MT will cut line AE at

punctum N, et pones punctum E eius cuspidem et facies circulum secundum quantitatem longitudinis E ex N, et facies circulum, qui erit circulus NSOV, et per hunc

- 41 punctum<sub>1</sub>] *om.* Oη; spacium Mv Mφ Wα; super punctum Nα N] M Mδ; ei Wι et<sub>1</sub>] tunc Wβ; *add.* tunc Cδ et<sub>1</sub> ... E]  *marg.* Wι pones] *add.* ei Qμ; *add.* tunc Rε; *add. and canc.* spacium Wα punctum<sub>2</sub> ... cuspidem] circinum ex una parte super E et ex alia parte super N Bη Wβ E] *om.* Pγ eius] *om.* Bα Bγ Cε Cη Dγ Dη Eτ Mo Nα Pρ Pτ Qμ Rδ Sκ Uα Vυ Wι; ei<sup>15</sup> Aα Bζ Bθ Bι Bκ Cβ(*twice*) Cδ Cζ Cθ Cι Eδ Eζ Eμ Ev Eο Lζ Mη Mθ Mκ(*interlin.*) Mλ Mν Mυ Mφ Oα Oη Oκ Oπ Oσ Pγ Pδ Pθ Pο Pυ Pψ Qα Rα Sλ Vε Vι Vκ Vπ Vσ Vχ Wψ Xα; eius *and* ei Mv Mφ Vι; N Ev; *add.* N Oα(*interlin.*) et facies] *twice* Sκ facies] *fac many; om.* Eα facies circulum] pones circinum Vβ circulum] *om.* Eο; *add.* alium Fβ; *add.* super cuspidem *and add.* in  *marg.* alium circulum Ov secundum] per Cε Cι Dη Nε Pγ Pυ Rδ Sκ; pro Nα Vψ Wι; vero Pδ
- 41-42 N ... NSOV] *corr. in marg.* Wβ 41-42 secundum quantitatem] per quantitate Aα Bθ Eτ Mη Mo Vπ
- 42 longitudinis] *om.* Oη E ex N] E Eδ; EN Bα Bη Cδ Dη Fα Lε Mκ Pα Pλ Qα Rβ Vσ Wβ; ET 4 ex N Mη; O ex N Sι; T ex N Vε; *add. and canc.* circulus Mv; *add.* id est pones circinum ex una parte super E et ex alia super N Cβ N ... circulus] *om.* Fζ et facies circulum] *om.* Bα Bγ Bε Cη Eβ Fα Lγ Lε Lη Mγ Mδ Mυ Mφ Nδ Oζ Ou Pλ Pμ Qβ Qγ Pα Pν Pρ Pτ Pφ Qλ Sδ Sι Tδ Vι Vν Vυ Wα Xβ facies ... erit] sit Qα circulum] *lac.* Mv qui erit circulus] *om.* Bκ Cδ Dγ Eζ Rα Sλ Vκ Wβ; *del.* Mκ erit] *om.* Bα; est Eβ Ev Lγ Lε Mυ Mφ Oξ Pμ Qλ Vι circulus] *om.* Qδ NSOV] *om.* Mv; NFAV Vι; NFOV Mφ; NS Oκ; NSCB Cε; NSO Vψ; NSO et v Bζ Ev; NSOL Ev; NST Cι; NSTB Nε; •N•SV Rβ; NSVO Bγ Cη Mθ; NVOS Wβ; NVVC Vε; VSON Bη Mo Nα Sκ hunc] istum Cζ Eμ Mθ Oα Oη Oσ Pψ Qα Vα Vσ Vυ; istud Oκ; quo Bκ
- 42-43 hunc circulum] quem Bα Bγ Bη Bι Cδ Cη Dγ Lζ Mγ Mλ Mν Pα Pτ Pφ Rα Sβ Sι Sλ Vκ Vν Wβ

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<sup>15</sup> See note to line 34.

point N, and you will take point E as its centre and you make a circle with radius EN, and you make a circle, which is circle NSOV; and along this

circulum vadit caput Cancri. Et hec est figura.

45 Et si constituerimus circulum HLKT, qui est circulus Arietis et Libre, et vellemus ex eo extrahere circulum Capricorni et circulum Cancri, divideremus circulum HLKT per

43 circulum] *om.* Bκ; *add.* per quem Eλ vadit] *interlin.* Cβ; incedit Fα Lγ Lη Nδ Oζ Oξ Oυ Pλ Qβ Qγ; incidit Lε Mη Mφ Oτ Pδ Pμ Pν Pρ Tδ Vψ Wα; pendit Pψ; red(d)it Aα Bθ Vπ; *add. in marg.* id est vadit Oξ Cancri] Capricorni Eo; *add. in marg.* qui vocatur tropicus estivalis<sup>16</sup> Pρ Et hec est figura] *om.* Bα Bζ Qα Rδ; cuius hec est figura Mγ; cuius hoc sub est figuracio Vν; et hec patet in figura proposita evident~ Bη; et huius erit subscripta figura Dη; et quod patet in subiecta figura Rε; ut apparet in figura Bκ; ut est in figura Eν; ut est in figura subscripta Bι Eδ Eζ Eο Lζ Mλ Vε; ut est in figura suprascripta Dγ Eα Pο Rα Vκ Xα; ut est in proposita figura Sβ; ut patet in figura Aα Bθ Cδ Mκ Nα Sλ Vπ Vσ hec] *om.* Eτ; *add.* eius Bε est] *add.* precedens Bε Cε Cι Eη Fβ Fζ Lγ Lη Mδ Mυ Mφ Nδ Nε Oξ Oτ Oυ Pδ Pθ Pμ Pν Qβ Qγ Qλ Sδ Vι Vψ Wα Xβ; *add.* presens Eβ Fα Tδ figura] *add.* que precedit Eτ; *add. interlin.* scilicet que procedit Vβ; *add.* scilicet figura Sι; *add.* scilicet figura predicta Mν; *add.* scilicet prenotata Mθ Oκ; *add.* scilicet presens [*illeg.*] Oα; *add.* secunda Mο; *add.* subsequens Lε Pτ; *add. interlin.* scilicet que prenotata Eμ; *add.* Primo scilicet figurando ipsum quod cum non est faciendum maxime cum mater sit prius mensurata et figurata Oη; *add. 1-line gloss* Cζ figura] *add.* Addendum 7 (ll. 62-67) Aα Bθ Eν Vπ

44 Et] *add. in marg.* Hoc pot[est?] alium modum Fβ; *add. in marg.* Idem per circulo arietis Bε; *add. in marg.* Hic docet per circulum Arietis invenire Cancri et Capricorni circulos Lζ circulum] *om.* Mγ Rε si] cum Vν; sit Bζ HLKT] HKLT Bι Sι; HKLET Pα; HLCC Aα; HLKC Vψ; HLKT *corr.* to HTKL Sθ; HLTC Nα; HTKL Bε Pρ Sλ; H|HTKL Mη; H et LK et T Bζ; KLHT Cη qui est] *om.* Bι Bκ Dγ Eα Eδ Eζ Lζ Mλ Rα Sβ Vκ et<sub>2</sub>] *add.* si Xα

44-45 constituerimus ... eo] volueris Cδ

45 ex eo] *om.* Sκ extrahere] intrare Aα; abstrahere Pα; subtrahere Oη; trahere Nδ Pδ extrahere ... Cancri] circulum Cancri et Capricorni extrahere Bι Eα Eδ Eζ Lζ Mλ(*om.* circulum Cancri) Pο Rα Sβ Vε Xα circulum Capricorni et circulum Cancri] circulum Cancri et Capricorni ex circulo Arietis et Libre iam constituto qui est HTKL Cδ; *add.* id est Fζ circulum<sub>2</sub>] *om.* Bκ Bη Cη Dγ Pτ Sλ Wβ divideremus] *twice* Bζ; divides istum Cδ circulum<sub>3</sub>] *om.* Bα Cζ Eμ Mγ Mθ Mκ Mν Oη Oκ Oσ Pφ Pψ Qα Sι Sλ Vν Vσ Vυ HLKT] *om.* Cδ; *corr.* to HTKL Sθ; HKL Pλ; HKLT Bι; HTKL Bη Eν Pρ Sλ; KLC Vψ

45-46 circulum ... divideremus] *om.* Vα

<sup>16</sup> "Tropicus estivalis" ("summer tropic"), a term used by many, e.g., Sacrobosco (*Sphere*, chap. 2).

circle the beginning of Cancer travels. And this is the diagram.

But<sup>17</sup> if [first] we have determined circle HLKT, which is the circle of Aries and Libra, and we wished to draw from it the circle of Capricorn and the circle of Cancer, we would divide circle HLKT into

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<sup>17</sup> The first section of this chapter, lines 12 to 43, describes how to draw the circle of Aries/Libra and the circle of Cancer, working from the given circle of Capricorn around the outer edge of the plate. This section (lines 44-54) describes how to draw the circles of Capricorn and of Cancer having been given the equatorial circle of Aries/Libra.

360 partes vel divideremus quartam, ut supra. Post hec poneremus arcum TQ sicut totam declinationem. Post hec iungeremus H cum Q et extraheremus lineam donec abscinderet diametrum LT super punctum B. Deinde poneremus punctum E cuspidem et faceremus circulum secundum quantitatem longitudinis E ex B, qui esset circulus ABCD,

- 46 360] 30 *corr. to* 360 Pα; *add.* divisiones Lε partes] *om.* Vκ; divisiones Bα Pλ Pq Pφ Sι Vν Vv; gradus Dη Eδ Fβ; *add.* equales Lγ; *add. interlin.* al' divisiones Vβ vel divideremus] *blacked out* Mη vel ... quartam] vel quartas Cδ divideremus] *om.* Bι Bκ Dγ Lζ Mλ Rα Sβ Vκ quartam] 4<sup>am</sup> many; *add.* in 90 partes equales Bε Eα Eβ Eη Fα Fβ Fζ Lε Lγ Lη Mδ Mυ Mφ Nδ Oζ Qλ Oξ Oτ Oυ Pλ Pμ Pν Qβ Qγ Sδ Tδ Vι Wα Xβ; *add.* eius in 90 partes equales Pq; *add.* scilicet in 90 partes equales Bζ Pα Pτ Vν; *add. interlin.* in 90 partes scilicet equales Vβ ut supra] *om.* Oξ supra] prius Aα Eυ Qδ Rβ Vπ; supra *corr. to* gradus Xα; *add.* in 90 scilicet(*om.* Rε) partes equales Mγ Rε; *add. 1-line gloss* Cζ post hec] postea *some*; *add.* autem Oα Vυ poneremus] ponamus Cδ; ponemus Bζ arcum] circulum Nα TQ] CQ Aα Bθ Vπ Vψ; κQ Sι; QT Mλ; eius Vε; T Mα Nα; TK Rδ; T4 Xβ TK Eν sicut] secundum Bε; super Bκ Eδ Eζ Lζ Mλ Po Rα Xα; vel sicut super Eo
- 46-55 Post ... divisiones] *om.* Fβ Pν Qλ Wα; *marg.* Pα
- 47 totam] *om.* Rδ declinationem] *add in marg.* si placet totam hoc Bγ post hec] post Bα; deinde Cδ; et Bγ Bη Cη Pτ Qλ Wβ iungeremus] iunge Cδ; coniungeremus Vσ H cum Q] H cum 4 Xβ; HL cum Q Xα; N cum A Vε; N cum F Qλ(*corr. to illeg.*) extraheremus] extrahe Cδ; ex H traheremus Mθ; ex eo traheremus Oκ lineam] *om.* Cζ Oη; *add.* ipsam Mυ Mφ Vι
- 48 abscinderet] abscindat Pφ; abscinderit Cδ; abscindet Mγ Mη; scindat Bζ diametrum] *add. in marg.* transiando diametrum extra circulum Cδ LT] *om.* Mφ; CT Mυ Vι; F Mδ; H Vκ; HT Bη; HT *corr. in marg. to* CA Wβ; LC Aα Bη Bθ Vπ; LT *corr. in marg. to* HT Dη; T Nδ punctum<sub>1</sub>] *om.* Bγ Cη Pτ Wβ B] H Rα deinde] et Cη Pτ poneremus] pone Cδ punctum<sub>2</sub>] *om.* Bγ Cη Oη Wβ; *add.* super Aα Bθ Eτ Eυ Mo Pγ Pυ Sκ Wβ; *add.* super E Uα punctum<sub>2</sub> ... cuspidem] circinum super E cuspidem ex una parte et ex alia parte super B Bη E] D Rα; E super E Nα; H Eν; super E et Vκ Vπ Wι E cuspidem] *corr. in marg. to* circinum super E cuspidem ex una parte et ex alia parte super [?] et faceremus circulum super Wβ
- 49 faceremus] fac Cδ circulum] *om.* Pθ; cuspidem Cη secundum] per Vκ longitudinis] *om.* Eα E ex B] EB Bα Bγ Bη Cδ Cη Cθ Eα Eβ Eη Eμ Fα Lγ Lη Mδ Mκ Mυ Mφ Nδ Oζ Oξ Oτ Pλ Pq Qγ Vι Vσ Wβ; EB ex N Bε(*marg.*); E ex H Aα; E ex N esset] erit Bα Mγ Rε Vν; est Vκ; est esset Oξ(*and esset canc.*) circulus] *om.* Oη
- 49-50 ABCD ... circulus] *om.* Nε
- 49-53 E ex B ... longitudinis] *om.* Mη Vυ
- 49-50 esset ... Capricorni] est vel sit ABCD per quem vadit capud Capricorni Cδ: esset circulus Capricorni Bγ Cη; esset circulus Capricorni capitis Bθ Vπ

360 parts, or we would divide divide the quadrant, as above. Next we would take arc TQ as the entire [obliquity]. Then we would join H with Q and extend the line until it has cut diameter LT at point B. Then we would take point E as centre and we would make a circle with radius EB, which would be circle ABCD,

- 50 essetque hic circulus capitis Capricorni. Post hec etiam absunderemus arcum HM sicut totam declinationem et iungeremus M cum T et absunderet linea MT lineam HK super punctum N, et post hec poneremus punctum E cuspidem et faceremus circulum secundum quantitatem longitudinis E ex N, qui esset circulus NSOV, per quem vadit
- 50 essetque] esset Cε Dη; erit Eζ; eritque Bζ Bι Eδ Dγ Lζ Mγ Mθ Mλ Oκ Pο Rα Vκ Vν Xα  
 essetque ... circulus] per quem vadit Sλ essetque ... Capricorni] circulus  
 Capricorni Pτ; scilicet circulus Capricorni Bα hic] *om.* Bι Lζ Rα Sβ Vκ capitis]  
*om.* Cζ Qα Capricorni] *add.* scilicet maior Rε hec] *om.* Bα etiam] *om.* Aα  
 Bθ Bζ Cδ Nε Pγ Tδ Pπ Sλ absunderemus] absconde Cδ; abscondemus Mγ  
 arcum] *om.* Cζ Eμ; circulum Nα HM] in AB Vε; BM Eο; KM Nα sicut] super  
 Cη Vε
- 50-51 sicut ... M] *om.* Rα
- 50-52 Post hoc ... N] *om.* Cε
- 51 et iungeremus] *om.* Bα iungeremus] iunge Cδ; iunges Mγ cum T] per lineam  
 MT Rβ T] C Vψ; *add.* per lineam MT Bε Bη Cδ Cι Eα Eβ Eη Fα Fζ Lγ Lε Lη Mδ Mν  
 Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pρ Qβ Qγ Qδ Qμ Rβ Rδ Sδ Sλ Tδ Vι Vψ Wβ Xβ  
 absunderet] abscondet Bγ Bζ Bη Bι Cβ Cδ Cη Dγ Eα Eβ Eμ Eν Eο Eτ Lε Lζ Mγ Mθ  
 Mκ Mλ Mν Oη Oξ Oπ Oσ Pλ Pρ Pτ Pφ Pψ Qδ Rβ Vι Vε Vν Vπ Vσ Wβ Xβ lineam]  
*om.* Uα lineam MT] *om.* Cδ Qμ MT] inter Mν MT lineam] *om.* Vα HK]  
*illeg.* Bη; BD Mγ Vν; BH Eδ; DLVE Pρ; HBD Bζ; HE Cζ Wβ; KH Dγ Eζ Lζ Mλ Pο Rα Vκ; KL Xα
- 52 N] F Pρ; M Wι; N N Mγ; enim Nε N ... punctum<sub>2</sub>] *om.* Pλ et<sub>1</sub> ... cuspidem] *om.* Pρ  
 post hec] *om.* Bγ Cη Pτ Wβ; post Bα; postea Bθ Bι Cδ Dγ Mλ Sβ Sι Vκ Vπ  
 poneremus] *om.* Qα; ponamus Mγ; pone Cδ; ponemus Bζ; *add.* in marg. circinum  
 super punctum E cuspidem ex una parte et ex alia super N et faceremus circulum Wβ  
 punctum<sub>2</sub>] *om.* Cη Pτ punctum E cuspidem] circinum super punctum E scilicet  
 cuspidem ex una parte et ex alia super N Bη E] C Vψ; T Nα faceremus] fac Cδ;  
 faciemus Mγ; *add.* interlin. E cuspidem et Pρ
- 53 E ex N] EN Bα Bγ Bη Cδ Cη Mν Mφ Pτ; E ex B Rβ; EF Pρ; E ex U Oτ; T ex N Nα Vε; *corr.* to  
 EN Mκ; *add.* scilicet Bε; *add.* bottom marg. id est pones circinum ex una parte super E et ex  
 alia super N Cβ N qui esset circulus] *om.* Eη qui] quia Bζ qui esset  
 circulus] scilicet circulum Bι Bκ Dγ Eδ Eζ Lζ Mλ Pο Rα Sβ; scilicet circulus Arietis Xα;  
 similem circulum Vκ esset] erit Bα Cδ Mγ Rε; est Nα Oη circulus] *add.*  
*interlin.* Cancrī Wι NSOV] et NOV Bθ Vπ; meridiē Vε; NGVS Eν; NOGS Oπ; NOV S Bι Bκ  
 Dγ Eδ Eζ Eο Lζ Mλ Pο Rα Vχ Xα; NSO Bζ; NSOB Cε Mθ Oκ; NSON Bα Pγ Pυ Vψ; N solus  
 Aα; NVOS Cβ Cθ; OV Cζ; VSON Mο Nα Rε Vκ Wα
- 53-54 circulus<sub>1</sub> ... Cancrī] circulus Cancrī NSOV Qδ Rβ per ... Cancrī] *om.* Aα Bα Bη Bθ Bι  
 Bκ Cζ Cθ Dγ Eδ Eζ Eμ Eν Eο Eτ Eυ Lζ Mθ Mκ Mλ Mν Mο Nα Oα Oη Oκ Oπ Oσ Pγ Pυ  
 Pψ Qα Rα Sβ Sθ Uα Vα Vε Vκ Vπ Vσ Vυ Vχ Wι Xα; circulus Cancrī Bγ Cε Cη Pτ Wβ;  
 esset circulus cancrī Dη; essetque hoc circulus capitis cancrī Cβ; *add.* gloss Nota et hoc est  
 faciendum Cζ
- 53-60 longitudinis ... longitudinis] *om.* Sκ



and this would be the circle of the beginning of Capricorn. After this we would also cut off arc HM as the entire [obliquity] and we would join M with T and line MT would cut line HK at point N, and after this we would take point E as centre and make a circle with radius EN, which would be circle NSOV, along which the beginning of Cancer travels.

caput Cancri.

55 Et si vellemus extrahere circulum Arietis et Libre et circulum Capricorni ex circulo Cancri, divideremus circulum NSOV per 360 divisiones. Post hec poneremus arcum SF sicut totam declinationem, et iungeremus N cum F per lineam NF, et

- 55 Et<sub>1</sub>] *add. in marg.* Idem per circulo Cancri Bε si] *add. ex hoc* Bγ Cε Dη Pτ  
Wβ(*interlin.*) vellemus] volueris Cδ Mγ extrahere] facere Eα Arietis ...  
circulum<sub>2</sub>] *om.* Cη et<sub>2</sub>] vel Sλ
- 55-56 Et si ... divisiones] Per 360 divisiones divideremus circulum NSOV si vellemus extrahere  
circulum Arietis et Libre Bζ et<sub>3</sub> ... Cancri] *om.* Sβ Capricorni ... Cancri] *om.* Rα
- 56 ex] *add. hoc* Bι Rε Vν ex circulo Cancri] *om.* Aα Bγ Bη Bθ Bκ Cβ Cε Cζ Cη Cθ Dγ  
Dη Eδ Eζ Ev Eo Eτ Ev Lζ Mλ Mν Mo Nα Oα Oη Oπ Oσ Pγ Po Pv Pτ Pφ Pψ Uα Sθ Sι Vα  
Vβ Vε Vκ Vπ Vυ Wβ Wι Xα; *marg.* Mκ; *interlin.* Eμ; de circulo Cancri, *supt*(?)  
Vχ(*interlin.*); *add. constituto* Cδ; *add. et Libre* Vψ ex circulo ... circulum] divideremus  
per circulum Cancri et circulum Bα Cancri] *add. constituo* Vσ divideremus]  
dividemus Fζ Mγ; divide in Mη; *add. istum* Sλ divideremus ... NSOV] qui est NSOV.  
Divide istum circulum Cδ divideremus ... divisiones] *om.* Qα circulum] *add.*  
qui est Sλ circulum ... poneremus] *om.* Rε NSOV] NBOS Mθ; NBOS *corr. to* NOS  
Oκ; NGVS Ev Vε; NOSV Cι Mη Mν Nε Pγ Pδ Pθ Qμ Rδ Uα; NOVOS Aα Bθ Bι Dγ Eδ Eζ Eo Ev  
Mλ Po Qδ Rα Rβ Vπ Xα; NSOBV Eη; NSON Cε Pv Qγ; NVOS Bα Cβ Cζ Cθ Eμ Mκ Oα Oπ  
Oσ Pψ Sθ Sι Vα Vσ Vυ Vχ; VSON Mo Nα; Cancri Bη Wβ divisiones] *om.* Bα; *add.*  
equales Rδ; *add. scilicet* VSON Wβ NSOV per] NS super Vψ Post hec] et Bγ Bη  
Cη Pτ Wβ; post Vκ; postea Sι Vε poneremus] pone Cδ; ponemus Mγ
- 56-58 Post hec ... punctum T] *om.* Mν
- 57 arcum] *om.* Bα Ev Nα Qδ Rβ; *add. scilicet* Sι SF] *om.* Cη Pτ; ES Vα; F Uα; FN Fβ Wα; FS  
Mη; FS Mφ Vι; HC Ev Vχ; SG Bι Bκ Cβ Cθ Dγ Eδ Eζ Eo Lζ Mλ Oπ Po Rα Sβ Sλ Vε Vκ Xα;  
*corr. from* FN Qλ; *corr. from* SG Cδ; scilicet F Pφ Qμ; similem Bη Wβ sicut] *interlin.* Rε;  
super Vε totam declinationem] tota declinatione Fα; *add. in marg.* id est 24<sup>or</sup> gradus  
circuli Cancri et ibi erit F Vβ et] in alzuc Eo iungeremus] iunge Cδ; iungemus  
Mγ; iungeretur Wι N] M Rβ N cum F] eum NF Wι; id est cum G Dγ; VFG Vε; S  
cum F Oη F] C Ev Oπ Vχ; G Bι Bκ Cβ Cθ Eδ Eζ Eo Lζ Mλ Po Rα Sβ Sλ Vκ; T Vα; *corr.*  
ex G Cδ per lineam NF] *om.* Bε Eβ Eη Fβ Mν Mφ Nα Oη Pα Qλ Vι Wα NF] *om.*  
Vπ; A Bθ; FNF Vψ; MT Bι Bκ Eζ Dγ Lζ Mλ Rα Sβ Vκ; NC Ev Oπ Vχ; NG Cβ Cθ Eδ Eo Po Sλ  
Vε Xα; *corr. from* NG Cδ; *add. and canc.* postea Eα
- 57-58 NF ... lineam] *om.* Vα

And<sup>18</sup> if we wished to draw the circle of Aries and Libra and the circle of Capricorn from the circle of Cancer, we would divide circle NSOV into 360 divisions. After this we would take arc SF as the entire [obliquity], and join N with F by line NF, and

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<sup>18</sup> This third section (lines 55-61) describes how to draw the circles of Aries/Libra and of Capricorn having first been given the circle of Cancer.

60 extraheremus lineam in directo, donec se abscinderet cum diametro VS super punctum T. Post hec poneremus E cuspidem et faceremus circulum secundum quantitatem longitudinis E ex T, qui esset circulus THLK, qui est circulus Arietis et Libre. Post hoc

- 58 extraheremus] extrahe Cδ; *add. and canc.* circulorum Eα lineam] NF Mγ; *add.* NF Aα Bα Bζ Bθ Ev Pτ Pφ Rε St Vβ(*interlin.*) Vv Vπ [NF] in directo donec se abscinderet cum diametro] *twice* Bζ se] *om.* Nα Nε abscinderet] abscindet Cδ Mγ Oξ Qγ Sλ; abscindent Pφ vs] BD Bε; CA Eβ Fβ Lη Mδ Mu Mφ Nδ Pμ Pv Qγ Qλ Vι Wα; CA *corr.* to DB Eα; <sup>DB</sup><sub>CA</sub> Lε Lγ Oζ Oξ Pα Pλ Tδ; DB Eα Fα Fζ Oτ Ou Xβ; DLS Pq; HS Ev; M Nα; N Eζ; NF Pθ Rδ Vψ; NL Mη; NO' Vκ; NS Eδ Eτ Mθ Mo Ok Pδ Po Pv Vκ Wι; SDAB (scilicet DAB?) Qδ Rβ; SADB (scilicet ADB?) Qβ Sδ; ut Vv; VB Eη; VF Cι Nε; VLS Bζ; VS *corr.* to VES Vβ; VS et VS *corr.* to VS Eμ; VS *corr.* in marg. to DB (or AB) Qμ; *add.* in marg. transiendi diametrum ut prius extra circulum scilicet ubi supponant alii circuli Cδ; *add.* in marg. aliter C.A vel H Ov super] per Mη
- 59 T] BT Nα; E ex T Vε; H Eβ Fβ Lη Mδ Mu Mφ Nδ Pμ Pv Qλ Wα; HD Pλ; HT Fζ Qβ Qδ Qγ Rβ Sδ Tδ Vι; H *add.* T Oξ; H *add. suprascr.* T Oζ; *corr.* from H Lγ Lε; *corr.* from HT Pα; *corr.* from HD Pq; *add.* in marg. aliter H Ov hec] *om.* Rα Sβ poneremus] pone Cδ; ponemus Mγ; *add.* circinum super Bη; *add.* punctum Mγ Rε Vκ Vv E] *om.* Mθ; *add. suprscr. illeg.* Mθ; circulum Ok faceremus] fac Cδ circulum] B Nα secundum] *ms* Lβ *begins again* quantitatem] *om.* Dη
- 59-60 Post ... T] *om.* Vα
- 60 longitudinis] *om.* Aα Bα Bζ Bθ Bι Bκ Cβ Cζ Cθ Dγ Eδ Eζ Eο Eτ Ev Lζ Mθ Mκ Mλ Oα Oη Oπ Oσ Pψ Qα Rα Sβ Uα Vε Vκ Vπ Vv Vχ Xα; *marg.* Wι; *interlin.* Vβ; longitudinem Dη E ex T] ET Bα Bγ Bη Cδ Fa Mκ; et Cη; *interlin.* Cθ Vσ; E ex C Mv; E ex H Eβ Fβ Lβ Lη Mδ Mφ Nδ Oζ(*add.* T *suprascr.*) Pλ Pμ Pv Qλ Vι Wα; E et ex H Lγ(*add.* T *suprascr.*); E ex HT Fζ Qβ Qγ Qδ Rβ Sδ Tδ; E ex HNLT Xβ; *corr.* from E ex H Lε; NT *corr.* to MT Pq; circulus C scilicet T Nα T] *add.* in marg. aliter H Ov qui<sub>1</sub>] *om.* Dη qui<sub>1</sub> ... THLK] *om.* Vε qui esset] *om.* Lζ esset] erit Bα Cδ Mγ Rε Vv; est Sβ circulus<sub>1</sub>] *om.* Bα THLK] *illeg.* Eη; CHLK Nα; HKLT Pq; HLKT Eβ Fa Fβ Fζ Lβ Lγ Lε Lη Mδ Mu Mφ Nδ Oζ Oξ Oτ Ou Pα Pλ Pμ Pv Qβ Qγ Qλ Sδ Tδ Wα Xβ; HTKL Bε Oη; THLKE Bζ; THSE Oπ; THKL Bκ Rδ; TKLH Cδ Sλ; TLCD Pψ THLK ... circulus<sub>2</sub>] *om.* Eα Pφ qui est] scilicet Bα Bγ Bη Cη Pτ qui est circulus] *om.* Bι Bκ Dγ Lζ Mλ Qγ Rα Sβ; per quem vadit capud Cδ Sλ; scilicet Vκ est] esset Eο Qδ Rβ; *om.* Pv Arietis et] *add.* scilicet Mλ Rα Sβ Libre] *add.* secundum artem predictam Fβ Lβ Oξ Pv Qλ Wα Post hoc] postea Ev Rα Sβ; Hec Pδ hoc] *om.* Bζ Eβ Nε; *add.* ex isto circulo Cδ Sλ Sθ(*marg.*)
- 60-61 Post ... Libre] *om.* Fβ Lβ Oξ Pv Qλ Qμ Wα; *marg.* Pα

extend the line directly until it has cut the diameter VS at point T.<sup>19</sup> After this we would take E as the centre and make a circle with radius ET, which would be circle THLK, which is the circle of Aries and Libra. After this

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<sup>19</sup> There is a great deal of (systematic) confusion in this clause. Diameter VS is the same line as diameter DB, but is perpendicular to diameter CA. And for the point of intersection to be H (never “HT”) the original arc would have to be 24 degrees to the left of point N.

extraheremus circulum Capricorni ex circulo Arietis et Libre.

- 61 extraheremus] extrahe Cδ; trahemus Eδ; *add.* de Pv ex ... Libre] ABCD secundum artem predictam Cδ Sλ(*om.* ABCD) et Libre] *om.* Dη Xα Libre] *add.* secundum artem predictam Bε Cι Eα Eβ Eη Fα Fζ Lγ Lη Lε Mδ Mη Mκ(*marg.*) Mυ Mφ Nδ Nε Oα Oζ Oσ(*interlin. later hand*) Oτ Oυ Pδ Pθ Pλ Pμ Pφ Qβ Qγ Qδ Qμ Rβ Rδ Sδ Tδ Vι Vσ Vυ Vψ Xβ; *add.* secundum artem supradictam et declaratam Pα; *add.* ut supra Cβ; *add.* ut supra dictum est Bα Dη; *add. interlin.* scilicet eodem modo Vβ; *add.* secundum artem predictam ut in hac presente(?) figura Pq

we would construct the circle of Capricorn from the circle of Aries and Libra.

## [ ADDENDUM 7 ]

line 26 in marg. W<sub>1</sub>

following line 31: Bε Bγ Bη Cε Cη Cι Dη Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mυ Mφ Nδ Nε Oζ Oξ  
Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qβ Qγ Qλ Rδ Sδ Sκ Tδ Vβ Vι Vψ Wα Wβ Xβ

following line 37: Qδ Rβ

following line 43: Aα Bθ Eυ Vπ

65 Vel divides sic omnem circulum: posita tabula in matre et ea diametrata, accipe  
in limbo ex A in D 24 gradus, si vis, et in termino ipsorum et super E pone regulam et fac  
subtilem lineam, que vocetur EZ, et hoc includit cum linea EA spatium 24 graduum  
omnis circuli infra inscripti. Et nota quod hoc modo in quolibet circulo infra limbum  
scripto tot sunt gradus accepti quot in limbo accepimus; et hic modus est melior, serva  
eum.

62 divides] dividas Bε Eτ Lε Fβ Fζ; dividemus Aα Qδ Rβ sic] om. Eβ circulum]  
corr. from circa Qδ matre] illeg. Rδ et ea] vel Eα ea] eas Dη  
diametrata]<sup>20</sup> diametra Bε Cε Cη Cι Eη Eτ Fα Fβ Lγ Oτ Pδ Pλ Qγ Vβ; dyametrum  
Aα; diametros Dη Pρ

63 ex] om. Vψ D] B Mδ; corr. from Z Sδ 24] 23 gradus vel 24 Bη; 23 and add. in marg.  
vel 24 Wβ; et quatuor Vψ gradus] om. Aα si vis] om. Vψ; add. in marg. si placet  
Bγ et] etiam Sκ termino] circulo Cε; initio Eτ; tertio Cη; tercio termino Pτ; 3  
corr. to termino Rβ ipsorum] ipsarum Aα Bγ; add. ibi est Z Fβ; add. ubi est Pθ; add.  
ubi est z Bε Bη Cε Cι Dη Eα Eβ Eη Fα Fζ Lγ Lε Lη Mδ Mυ Nδ Nε Oζ Oξ Oτ Oυ Pδ Pλ Pμ  
Pν Pρ Qβ Qγ Qδ Rβ Rδ(RR) Sδ Tδ Vψ Wα Wβ; add. ubi sit Z Mφ Qλ Vι Xβ; add. [illeg.] Z  
Wι regulam] om. Mυ Sκ

64 EZ] E Eυ; E corr. to ZE Xβ; ER Rδ hoc] in Vψ; add. modo Aα Bθ Vπ includit] om.  
Eυ; interlin. Pρ EA] eodem Pρ; scilicet A Xβ 24 graduum] 54 Vψ

65 infra<sub>1</sub>] om. Eα; intra Aα Bγ Bη Bθ Cη Cι Eτ Eυ Pα Pθ Pρ Pτ Rδ Vπ Wβ Wι; in terra Pδ; MF  
Vψ inscript] scripti Bε Bη Eτ Lγ Lε Mδ Nε Pδ Qγ Rβ Wβ; in spatio corr. to scripti Fζ  
quolibet] quolicec Sκ infra<sub>2</sub>] intra Aα Bγ Bη Bθ Cε Cη Cι Dη Eτ Eυ Pα Pδ Pθ  
Pτ Qδ Rβ Sκ Vπ Wβ Wι

66 tot ... accepimus] quotquotlibet (quotlibet Sκ) gradus accipimus Aα Bγ Bθ Cη Eτ Eυ Pτ Sκ  
Vβ Vπ Wι tot] om. Pρ quot] add. in marg. gradus Wβ limbo] add. gradus  
Pα melior] rator Aα

<sup>20</sup> From *diametro*, *diametrare*, “to draw diameters.” An uncommon word, but see *Dictionary of Medieval Latin from British Sources*, vol. 3 (1986), p. 650.



## [ ADDENDUM 7 ]

Or you will divide all the circles thus: after the plate has been positioned in the mother and its diameters drawn, measure along the limbus from A towards D 24 degrees (if you wish), and place the rule at the end of them [i.e., of the 24 degrees] and on point e and make a fine line, which should be labelled EZ, and this with line EA encloses a distance of 24 degrees on every circle inscribed within. And note that by this means we mark on whatever circle inscribed within the limbus, there are as many degrees as we had on the limbus; and this method is better – preserve it.

[ FIGURA 7 ]

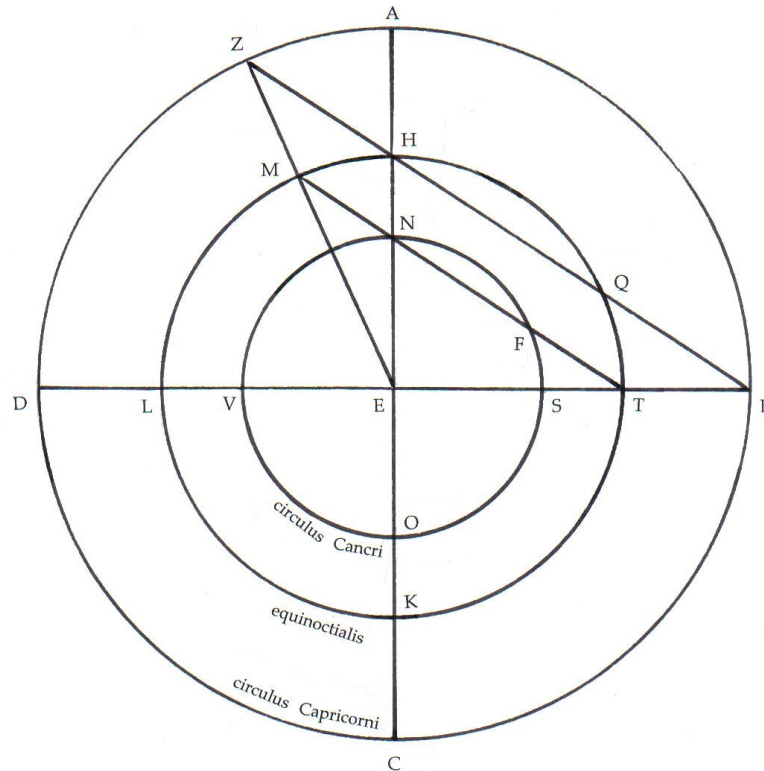


Figura inscriptionis trium circularum super totam declinationem /  
 Figure of the inscription of the three circles using the whole obliquity

[Complete diagram] B $\alpha$ (fol. 79<sup>v</sup>) B $\gamma$  B $\epsilon$  B $\eta$  B $\theta$  B $\iota$  B $\kappa$  C $\beta$  C $\delta$  C $\eta$  C $\theta$ <sup>21</sup> C $\iota$  E $\beta$  E $\eta$  E $\mu_1$ (fol. 52<sup>r</sup>)  
 E $\mu_2$ (fol. 52<sup>v</sup>) E $\nu$  E $\omicron$  E $\tau$  E $\upsilon$  F $\alpha$  F $\beta$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\zeta$  L $\eta$  M $\gamma$  M $\delta$  M $\eta$  M $\theta$  M $\kappa$  M $\lambda$  M $\nu$  M $\omicron$  M $\upsilon$  N $\delta$  O $\zeta$  O $\eta$   
 O $\kappa$ (reversed) O $\xi$  O $\pi$  O $\sigma$  O $\tau$  O $\upsilon$  P $\alpha$  P $\gamma$  P $\delta$  P $\lambda$  P $\mu$  P $\omicron$  P $\rho$  P $\tau$  P $\upsilon$  P $\psi$  Q $\alpha$  Q $\beta$ (fol. 50<sup>r</sup>) Q $\gamma$  Q $\delta$  Q $\lambda$  Q $\mu$  R $\alpha$   
 R $\delta$  R $\epsilon$  S $\beta$  S $\delta$  S $\theta$  S $\iota$  S $\kappa$  T $\delta$  V $\alpha_1$ (fol. 201<sup>r</sup>) V $\alpha_2$ (fol. 201<sup>v</sup>) V $\beta$  V $\epsilon$  V $\iota$ (fol. 332<sup>r</sup>) V $\kappa$  V $\nu$ (rotated 90°  
 counterclockwise) V $\sigma$  V $\chi_1$ (fol. 60<sup>r</sup>) W $\beta$  W $\iota$  X $\beta$

[Partial diagram] E $\alpha$  M $\nu$ (fol. 406<sup>v</sup>) V $\chi_2$ (fol. 60<sup>v</sup>; cut off) W $\alpha$

[Outline, or space only] A $\alpha$  B $\zeta$  C $\epsilon$  D $\gamma$  D $\eta$  E $\delta$  E $\zeta$  F $\delta$  M $\phi$  N $\alpha$  O $\alpha$  P $\nu$  P $\phi$  U $\alpha$  V $\pi$  V $\upsilon$  V $\psi$

[No space] R $\beta$  S $\lambda$  V $\iota$  X $\alpha$

P $\theta$ : "G"

[Combined with Fig. 1] V $\kappa$

[Combined with Fig. 8] B $\gamma$  N $\epsilon$  V $\upsilon$

[Combined with Fig. 8 and 9] B $\eta$  E $\omicron$  W $\beta$ <sup>22</sup>

<sup>21</sup> There are two diagrams in C $\theta$  (fol. 107<sup>r</sup> and fol. 107<sup>v</sup>) with identical lettering.

<sup>22</sup> Mss B $\eta$  (fol. 120<sup>r</sup>), E $\omicron$  (fol. 186<sup>r</sup>), and W $\beta$  (fol. 1<sup>va</sup>) have Fig. 7, 8 and 9 all superimposed as one diagram. In E $\omicron$  the lettering for Fig. 9 is not included and in W $\beta$  an attempt has been made to distinguish the

## [Caption]

Figura ... declinationem] Bε Bθ Cη Eη Eτ Ev Fβ Fζ Lγ Le Lη Mη Mv Mu Oτ Ou Πα Πλ Ρο Ρτ Qβ Qδ Qλ Sδ Sκ Tδ Vι; *om.* Bα Bι Bκ Cβ Cδ Cθ Eα Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Lζ Mγ Mθ Mκ Oκ Oπ Oσ Pψ Qα Qγ Rα Rδ Sβ Sθ Sι Vα<sub>1</sub> Vα<sub>2</sub> Vε Vv Vσ Wα; *cut off* Vχ<sub>2</sub>; Ars [ad accipiendum(?)] circulos capricorni, equinoxis et cancri per [maximus] declinationem secundum Tholomeum Oη; Figura descriptionis et circulorum scilicet Capricorni, Arietis et Cancrī super totam declinationem Rε; Figura descriptionis trium circulorum super tota declinatione. Et circuli signorum. Et divisionis zodiaci per arcus super polum medie declinationis Bη; Figura descriptionis trium circulorum super tota declinatione. Et figura descriptionis circuli signorum. Et figura divisionis zodiaci per arcus super polum medie declinationis Wβ; Figura inscriptionis circuli Capricorni, equinoctialis et circuli Cancrī super medie declinationem polum Eο; Figura inscriptionis circulorum Cancrī et Capricorni Qμ; Figura inscriptionis circuli signorum Nε; Inscriptio circulorum super totam declinationem atque zodiaci Nδ

Figura] Circulus Po      Figura inscriptionis] Inscriptio Mδ Oζ Pο      inscriptionis] *om.* Pγ; subscriptionis Xβ      trium ... declinationem] circuli Capricorni, equinoctialis et Cancrī Cι Pδ      circulorum] *add.* Arietis, Cancrī et Capricorni Vκ Wι; *add.* Arietis, scilicet Cancrī et Capricorni Mo Pv; *add.* scilicet Arietis (et) Cancrī et Capricorni Bγ Pμ Po; *add.* scilicet Cancrī, Arietis, et Capricorni Mλ; *add.* scilicet Cancrī, Arietis et Libre, et Capricorni Vχ<sub>1</sub>; *add.* scilicet Capricorni, Arietis et Cancrī Vβ      super ... declinationem] *om.* Eβ Fα; Capricorni, Arietis et Libre, ac Cancrī Pγ      totam] *om* Xβ      declinationem] *add.* et similiter zodiaci Bγ; *add.* inscriptorum Mδ; *add.* scilicet Capricorni, equinoctialis et Cancrī Oξ Qλ(*marg.*) Xβ; *add.* zodiaci Πα

## [Lettering on the diagram]

A] Bα Bγ Bε Bη Bθ Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eο Eτ Ev Fα Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mv Mo Mu Nδ Nε Oζ Oη Oκ Oξ Oπ Oσ Oτ Ou Πα Πγ Pδ Πλ Pμ Po Pο Pτ Pυ Pψ Qα Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Sι Sκ Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vε Vι Vκ Vv Vσ Vχ<sub>1</sub> Wα Wβ Wι Xβ; *cut off* Vχ<sub>2</sub>      B] Bα Bγ Bε Bη Bθ Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eο Eτ Ev Fα Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mκ Mλ Mv Mo Mu Nδ Nε Oζ Oη Oξ Oπ Oσ Oτ Ou Πα Πγ Pδ Πλ Pμ Po Pο Pτ Pυ Pψ Qα Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Sι Sκ Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vι Vκ Vv Vσ Vχ<sub>1</sub> Vχ<sub>2</sub> Wα Wβ Wι Xβ; D Mθ Oκ Vε      C] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eο Eτ Ev Fα Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mv Mo Mu Nδ Nε Oη Oκ Oξ Oπ Oσ Oτ Ou Πα Πγ Pδ Πλ Pμ Po Pο Pτ Pυ Pψ Qα Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Sι Sκ Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vε Vι Vκ Vσ Vχ<sub>1</sub> Wα Wβ Wι Xβ; *om.* Oζ; *cut off* Bθ Vv Vχ<sub>2</sub>      D] Bα Bγ Bε Bη Bθ Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eο Eτ Ev Fα Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mκ Mλ Mv Mo Nδ Nε Oζ Mu Oη Oκ Oξ Oπ Oσ Oτ Ou Πα Πγ Pδ Πλ Pμ Po Pο Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Sι Sκ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vι Vκ Vv Vσ Vχ<sub>1</sub> Wα Wβ Wι Xβ; *cut off* Qα Tδ Vχ<sub>2</sub>; B Mθ Vε      E] Bα Bγ Bε Bη Bθ Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eο Eτ Ev Fα Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mv Mo Mu Nδ Nε Oζ Oη Oκ Oξ Oπ Oσ Oτ Ou Πα Πγ Pδ Πλ Pμ Po Pο Pτ Pυ Pψ Qα Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Sι Sκ Tδ Vα<sub>1</sub> Vβ Vε Vι Vκ Vv Vσ Vχ<sub>1</sub> Vα<sub>2</sub> Wα Wβ Wι Xβ; *cut off* Vχ<sub>2</sub>      F] Bα Bγ Bε Cδ Cη Cι Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eο Eτ Ev Fβ Fζ Lγ Le Lη Mγ Mδ Mη Mκ Mv Mo Mu Nδ Nε Oζ Oη Oξ Oσ Oτ Ou Πα Πλ Ρο Ρτ Pψ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Sθ Sκ Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vι Vσ Wβ Xβ; *om.* Bη Bθ Eα Ev Fα Mθ Oκ Pγ Pδ Pμ Po Qα Sι Vv Vχ<sub>1</sub> Wα; *cut off* Vχ<sub>2</sub>; G Bι Bκ Cβ Cθ Lζ Mλ Oπ Pv Rα Vε Vκ Wι; S' Sβ      H] Bα Bγ Bε Bη Bθ Bι Bκ Cβ Cδ Cη

Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mν Mo Mu  
Nδ Ne Oζ Oη Ok Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ  
Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν Vσ Vχ<sub>1</sub> Wβ Wi Xβ; *om.* Wα; *cut off* Vχ<sub>2</sub> κ] Ba  
Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ  
Mη Mθ Mκ Mλ Mν Mo Mu Nδ Ne Oζ Oη Ok Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ  
Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν Vσ Vχ<sub>1</sub> Wβ Wi; *om.*  
Wα Xβ; *cut off* Vχ<sub>2</sub> λ] Ba Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev  
Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mκ Mλ Mν Mo Mu Nδ Ne Oζ Oη Oξ Oπ Oσ Ot Ou Pa Pγ Pδ  
Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν  
Vσ Vχ<sub>1</sub> Wβ Wi Xβ; *om.* Wα; *cut off* Vχ<sub>2</sub>; τ Mθ Ok μ] Ba Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι  
Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mν Mo Mu Nδ Ne  
Oζ Oη Ok Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ  
Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν Vσ Vχ<sub>1</sub> Wβ Wi Xβ; *om.* Vi Wα; *cut off* Vχ<sub>2</sub> ν] Ba Bγ Be  
Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ  
Mκ Mλ Mν Mo Mu Nδ Ne Oζ Oη Ok Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ  
Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν Vσ Vχ<sub>1</sub> Wβ Wi Xβ; *om.* Wα;  
*cut off* Vχ<sub>2</sub> ο] Ba Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ  
Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mν Mo Mu Nδ Ne Oζ Oη Ok Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl  
Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν Vσ  
Vχ<sub>1</sub> Wβ Wi; *om.* Wα Xβ; *cut off* Vχ<sub>2</sub>; ς Si ρ] Ba Bγ Be Bi Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub>  
Eo Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mκ Mλ Mν Mo Mu Ne Oζ Oη Oξ Oπ Oσ Ot Ou Pa  
Pδ Pl Pμ Po Pρ Pτ Pψ Qβ Qγ Qδ Qμ Ra Rδ Re Sδ Sθ Sk Tδ Va<sub>2</sub> Vβ Vi Vκ Vσ Vχ<sub>2</sub> Wβ Wi Xβ; *om.*  
Bη Bθ Eα Ev Mθ Ok Pγ Pv Qα Qλ Sβ Si Va<sub>1</sub> Ve Vv Vχ<sub>1</sub>; λ' Nδ σ] Ba Bγ Be Bη Bθ Bi Bκ Cβ  
Cδ Cη Cθ Cι Eα Eβ Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mκ Mλ Mν Mo Mu  
Nδ Ne Oζ Oη Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re  
Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Vi Vκ Vν Vσ Vχ<sub>1</sub> Vχ<sub>2</sub> Wβ Wi Xβ; *om.* Eη Wα; B Ok; T Ve; ν Mθ  
τ] Ba Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Fβ Fζ Lγ Le Lζ  
Lη Mγ Mδ Mη Mκ Mλ Mν Mo Mu Nδ Ne Oζ Oη Oξ Oπ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv  
Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vi Vκ Vν Vσ Vχ<sub>1</sub> Vχ<sub>2</sub> Wβ Wi  
Xβ; *om.* Wα; λ Mθ Ok υ] Ba Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et  
Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mκ Mθ Mλ Mν Mo Mu Nδ Ne Oζ Oη Oξ Oπ Oσ Ot Ou Pa  
Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Sθ Si Sk Tδ Va<sub>1</sub> Vβ Ve Vi Vκ Vν  
Vσ Vχ<sub>1</sub> Va<sub>2</sub> Wβ Wi Xβ; *om.* Si Wα; *cut off* Vχ<sub>2</sub>; ς Mθ Ok ζ] Ba Bγ Be Bη Bθ Bi Bκ Cβ Cδ Cη  
Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Et Ev Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mκ Mλ Mo Mν Nδ Ne  
Oζ Oη Oξ Oσ Ot Ou Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qα Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Sθ Si Sk  
Tδ Va<sub>1</sub> Va<sub>2</sub> Vβ Ve Vκ Vν Vσ Vχ<sub>1</sub> Wβ Wi Xβ; *om.* Eo Mu Oπ Vi Wα; *cut off* Vχ<sub>2</sub>; ς Ok Rδ

## [Other information]

circulus Cancrī] Bγ Bη Cι Eα Eβ Fζ Lγ Le Mo Oζ Oξ Oσ (*later hand*) Pa Pδ Pμ Po Pτ Pv Qβ Qγ Qδ  
Qλ Rδ Tδ Vβ Vχ<sub>1</sub> Vi Wi Xβ; *om.* Ba Bθ Bi Bκ Cβ Cδ Cη Cθ Eβ Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Fa Lζ Mη Mθ  
Mκ Mν Mu Nδ Ne Oη Ok Oπ Pγ Pl Pψ Qα Qμ Re Sk Va<sub>1</sub> Va<sub>2</sub> Ve Vv Vσ Wα; *cut off* Vχ<sub>2</sub>; Cancer  
Pρ (*twice*); Cancrī Be (*twice*) Eη Lη Mδ Mλ Oζ Ot Ou Sδ Vκ; *add. in marg.* NSOV est circulus Cancrī  
capitū Wβ equinoctialis Be (*twice*) Cι Eη Fβ Fζ Lγ Le Lη Mδ Oζ Oξ Ot Ou Pδ Pρ Pτ Qβ Qγ  
Qδ Qλ Sδ Tδ; *om.* Ba Bη Bθ Bi Bκ Cβ Cδ Cη Cθ Eβ Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Et Ev Lζ Mη Mθ Mκ Mν Mu  
Nδ Ne Oη Ok Oπ Oσ Pa Pγ Pl Pψ Qα Re Sk Va<sub>1</sub> Va<sub>2</sub> Ve Vi Vσ Vv Wα; *cut off* Vχ<sub>2</sub>; Aries et Libra  
Pρ (*twice*); Arietis Mλ Vκ Wi; circulus Arietis Mo Pμ Po Pv Qμ Tδ; circulus Arietis et Libre Bγ Eα

Fα Vχ<sub>1</sub>; circulus Arietis scilicet et Libre Vβ; circulus equinoctialis Oξ Rδ Xβ; equitoris Mδ; *add.*  
*marg.* HLKT est circulus Arietis et Libre Wβ      circulus Capricorni] Bγ Bε Cι Eα Fβ Fζ Lγ Lε Mλ  
 Mo Oξ Oσ(*later hand*) Pα Pδ Pμ Po Pτ Pv Qβ Qγ Rδ Re Tδ Vβ Vχ<sub>1</sub> Wι; *om.* Bα Bη Bθ Bι Bκ Cβ Cδ  
 Cη Cθ Eβ Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Eτ Ev Fα Lζ Mη Mθ Mκ Mν Mu Nδ Ne Oη Ok Oπ Pγ Pλ Pψ Qα Qλ Qμ  
 Sk Vα<sub>1</sub> Vα<sub>2</sub> Vε Vι Vv Vσ Wα; *cut off* Vχ<sub>2</sub>; Capricorni Bε Eη Lη Mδ Oζ Oτ Ou Qδ Sδ Vκ Xβ;  
 Capricornus Pq(*twice*); *add.* in 90 gradus Qγ; *add.* in *marg.* ABCD est circulus Capricorni capitis Wβ

*add.* meridies] Bγ Bε Bη Cη Cι Eβ Fβ Fζ Mδ Nδ Oζ Oξ Pδ Pμ Po Pq Qβ Qγ Qλ Rδ Re Sδ  
 Vκ Vv Vχ<sub>1</sub> Wα Wβ Wι Xβ; *om.* Bα Bθ Bι Bκ Cβ Cδ Cθ Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Eτ Ev Fα Lγ Lε Lζ Lη  
 Mη Mθ Mκ Mλ Mν Mo Mu Ne Oη Ok Oπ Oσ Oτ Ou Pα Pγ Pλ Pτ Pv Pψ Qα Qδ Qμ Tδ Vα<sub>1</sub> Vα<sub>2</sub>  
 Vβ Vε Vι Vσ; *cut off* Vχ<sub>2</sub>      *add.* occidentes] Bγ Bε Bη Cι Fβ Fζ Mδ Mλ Mo Nδ Oζ Oξ Oσ Ou Pα  
 Pδ Pμ Po Pq Pv Qβ Qγ Qδ Qλ Rδ Sδ Vv Vσ Vχ<sub>1</sub> Vκ Wα Wβ Wι Xβ; *om.* Bα Bθ Bι Bκ Cβ Cδ Cη Cθ  
 Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Eτ Ev Fα Lγ Lε Lζ Lη Mη Mθ Mκ Mν Mu Ne Oη Ok Oπ Oτ Pγ Pλ Pτ Pψ  
 Qα Qμ Re Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vε Vι; *cut off* Vχ<sub>2</sub>      *add.* septentrio] Bγ Bε Bη Cι Fβ Fζ Mδ Mo Nδ Oξ  
 Ou Pα Pδ Pμ Po Pq Qγ Qλ Rδ Re Vκ Vv Vχ<sup>1</sup> Wβ; *om.* Bα Bθ Bι Bκ Cβ Cδ Cη Cθ Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub>  
 Ev Eo Eτ Ev Fα Lγ Lε Lζ Lη Mη Mθ Mκ Mλ Mν Mu Ne Oζ Oη Ok Oπ Oτ Pγ Pλ Pτ Pv Pψ Qα Qβ  
 Qδ Qμ Sδ Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vε Vι Vσ Wα Wι Xβ; *cut off* Vχ<sub>2</sub>; *illeg.* Oσ      *add.* oriens] Bγ Bε Bη Bκ  
 Cι Fβ Fζ Mδ Mλ Mo Nδ Oζ Oξ Oσ(*later hand*) Ou Pα Pδ Pμ Po Pq Pv Qβ Qγ Qδ Qλ Rδ Re Sδ Vκ  
 Vv Vσ Vχ<sub>1</sub> Wα Wβ Wι Xβ; *om.* Bα Bθ Bι Cβ Cδ Cη Cθ Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Ev Eo Eτ Ev Fα Lγ Lε Lζ  
 Lη Mη Mθ Mκ Mν Mu Ne Oη Ok Oπ Oτ Pγ Pλ Pτ Pψ Qα Qμ Tδ Vα<sub>1</sub> Vα<sub>2</sub> Vβ Vε; *cut off* Vχ<sub>2</sub>

*line EZ]* *add.* linea totius declinationis Vβ      *arc AZ]* *add.* 23 g<sup>a</sup> 33 m<sup>a</sup> Ev Mη; *add.*  
 declinatio Bθ; *add.* declinatio maxima solis Pq      *arc HM]* *add.* 24 Pq; *add.* declinatio Bθ  
*zodiac added:* Bγ Bη Bι Eo Nδ Ne Oσ Rα Sβ Vv Wβ

## [CAPITULUM 8.] DE INSCRIPTIONE ZODIACI

Et post constitutionem horum trium circulorum, scilicet Capricorni, Arietis et

- 1 De ... zodiaci] Dη Εβ Εη Fα Fζ Lβ Lγ Lε Lη Mδ Mφ Nδ Oζ Oξ Oτ Oυ Pα Pλ Pμ Pρ Pτ Qγ Qδ Rβ Sδ Sθ Wι; *om.* Aα Bα Bκ Cδ Cε Cη Cθ Dγ Eν Eο Lζ Mλ Nα Oα Oπ Oσ Pγ Pφ Qλ Rα Sβ Sι Uα Vα Vε Vκ Vυ Vχ Wα Xα; Capitulum de inscriptione circuli signorum Rδ; Capitulum. De inscriptione zodyaci Fβ(*repeated in marg.*); Cuius facere circulum zodiaci Eα(*marg.*); De circulo signorum et eius divisione Qα(*marg.*); De compositione rethis et primo de inscriptione zodiaci Bθ(*rescriptione; add. Rubrica*) Eυ Mη Pυ Rε Vβ<sup>1</sup> Vπ(*rescriptione; add. Rubrica*); De constitutione zodiaci et eius divisione Cζ Eμ(*repeated in marg.*) Mκ Pψ Sλ Vσ; De constitutione zodiaci. Rubrica Mθ Oκ; De constructione zodiaci et eius divisiones Oη; De descriptione zodiaci Bη Wβ Xβ; De factione circulum signorum Eτ; De inscriptione circuli signorum Mν Pδ Pθ; De inscriptione circuli signorum et divisione eius Sκ; De inscriptione signorum Qβ; De inscriptione zodiaci scilicet 8<sup>um</sup> Bε(*and add. in marg. 8<sup>um</sup>*); De inscriptione zodiaci seu circuli signorum Mυ; De positione circuli signorum in tabulam et eiusdem divisione Cβ(*marg.*); Inscriptio circuli signorum Bγ(*later hand*) Cι Eζ Pο(*repeated in marg.*) Qμ Vψ; Invenio zodiaci et divisionis eiusdem Bζ Vν; Inventio zodiaci et eiusdem divisio Mγ; Zodiaci invenio et eiusdem divisio Bι (*and add. in marg.* Hic de rethi [et] divisione signorum [*cut off*] situatione stella[rum] sicut divisimus); [*illeg.*]tione circuli signorum vel zodiaci Eδ(*marg.*)
- 1 zodiaci] *add.* et c. Nε; *add.* Rubrica Mο; *add.* sequitur Pν; *add.* sive circuli signorum Vι; *add.* vel circuli signorum Tδ
- 2 post] *add.* hanc Eη constitutionem] compositionem Aα Bθ Eυ Lε Qδ Rβ Vπ horum] *om.* Vε; eorum Xα trium] *om.* Rδ Sλ circulorum] *om.* Vι scilicet] *add.* circuli Cβ Cθ Eμ Eο Mγ Mθ Mκ Mν Oα Oη Oπ Oσ Pφ Rε Sθ Sλ Vα Vε Vν Vσ Vυ Vχ Capricorni] *add.* et circuli Cβ Cζ Cθ Eμ Eο Mγ Mθ Mκ Mν Oα Oη Oπ Oσ Pφ Sθ Sι Vα Vε Vσ Vυ Vυ Vχ et<sub>2</sub>] *add.* circuli Cθ Sλ
- 2-3 Et<sub>1</sub> ... signorum] Post hoc facies circulum signorum super dictos circulos transire sic Cδ Arietis et Libre] *corr. from* Libre et Arietis Wα

<sup>1</sup> Ms Vβ is misbound. This rubric begins on fol. 50<sup>v</sup> and then skips over to fol. 91<sup>r</sup>

[CHAPTER 8.] ON THE ENGRAVING OF THE ZODIAC<sup>2</sup>

After the construction of these three circles, that is, of Capricorn, of Aries and

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<sup>2</sup> Those manuscripts which add “et eius divisione” (“and the dividing of it”) as in Gunther, are generally those which combine Capitulum 8 and Capitulum 9 as one.

- Libre, ac Cancri, fac circulum signorum. Hoc est ut dividas lineam AO per medium et facies super lineam AO circulum transeuntem per puncta T, L. Si sic, iam invenisti opus.  
5 Et si non transierit per hos duos punctos errasti; reitera ergo opus donec verificetur. Et hic circulus est circulus signorum.
- 3 Libre] *om.* S $\iota$ ; *add.* necnon C $\beta$  C $\zeta$  C $\theta$  E $\mu$  E $\nu$  E $\omicron$  M $\gamma$  M $\kappa$  M $\nu$  O $\alpha$  O $\eta$  O $\kappa$  O $\pi$  O $\sigma$  P $\phi$  P $\psi$  Q $\alpha$  S $\theta$  S $\iota$  S $\lambda$  V $\alpha$  V $\epsilon$  V $\nu$  V $\sigma$  V $\upsilon$  V $\chi$ ; *add.* qui est circulus ABCD necnon M $\theta$  ac] et *many*; nec non circuli R $\epsilon$ ; *add.* circuli C $\beta$  C $\zeta$  C $\theta$  E $\mu$  E $\nu$  E $\omicron$  M $\theta$  M $\gamma$  M $\kappa$  M $\nu$  O $\alpha$  O $\eta$  O $\pi$  O $\sigma$  P $\phi$  P $\psi$  Q $\alpha$  S $\theta$  S $\iota$  S $\lambda$  V $\alpha$  V $\epsilon$  V $\nu$  V $\sigma$  V $\upsilon$  V $\chi$  Cancri] Capricorni B $\eta$  fac] faciamus B $\alpha$  B $\zeta$  C $\beta$  C $\theta$  E $\nu$  E $\omicron$  M $\gamma$  M $\theta$  M $\nu$  O $\alpha$  O $\eta$  O $\kappa$  O $\pi$  O $\sigma$  P $\psi$  Q $\alpha$  S $\theta$  S $\iota$  V $\alpha$  V $\epsilon$  V $\nu$  V $\chi$ ; faciamus *corr.* to fac M $\kappa$ ; facies R $\epsilon$  S $\lambda$  Hoc ... dividas] Divide primo C $\delta$ ; Hoc modo divide B $\eta$ ; sic divide S $\lambda$  ut] *om.* D $\eta$  E $\nu$  M $\nu$  dividas] *add.* ipsam Q $\lambda$  lineam] *add.* in V $\epsilon$  AO] A $^\circ$  B $\zeta$ ; AC A $\alpha$  D $\gamma$  S $\beta$  U $\alpha$  W $\beta$ ; AD X $\alpha$ ; AG C $\theta$  E $\nu$  O $\pi$ ; AS10 E $\omicron$ ; A vel AO C $\epsilon$ ; AE *corr.* to NE B $\eta$  per] *add.* r O $\kappa$  medium] *add.* ut in praetacta(?) figura Q $\alpha$
- 3-4 per ... AO] *om.* P $\phi$  et ... AO] *om.* E $\delta$  E $\zeta$  P $\omicron$  P $\upsilon$  U $\alpha$  W $\iota$  X $\alpha$
- 4 facies] fac *some*; facias F $\beta$  L $\epsilon$  Q $\gamma$ ; *add.* circulum B $\epsilon$  E $\eta$  facies ... AO] *om.* Et S $\kappa$  super lineam AO] *om.* Q $\alpha$  S $\beta$  lineam] *om.* B $\alpha$ ; eam R $\epsilon$  AO] *om.* R $\epsilon$ ; AC D $\gamma$  O $\eta$  W $\beta$ ; AC *corr.* to AE B $\eta$ ; AG C $\theta$  E $\nu$  O $\pi$  circulum] *add.* .c. E $\alpha$  transeuntem] qui circulus si transierit B $\zeta$  C $\beta$  C $\zeta$  C $\theta$  E $\mu$  E $\omicron$  M $\gamma$  M $\eta$  M $\kappa$  M $\nu$ (insierit) O $\alpha$  O $\eta$  O $\pi$  O $\sigma$  P $\phi$  P $\psi$  Q $\alpha$  S $\theta$  S $\iota$  S $\lambda$  V $\alpha$  V $\epsilon$  V $\nu$  V $\sigma$  V $\upsilon$  V $\chi$ ; qui circulus non transierit M $\theta$ (non *canc.*) O $\kappa$ ; qui si transierit B $\alpha$  C $\delta$  E $\nu$  R $\epsilon$  per] *om.* V $\pi$ ; *add.* 2 B $\gamma$  B $\eta$  W $\beta$ ; in P $\lambda$  P $\omicron$ ; super X $\beta$  puncta] predicta P $\gamma$ ; *add.* prima M $\gamma$  T, L] T, H M $\nu$ ; A S $\kappa$  V $\epsilon$ ; CL P $\gamma$ ; id est S E $\nu$ ; *add.* qui erit ATOL P $\omicron$  Si] *om.* W $\iota$  Si sic] *om.* B $\alpha$  B $\zeta$  C $\beta$  C $\delta$  C $\zeta$  C $\theta$  E $\mu$  E $\nu$  E $\omicron$  M $\gamma$  M $\theta$  M $\kappa$  M $\nu$  O $\alpha$  O $\eta$  O $\kappa$  O $\pi$  O $\sigma$  P $\phi$  P $\psi$  Q $\alpha$  R $\epsilon$  S $\theta$  S $\iota$  S $\lambda$  V $\alpha$  V $\epsilon$  V $\nu$  V $\sigma$  V $\upsilon$  V $\chi$  iam] *om.* Et; idem V $\nu$  invenisti] *add.* T, L iam invenisti O $\pi$ (*twice*)
- 4-5 per ... transierit] *margin.* M $\kappa$
- 5 Et ... errasti] Sin autem errasti B $\alpha$  Q $\alpha$  Et ... ergo] *om.* B $\zeta$  si] *om.* C $\zeta$  O $\eta$ ; hoc E $\omicron$  non] *interlin.* C $\beta$  transierit] transit N $\alpha$  transierit per] pertransierit B $\kappa$  hos duos punctos] hec duo puncta R $\epsilon$  duos] 2 *many*; 20 Q $\mu$  duos punctos] iam V $\epsilon$  punctos] puncta *some* reitera] *om.* O $\pi$  S $\iota$  V $\nu$ ; itera B $\alpha$  C $\delta$  C $\zeta$  E $\mu$  E $\omicron$  M $\gamma$  M $\theta$  M $\kappa$  O $\kappa$  O $\alpha$  O $\eta$  O $\sigma$  Q $\alpha$  S $\theta$  S $\lambda$  V $\alpha$  V $\nu$ ; ita P $\psi$  V $\sigma$ ; *add.* vel P $\alpha$  ergo] *om.* B $\alpha$  C $\zeta$  C $\theta$  E $\mu$  E $\nu$  M $\gamma$  M $\theta$  M $\nu$  O $\alpha$  O $\eta$  O $\kappa$  Q $\alpha$  S $\theta$  S $\iota$  S $\lambda$  V $\alpha$  V $\nu$  V $\upsilon$  V $\chi$  opus] *add.* tuum C $\epsilon$ ; *add.* iterim S $\theta$ ; *add.* and *canc.* et si non transierit per hos X $\alpha$  verificetur] modo iam dicto transeat C $\delta$ ; riverificetur circulus B $\zeta$
- 6 Et ... signorum] *om.* B $\alpha$  circulus<sub>1</sub> est] *om.* X $\alpha$ ; erit C $\delta$  S $\lambda$ ; circulus eius circulus est C $\zeta$  signorum] *add.* scilicet zodiacus C $\epsilon$ ; *add.* scilicet zodiacus patet in figura D $\eta$ ; *add.* scilicet patet in sequenti figura S $\beta$ ; *add.* Addendum 8: *many*



Libra, and of Cancer, make the circle of signs. This is when you divide line AO in half and make a circle on line AO passing through points T and L; if so, you have already done your work. And if it does not pass through these two points you have erred; return then to the work until it is correct. And this circle is the circle of signs [i.e., the ecliptic].<sup>3</sup>

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<sup>3</sup> While the title of this capitulum makes reference to the zodiac, the text is really about drawing the circle of the ecliptic. The zodiac is technically a band within which the sun moves “up and down” as well as along, the edges of the band marking the maximum deviations on both sides. The ecliptic is the centre line of the zodiac and as a line it is a circle with no breadth.

## [ ADDENDUM 8 ]

Bα Bε Bζ Bη Cβ(marg.) Cδ Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mγ Mδ Mη Mυ Mφ Nδ Nε  
 Oα(marg.) Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Pφ Qβ Qγ Qδ Qλ Qμ Rβ Rδ Rε Sβ(marg.) Sδ Sθ  
 Tδ Vβ Vι Vν Vψ Wα Wβ Xβ

Et tunc fac alium circulum in quo possint gradus designari. Iterum intra illum fac alterum ad scribendum litteris numerorum. Ad huc infra facies tertium ubi scribantur signa .

- 7 Et] *add. in marg.* Ego Iohannes<sup>4</sup> de Calomonte. Istum a littera. Et(?) tunc fac alium circulum usque ad litteram exclusivem. Cumque feceris circulum signorum in paucis reperitur exemplaribus et habetur pro extranea Vβ Et tunc] Quo facto Bα circulum] *add.* infra circulum signorum Cβ possint] *om.* Bα; possunt Cδ Pν gradus] *add.* signorum Cβ designari] assignari Bη Pδ; insignari Wβ; scribamit Bα; signari Cβ Fβ Pθ; signari vel designari Pα Iterum ... illum] Post etiam Bα intra] infra Cβ Cδ; iuxta Bζ Bη Lη Mγ Pτ Pφ Vβ Wβ Xβ
- 8 fac] *om.* Cβ; fit Pφ fac alterum] alium Qδ Rβ alterum] alium fac alium Cδ; alium Oα Pφ; alium circulum Bε Bζ Eη Mγ Rε Vν ad scribendum] in quo possent Cβ scribendum] inscribendum Bε; describendus Pφ Rε; *add.* gradus Vν; *add.* gradus et Vβ litteris numerorum] gradus numerorum et litteris Mγ; numeros Bα; numerum~ circulorum miorum(?) z litteras Bζ; *add.* graduum Rε; *add.* scribi Cβ Ad ... infra] *om.* Bα Bζ Pτ Rε Vβ Vν Ad ... facies] Et iterum Cβ infra] *om.* Bη Pρ; intra Oα Pα; iuxta Pφ; *add.* illum Oυ Qδ Rβ Rδ; *add.* istum Cδ facies] fac Bε Mφ Qδ Rβ; est faciendum Pρ; *add.* etiam Bα Bζ Mγ Pτ Rε Vβ Vν tertium] *illeg.* Rε; unum Bη; *add.* si volueris Cδ tertium ubi] alium in quo Qδ Rβ; circulum Sθ ubi] et ibi Pφ; in quo Bη Cβ Fβ; ut Bζ Mγ Pτ Vβ Vν; ut ibi Rε
- 9 scribantur] inscribantur Pτ Vβ Vν; inscribentur Mγ; possent scribi Cβ signa] *om.* Vβ; *add.* ipsa Pτ; *add.* .xii. sicut vides Cδ; *add.* long marginal note in a later hand Wα(fol. 80<sup>v</sup>-81<sup>r</sup>)

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<sup>4</sup> See note to Cap. 7 line 9 (var.).

## [ ADDENDUM 8 ]

And now make a second circle in which degrees can be marked. And again inside this one make another one for writing the figures. Now make a third one inside [the first two] where the signs are written.

[ FIGURA 8 ]

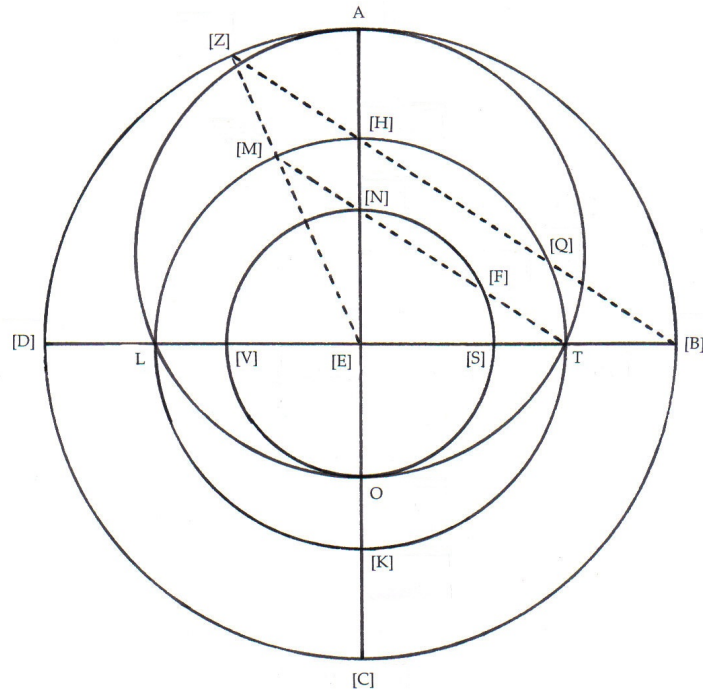


Figura inscriptionis zodiaci /  
Figure of the inscription of the zodiac

[Complete diagram] Bα(fol. 79<sup>v</sup>) Bε Bι Cβ Cδ Cη Cθ? Cι Eβ(very faint) Eη Eμ Eτ Ev<sup>5</sup> Fα Fβ Fζ  
Lγ Lε Lζ Lη Mδ Mη Mθ(reversed) Mκ Mλ Mν Mo Mv(fol. 406<sup>v</sup>) Oζ Ok(reversed) Oξ Oπ Oσ Oτ Ov  
Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ(fol. 185<sup>v</sup>) Qμ Rα Rδ Sβ Sδ Tδ Vα Vβ(fol. 50<sup>v</sup>) Vε  
Vι(fol. 332<sup>r</sup>) Vκ Vσ Vχ Wι Xβ

[Partial diagram] Bθ Eα Mγ Wα

[Outline, or space only] Aα Cε Dη Mφ Nα Pν Qα Vπ Vυ

[No space] Bζ Bκ Cζ Cθ Dγ Eδ Eζ Ev Lβ Nδ Oα Oη Pφ Rβ Sθ St Sλ Uα Vψ Xα  
Pθ: "H"

[Combined with Fig. 7 (q.v.)] Bγ Bη Eο Nε Vν Wβ<sup>6</sup>

[Combined with Fig. 9 (q.v.)] Cβ<sub>1</sub> Rε Sκ

<sup>5</sup> In ms Ev, D, K and v have been shifted to the left; the place for v is blank, L is v, d is L, and "D" has been set on the limbus.

<sup>6</sup> Mss Bη (fol. 120<sup>r</sup>), Eο (fol. 186<sup>r</sup>), and Wβ (fol. 1<sup>va</sup>) have Fig. 7, 8 and 9 all superimposed as one diagram. In Eο the lettering for Fig. 9 is not included and in Wβ an attempt has been made to distinguish the figures in part by different coloured inks.

## [Caption]

Figura ... zodiaci] Βε Βθ Cι Eη Eτ Eυ Fα Λγ Mη Μλ Μν Μο Μυ Οτ Ργ Ρδ Ρλ Ρο Ρρ Ρυ Qγ Qλ Qμ Vβ Vι Vκ Vχ Wι; om: Βα Βθ Βι Cδ Eα Eμ Λζ Mγ Mθ Mκ Oκ Oξ Oπ Pψ Ρα Sβ Vα Vε Vσ Wα; illeg. Eβ; Figura descriptionis zodiaci ... Rε; Figura inscriptionis circuli signorum Fζ Λε Nε Ρα Ρτ Qβ Qδ Sδ Tδ; Figura inscriptionis circuli signorum id est zodyaci Fβ(*twice in marg.*); Figura inscriptionis circuli signorum sive zodiaci Oυ Ρμ Ρδ Χβ; Figura iscriptionis zodiaci Qλ; Inscriptio zodiaci Cη Λη Mδ Oζ; Ista figura [*illeg.*] Oσ(*later hand*)

## [Lettering on the diagram]

A] Βα Βε Βθ Βι Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mγ Mδ Mη Mθ Mκ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vα Vβ Vε Vι Vκ Vσ Vχ Wι Χβ; l] Βα Βε Βι Cδ Cη Cθ Cι Eα Eη Eμ Eτ Fα Fβ Fζ Λγ Λε Λζ Λη Mγ Mδ Mη Mθ Mκ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vα Vβ Vε Vι Vκ Vσ Vχ Wι Χβ; illeg. Eβ; om. Rε Wα; c Βθ; v Eυ o] Βα Βε Βι Cδ Cη Cθ Cι Eα Eη Eμ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mγ Mδ Mη Mθ(illeg) Mκ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qμ Ρα Rδ Rε Sβ Sδ Tδ Vα Vβ Vι Vκ Vσ Vχ Wι Χβ; illeg. Eβ; om. Βθ Wα; g Oπ Vε t] Βα Βε Βι Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mγ Mδ Mη Mθ Mκ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vα Vβ Vε Vι Vκ Vσ Vχ Wι Χβ; om. Rε Wα; b Βθ

Many of the diagrams (unnecessarily) repeat other lines and letters from Figure 7: b] Βε Βθ Βι Cβ Cη Cθ Cι Eα Eβ Eη Eτ Eυ Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Vσ Vχ Wα Wι Χβ

c] Βα Βε Βθ Βι Cβ Cη Cθ Cι Eα Eη Eτ Eυ Fβ Fζ Λγ Λε Λζ Λη Mγ Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oσ Oτ Oυ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Vσ Vχ Wα Wι Χβ; illeg. Eβ d] Βε Βθ Βι Cβ Cη Cθ Cι Eα Eβ Eη Eτ Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Vσ Wα Wι Χβ; l Eυ; cut off Ρμ Vχ e] Βα Βε Βθ Βι Cβ Cη Cθ Cι Eα Eβ Eμ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mγ Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Wα Wι Χβ f] Cη Eβ Fβ Fζ Λγ Λε Λη Mδ Μυ Nε Oζ Oξ Oτ Oυ Ρα Ρλ Ρμ Ρρ Ρτ Qβ Qγ Qδ Qμ Rδ Sδ Tδ Vι Wι Χβ; c Cθ; g Βι Λζ Rα; s' Sβ Vε; 6 Oπ h] Βε Βθ Βι Cβ Cη Cθ Cι Eα Eβ Eη Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vι Vκ Vσ Vχ Wι Χβ; b Vε κ] Βε Βι Cη Cθ Cι Eα Eη Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Vσ Vχ Wι Χβ; illeg. Eβ m] Βι Cη Cθ Cι Eα Eβ Fβ Fζ Λγ Λε Λζ Λη Mδ Mθ Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ρλ Ρμ Ρρ Ρτ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vε Vι Χβ n] Βε Βι Cη Cθ Cι Eα Eβ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Vσ Vχ Wι Χβ o] Βι Cη Cθ Eβ Fβ Fζ Λγ Λε Λζ Λη Mδ Μυ Nε Oζ Oτ Oυ Ρα Ρλ Ρμ Ρρ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vι Wι Χβ s] Βι Cη Cθ Cι Eα Eβ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oκ Oξ Oπ Oτ Oυ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vι Vκ Vσ Vχ Wι Χβ; f Vε v] Βι Cη Cθ Cι Eα Eτ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Μλ Μν Μο Μυ Nε Oζ Oξ Oπ Oτ Oυ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Sβ Sδ Tδ Vβ Vε Vι Vκ Vσ Vχ Wι Χβ; illeg. Eβ; b Oκ z] Βι Cη Cθ Cι Eα Eβ Fβ Fζ Λγ

Λε Λζ Λη Μδ Μθ Μυ Νε Οζ Οξ Οπ Οτ Ου Ρα Ρλ Ρμ Ρο Ρτ Ρβ Ργ Ρδ Ρλ Ρμ Ρα Ρβ Ρδ Τδ Vε Vι  
 Χβ; V Οκ

[*Other information*]

meridies] *add.* Μδ Μλ Μο Ρο Ρο Ρβ Ρχ; septentrio Χβ; *om.* Ρυ occidens] *add.* Μδ Μλ Μο Ρο  
 Ρο Ρυ Ρβ Ρχ; *om.* Χβ septentrio] *add.* Μδ Μο Ρο Ρυ Ρβ Ρχ; *om.* Μλ Ρο Χβ oriens] *add.*  
 Μδ Μλ Μο Ρο Ρο Ρυ Ρβ; *om.* Χβ; *cut off* Ρχ

Cancri circulus] *add.* Vσ; Cancer Ρο equinoctialis] *add.* Vσ; Aries | equinocitalis | Libra Ρο  
 circulus Capricorn] *add.* Vσ; Capricornus Ρο

zodiac] *om.* Εα; *add.* zodiacus Ρο Vσ(*twice*); *add.* names of signs rotated 180° Βθ; Aries to Cancer divided  
 into degrees 5 10 ... 25 30 Βθ

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[CAPITULUM 9.] DE DIVISIONE CIRCULI SIGNORUM SIVE ZODIACI<sup>1</sup>

Cumque feceris circulum signorum, oportet te postea dividere eum per signa et gradus signorum. Cuius rei exemplar est ut facias circulum Arietis et Libre qui est circulus ABCD, et diametra abscondant se super punctum E et super circulum signorum AZCH.

5

- 1 De ... zodiaci] *om.* Aα Bα Bγ Bζ Bι Bκ Cβ Cδ Cε Cθ Cι Dγ Eδ Eζ Ev Eο Eτ Fβ Lζ Mγ Mλ Mν Mo Nα Nε Oα Oη Oπ Oσ Pγ Pδ Pθ Po Pv Pφ Pψ Qα Qμ Rα Rβ Rδ Rε Sβ Sθ Sι Sκ Sλ Uα Vα Vβ Vε Vκ Vν Vν Vχ Vψ Wα Wι Xα; Capitulum de divisione zodiaci 9<sup>um</sup> Bε(*add. in marg.* 9<sup>um</sup>); Cuius divide circulum zodiaci per lineas arcuatus contangentes se in puncto K. Super demidium tocius declinationis Eα(*marg.*); De divisione zodiaci Dη Eμ(*marg.*) Fα Mθ(*add. Rubrica*) Mκ Oκ(*add. Rubrica*) Pν Qδ Vσ Xβ; De divisione zodiaci et circuli signorum Ev Mη(*marg.*); De divisione zodiaci vel circuli signorum Bθ Vπ; De modo dividendi circulum signorum Pτ; Sequitur ulterius de divisione circuli signorum sive zodiaci. Explicit praedictio Pλ
- 1 *before* De] *add. Rubrica* Oξ Oτ Pα circuli] *om.* Mφ Mν Pα Vι signorum] *om.* Lβ sive zodiaci] *om.* Bη Wβ; per signa et gradus Qβ zodiaci] *add. capitulum* Cη; *add. Rubrica* Qλ
- 2 Cumque ... te] *om.* Bα oportet te] *om.* Fβ Eτ te] *om.* Cζ Eμ Mγ Mθ Mν Oα Oη Oκ Oσ Pψ Qα Qδ Rε Sι Sλ Vε Vν postea] post Bα dividere] divide Bα Fβ; *add.* Eos Oκ eum] *om.* Vψ; *interlin.* Wι; circulus signorum Bα; cum Vα; cum dividere Eζ; eum dividere Po; ipsum Dη Rε Vν; tps [= ipsum?] Mγ et] *add. per* Bα
- 3 signorum] *om.* Bα Bη Ev rei] *add. gra* Dη exemplar] ex[space] Mν; *ms* Uα ends ut] *add. cum* Bα facias] faciamus Oη; faciatis Vν circulum] *add. capitis* Aα Bγ Bθ Bι Bκ Cβ Cη Cθ Dγ Ev Eο Ev Lζ Mλ Nα Oπ Pτ Pv Qδ Rα Rβ Sβ Vκ Vπ Vχ Wβ; *add. interlin. capitis* Vβ Arietis] *twice* Sδ qui] et Rε
- 3-4 qui ... et<sub>1</sub>] *om.* Mν qui ... ABCD] *om.* Pψ Sι
- 4 circulus] *om.* Bα Bγ Bε Bη Cη Cι Dγ Dη Eα Eβ Eδ Eζ Lε Lζ Mη Mλ Mo Mν Nε Oζ Oη Oξ Oτ Ov Pα Pδ Pθ Pμ Pv Po Pτ Pv Qδ Qλ Rα Rβ Sβ Sδ Sκ Tδ Vι Vπ Wα Wβ Wι Xα Xβ ABCD] HTKL Oη diametra] *add. AL* Xβ; *add. interlin.* scilicet eiusdem circuli Vχ abscondant] abscondat Qδ Rβ; abscondent Tδ; absconderet Bα; que abscondat Nα se] *om.* Bε Eη; κ Vε punctum] *interlin.* Bγ; *om.* Bη Wβ punctum E et super] E et Bα E] *om.* Mγ et<sub>2</sub>] *add. scribe* Rε Vβ(*interlin.*); *add. scribi* Nα super<sub>2</sub>] *om.* Cδ; *del.* Sλ; *add. punctum* Eδ; *add. signum* Vσ signorum] *om.* Nδ; *add. in punctis* Bα; *add. super* Cδ Sθ(*interlin.*) Sλ(*interlin.*)
- 5 AZCH] *corr. from* DZCH Cδ; ACH Bζ; ACTB Vν; A et TH Mγ Nα; ATCH *with Z superscr.* Eδ; AZ et CH Eζ; AZTH Dγ Lβ Ov Pθ Sι Vπ; ACCL Mν; ARTH Rδ; *corr. from* AZTH Sλ

<sup>1</sup> Numerous manuscripts continue on from Capitulum 8 without a break and without a heading.



[CHAPTER 9.] ON THE DIVISION OF THE CIRCLE OF SIGNS, OR ZODIAC<sup>2</sup>

When you have made the circle of signs, you should next divide it into signs and degrees of the signs. An example of this is that you should draw the circle of [the beginning of] Aries and Libra, which is circle ABCD<sup>3</sup> and its diameters should intersect at point E and with the circle of signs AZCH.

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<sup>2</sup> The issue of dividing circles projected in the plane which are oblique to the equatorial circle – including the issue of dividing the ecliptic/zodiac into its twelve signs – is discussed in detail in my *Jordanus de Nemore and the Mathematics of Astrolabes: De plana sphaera*, Studies and Texts 39 (Toronto: Pontifical Institute of Mediaeval Studies, 1978), pp. 62-67; see also the various editions of Proposition 4, and the commentary on pp. 142-143.

The main method in Capitulum 9 is to draw great circles through the pole [κ] of a great circle with only half the declination of the ecliptic. These great circles through the pole will cut off equal arcs on both the ecliptic and the equatorial circle, and therefore if they pass through points 30° and 60° along the latter, they will also pass through points 30° and 60° along the former; and similarly for other divisions of both the equatorial circle and the ecliptic. (Thomson, *Jordanus de Nemore*, pp. 65-66; Proposition 4 and commentary, pp. 142-143.)

Samsó argues that this method clearly derives from Maslama's extra chapter to his notes on Ptolemy's *Planisphaerium*. See his lengthy discussion in *On Both Sides*, pp. 421-423.

<sup>3</sup> The problem of variation in the lettering in the text and the diagrams is discussed in the Introduction, "F. The Text."

Deinde divides circulum ABCD per 360 gradus. Post hec pone arcum CT similem dimidio totius declinationis. Deinde iunge A cum T, et abscindet linea AT diametrum BD super punctum K. Deinde extrahe diametrum BD in directo, donec abscindat circulum

- 6 Deinde] Post hoc Rδ circulum] *om.* Bγ Bη Bθ Bκ Cη Dγ Eο Eτ Eυ Oπ Pυ Qδ Rβ Sβ Sδ Sκ Vβ Vε Vπ Vχ Wι Xα; *interlin.* Aα Cβ; *add. in marg.* circulum Arietis Pρ ABCD per] ABC per Rδ; AZCH per Sκ; BCFL Mv 360] 60 Bζ gradus] *om.* Bε Cι Eη Fβ Fζ Lγ Lε Lη Mδ Mφ Nα Nδ Nε Oζ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qλ Qμ Sδ Tδ Vι Vψ; *interlin.* Vχ; divisiones Xβ; divisiones vel gradus Mγ Mv Re Sθ Sι Vv; partes Sκ; partes equales Rδ; partes vel divisiones Pφ; vel divide id est quartam per 90 (*add. in marg.* gradus per exempli[!]) Qα; *add.* divisiones Bζ; *add.* per limbum Aα Bθ Eυ Qδ Rβ Vπ; *add. interlin.* al' divisiones Vβ; *add.* Glossa: (*om.* Bκ; *marg.* Lζ) secundum divisiones circuli magni qui est in matre id est pones regulam super punctum graduum circuli magni et sibi oppositum et signabis (*add.* hanc Eο) hinc inde contactum regule et circuli Arietis et Libre et ita divides (*om.* Eο) ipsum circulum Arietis et Libram per 360 gradus (*add.* si deus voluerit Eο) Bκ Eο Lζ Post hec] *om.* Sι; et postea Bα pone] pones *many*; *om.* Mθ Oκ pone ... CT] *marg.* Eμ CT] *om.* Eδ Pο; C Vε; CD Aα Bθ Vπ; CO Cζ Eμ Mθ Oη Oκ; T Cε Oπ; TC Mκ; et Bη Eζ Nε Pρ; et cetera(?) Sι; *add. interlin.* versus D Bγ similem] *om.* Sκ; simile in Mδ
- 7 dimidio] di[vi]des Sι; *crossed out* Bθ; medio Mδ; *add. interlin.* scilicet arcui Vβ; *add. in marg.* hoc est duodecim graduum secundum quod tota declinatio est 24 Mκ declinationis] *add.* hoc est 12 graduum secundum quad tota declinatio est 24 graduum Cζ Eμ(*interlin.*); *add. interlin.* id est 12 divisiones Vχ Deinde] *add. in marg.* dimidio totius declinationis h[*cut off*] fore 12 gradus ut tota declinatio sit fore 24 gradus ut patet super quid tia 61[*cut off*] dict circulus Capricorni [*cut off*] 360 divisiones et ponita regula super has divisiones et re[*cut off*] trium circularum fascsce dios circuli signorum ut(?) in precedenti t<sup>o</sup>ccata(?) Qα iunge] iunges *many*; *add.* per lineam Cδ Oα(*interlin.*) Sθ(*marg.*) SA A] L Mv T] *corr. ex* O Mκ; C Bη Mγ Mv Pρ Vε; E Xα; O Cζ Eμ Oη Oκ; *add.* per lineam Cι Mη Mv Mφ Nε Pα Pδ Qλ Vι Vψ Wα Xβ; *add.* per lineam AT Bε Eα Eη Fα Fζ Lβ Lγ Lε Mδ(AC) Nδ Oζ Oξ Oυ Pθ Pλ Pμ Pν Qγ Qδ Qμ Rβ Rδ Sδ Tδ abscindet] abscindat Wι; *add.* A Oπ AT] *corr. from* AO Mκ; AC Bη Mγ Mδ Mv Pρ Vε; AD or ad Sι; AO Cζ Eμ Mθ Oη Oκ; LC Mv BD] DB Cθ Eν Nδ; ABD Nα Oξ Vψ; DBBD Pλ; *add.* in directo donec Sκ; *add. and canc.* in directo donec abscindat Pα
- 8 super] in Bγ Bη Pτ Wβ; supra Lγ super ... BD] *om.* Aα Cε Eδ Eζ Eτ Mθ Mo Nα Oκ Pγ Pο Pυ Wι Xα; *add. in marg.* in puncto K. Deinde extrahe diametrum BD in directo donec abscindat circulum Wι punctum] puncto Bγ Bη Cη Pτ Wβ K] B *corr. to* K Sθ; E Eμ Wβ; *add. in marg.* med. Inter polum mundi et polum zodiaci et h' in spera non āūt in extensione Oα extrahe] abscindes Nδ; extrahes *many*; protractes Bα; trahe Bζ; *add. interlin.* id est pertrahes vel extends Vχ BD] *om.* Bζ; DB Cθ Nδ; BC Cι in directo] super directum Bα; *add.* dyametrum Vε abscindat] abscindet Bα; *add.* BD Pμ
- 8-9 super ... signorum] *om.* Mv

Then divide circle ABCD into 360 degrees. After this construct arc CT similar to half of the total declination [i.e., obliquity of the ecliptic]. Then join A to T and line AT will cut diameter BD at point K. Next extend diameter BD in a straight line, until it cuts the circle

- 10 signorum super H. Tunc punctus A erit punctus capitis Libre et punctus H erit punctus capitis Capricorni, et punctus C erit punctus capitis Arietis, et punctus Z erit punctus capitis Cancri. Post hec pone arcum DL et arcum BM unumquemque videlicet istorum
- 9 signorum] *om.* Sβ super] sub Wι super H] ZH Eδ H<sub>1</sub>] A Nα Tunc] *add.* cuidat Pμ punctus<sub>1</sub>] scilicet St A] *om.* Vε; H Sκ; L Mν; *add.* et punctus A Vκ A ... punctus<sub>3</sub>] *om.* Bα punctus<sub>2</sub>] *add.* Libre Vπ H<sub>2</sub>] A Bζ Cε Mν Vε erit<sub>2</sub>] *om.* Cβ erit<sub>2</sub> punctus] *om.* Bζ Ev punctus<sub>4</sub>] *om.* Mφ Vι Wα
- 9-10 Libre ... capitis<sub>1</sub>] *marg.* Lε; *om.* Nα Sι et ... Capricorni] *om.* Dη erit<sub>2</sub> punctus capitis] *om.* Bγ Bη Pτ
- 10 capitis<sub>1</sub>] *om.* Bα Cε Cη Eη Mν Oη Pφ Qα Vε Wβ; *marg.* Sθ C] T Mν Nα erit<sub>1</sub>] *om.* Bα Ev Pτ erit<sub>1</sub> punctus capitis] *om.* Bγ Bη Cη punctus<sub>2</sub>] *om.* Ev Pτ capitis<sub>2</sub>] *om.* Bα Bζ Cζ Mθ Oη Oξ Oτ Pρ Vν Wβ; *marg.* Mκ Z] *om.* Mν; *lac.* Nα; R Rδ erit<sub>2</sub> punctus] *om.* Bγ Cη punctus<sub>3</sub>] *om.* Ev Pτ
- 10-11 Capricorni ... capitis] *om.* Aα erit<sub>2</sub> ... capitis] *om.* Bα Bη
- 11 capitis] *om.* Oζ Oη Pρ Cancri] *add.* et punctus A Libre Bα; *add.* 1-line gloss Cζ Post hec] Postea *many*; Post *some*; *add.* in *marg.* De divisione circuli signorum Cβ pone] pones *many* arcum<sub>1</sub>] *om.* Wι; circulum Eδ Eζ Eτ Mo Pγ Po Pv arcum DL] *add.* *interlin.* al' circulum Vβ arcum<sub>1</sub> ... BM] circulum DLBM Sκ; pones FLZ et arcus BG Mν et arcum<sub>2</sub>] *om.* Aα Bθ Bι Bκ Cθ Dγ Eδ Eζ Ev Eo(*corr.* from L.BM) Eτ Ev Lζ Mλ Mo Oπ Pα Pγ Po Pv Rα Sβ Vε Vκ Vπ Vχ; in Bη arcum<sub>2</sub>] *om.* Cβ Cη Nα Pτ Vβ(*corr.* *interlin.* to ... et arcum scilicet) Wβ Wι BM] B in Nα; B<sup>M</sup> Wι; BLMG MF GA FC Rδ; BM LG MF GA FC Bε Cε Cι Dη Eα Eβ Eη Fα Fζ Lβ Lγ Lε Lη Mν Mφ Nε Oξ Oτ Oυ Pδ Pθ Pλ Pμ Pν Pρ(*add.* *interlin.* TD) Qβ(G in *marg.*) Qγ Qδ Qλ Rβ Sδ Tδ Vι Vψ Wα Xα Xβ(*om.* FC); BM SG MF XA FC Wβ(*add.* in *marg.* DL in BM; SG in MF; XA in FC); BM scilicet G in MF XA in FC Bη; LG MF GA FC Mδ Nδ Pα; *add.* circulum Wι unumquemque] unumquodque *some*; *add.* volueris Aα Bθ Vπ unumquemque videlicet] unumquemlibet Pτ videlicet] *om.* Bα Bζ Cβ Eη Oη Pρ Qα Tδ Vε; N. Mη; scilicet Bε Bζ Cδ Cζ Cθ Eμ Ev Mγ Mθ Mκ Mν Oα Oκ Oπ Oσ Pφ Pψ Rε Sθ Sι Sλ Vα Vν Vσ Vυ Vχ; *add.* dividet Rβ; *add.* volueris dividet(*corr.* to divides) Qδ istorum] *om.* Oξ

of signs at H. Then point A will be the point of the beginning of Libra, and point H will be the point of the beginning of Capricorn, and point C will be the point of the beginning of Aries, and point Z will be the point of the beginning of Cancer. After this take arc DL and arc BM, namely each one of them,

ex 30 gradibus. Deinde queres arcum qui eat super punctum M, K, L, et abscindet circulum signorum super N, S; eritque signum Sagittarii HS et arcus ZN signum Geminorum. Post hec pones unumquemque ex arcubus LG et MF 30 gradus. Deinde

- 12 ex] *om.* Bζ Bθ gradibus] gradus Pφ Deinde] Post Bα queres] queras Eϵ Eϵ Pφ Qα Vπ; quartas Xα; *add.* hoc(hic Cζ) scitur per illum propositionem<sup>4</sup> datis tribus punctis in linea non recta (non recta] ipse Cζ), centrum (*add. illeg.* Cζ) invenire Cζ Mκ(*marg.*) qui eat] *om.* Cε Rε eat] erat Aα Bθ Oκ Pφ Vε Vπ; erat *with eat interlin.* Mθ; erat *corr. to eat* Vχ; erat *corr. to vadit* Mκ Sλ; est Bε Bη Cι Dγ Eα Eβ Eδ Eζ Eη Eτ Eϵ Fα Lβ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mϵ Mο Mφ Nα Oζ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pθ Pλ Pμ Pν Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rβ Rδ Sδ Tδ Vι Vκ Vψ Wα Wβ Xα Xβ; vadit Cδ Mγ Vβ(*add. interlin.* al' est) Vν Vσ Vτ super] per Eν punctum] puncta Qδ Rβ M, K, L] M et K et L *some*; G et K et H Mν; KLM Eη; HKL Eϵ; MCK et B Vε; MLK Sβ; N per K et B Eο abscindet] abscindas Vα; abscindat Bζ Cβ Cδ Cζ Cθ Eμ Eν Eο Mθ Mκ Mν Oα Oη Oκ Oσ Pγ Pφ Pψ Qα Vσ Vυ Vχ; abscinde Bε Eβ Eη Eϵ Fα Lβ Lγ Lε Lη Mδ Mη Mν Mφ Oζ Oξ Oτ Oυ Pα Pμ Pν Qβ Qγ Qλ Sδ Tδ Vε Vι; abscindes Aα Bθ Qδ Rβ Vπ; abscindit Dγ Lζ Oπ Vν
- 13 super] punctos Vχ N, S] *illeg.* Nα; KS Sβ; *marg.* Bε; HS Pρ; VS Bη Cι Pθ Sκ Vε; *add.* scilicet Oη; *add. interlin.* punctos Cβ eritque] erit quod Sκ signum<sub>1</sub> ... HS] arcus HS signum Sagittarii Bα Cβ Cδ Mγ Mκ Pτ Pφ Qα Rε Sθ Sι Sλ Vν Vσ; H signum scilicet<sup>5</sup> Sagittarii Eϵ; HS arcus signum Sagittarii Bγ Cη; HS signum Sagittarii Dη Vβ; Sagittarii Vε Vψ; signum HS Sagittarii Aα Bη Bθ Bι Bκ Cε Cι Dγ Eδ Eζ Eτ Lζ Mη Mλ Mο Pγ Pδ Pθ Pο Qδ Rα Rβ Rδ Sβ Vκ Vπ Wβ Wι Xα; signum HS signum Sagittarii Bζ Cζ Cθ Eμ Eν Eο Mθ Nα Oα Oη Oκ Oπ Oσ Pυ Pψ Vα Vυ(AS) Vχ; *add. interlin.* scilicet iste arcus Vβ arcus] *om.* Pρ; Arietis *corr. to arcus* Qδ ZN] M or in Vπ; M signorum vel Xα; RN Rδ; SN Mν; TN Vυ; XN Pα Qλ; ZB Pρ; ZM Oη Vε; ZV Bη signum<sub>2</sub>] *om.* Bα Pτ; signorum Dγ
- 13-16 circulum ... Scorpionis] *illeg.* Eη
- 14 pones] *add.* ex Bη ex arcubus] *om.* Pτ LG et MF] LG, MF or LGMF *many*; BGLN facie Pρ; EG FM Dγ; GMKP Mν; id est MF Sθ; J et MF Pψ; LCMF Oσ; LGMMF Nα; LG NF Rδ; LG ut supradictum est MF Xβ; LMF Oα LTMF Bζ Mθ Oκ Vε Vυ; LT.MF Cζ Eμ; LZMF Qα; MLG Vν; SXMf Wβ; *corr. from* LZ MK Sλ 30 gradus] xxx.xxx Cθ Oπ; 20.30 *corr. to* 30 Lζ; 30 et 30 Cβ; 30.30 Eν Eο Vε; 30 gradibus Vα Vχ(*add. interlin.* ex); 30 graduum Aα Cε Mν Rε Vν Vπ; 60 gradus Bα Deinde] Post Bα
- 14-15 Deinde ... puncta] *om.* Cε

<sup>4</sup> Euclid, *Elements*, Bk. 4, Prop. 5: "About a given triangle to circumscribe a circle," which is equivalent to this problem.

<sup>5</sup> HS read as H s[*cilicet*], with *scilicet* moved to its normal position after *signum*.

as 30 degrees. Next you will require an arc which is to run through points M, K and L, and will cut the circle of signs at N and S; and HS will be the sign of Sagittarius, and arc ZN the sign of Gemini. After this take each one of the arcs LG and MF [as] 30 degrees.  
Next

- 15 queres arcum qui vadit per puncta F, K, G et abscondet circulum signorum super punctos Q, X, eritque arcus SX signum Scorpionis et arcus NQ signum Tauri, et remanebit arcus XA signum Libre et arcus QC signum Arietis. Post hec pone arcum HO sicut arcum HS et
- 15 queres] queras Mv Pτ Pφ qui vadit] *om.* Eζ vadit] eat Bα puncta] *om.* Mv Qλ; punctum Bα Cθ Cι Qα F, K, G] FA et Qδ; FFG Vε; FGK Eδ Po Pτ; FGK *corr.* to FKX Pq; FHG Nε; FKH Bζ; FKLg Wι; FKT Cζ Eμ Mθ Oα Oη Oκ Vα Vυ; *corr.* from FKT Sλ; FKZ Qα; FLAG Bη; FLAT *corr. in marg.* to FLCλg Wβ; PHM Mv; secundus HG Mη abscondet] abscondat Cβ Ev Mv Oα Oσ Pψ Vυ Vχ; abscondit Eo; *add. and canc.* diametrum Bι circulum] circulos Bζ circulum signorum] circulorum Dγ punctos] *om.* Pτ; puncta Bα Mv; punctos Oη; *add. interlin.* al' punta Vβ
- 16 Q, X] NG Qα; QG Cζ Eμ Oα Oη Oκ Oσ Vα Vυ; QG *corr.* to QT Sθ Sλ; QG *corr.* to QX Mκ; QR Mv Vκ; QT Bα Bζ Cβ Cδ Cθ Ev Mγ Oπ Pψ Si Vv; QT in alio AX Eo; QZ Pφ; SX Sκ; XG Mθ; *add.* eritque QX Pα arcus SX ... et.] *om.* Bη Wβ SX] FT Pφ; HG Mη; SG Cζ Eμ Oη Oα Oσ Qα Vα; SG *corr.* to ST Sθ Sλ; SR Mv; ST Bα Bζ Cβ Cδ Cθ Ev Mγ Mθ Mκ Pψ Si Vv; ST *corr.* ad SX Mκ; XA *corr.* to SX Pγ; scilicet ST sive vel(!) SX Eo; scilicet eit ST Oπ; *add.* Scorp̄ii et arcus NQ Aα signum.] *om.* Bα Scorpionis] Bα Bγ Bζ Cβ Cδ Cη Cθ Eμ Ev Eo Fβ Mθ Mκ Mv Oα Oη Oπ Oσ Pτ Pφ Pψ Qα Qλ Vα Vβ Vε Vv Vσ Vυ Vχ Xβ; Scorp̄ii Aα Bε Bθ Bι Cε Cι Dγ Dη Eβ Eδ Eζ Eη Eτ Ev Fα Fζ Lβ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mv Mφ Nε Oζ Oξ Oτ Ov Pα Pγ Pδ Pμ Pν Po Pq Pv Qβ Qγ Qδ Rα Rβ Rδ Sβ Sδ Sκ Tδ Vι Vκ Vπ Vψ Wα Wι Xα; *abbreviated* Eα Oκ Pθ Pλ; *om.* Nα; *add. interlin.* al' scorp̄ii Vβ NQ] FM Oη; VQ Bη; si qui Lβ signum.] *om.* Bα Bγ Eδ Eζ Eτ Dγ Nα Pγ Po Pτ Pv Qδ Rα Rβ Sβ Sκ Vβ Vκ Wι Xα Tauri] Canc̄ri Cε Mγ; Thauri Ev Mo Mφ Qδ Vπ remanebit] *om.* Pα aracus.] *om.* Nδ
- 17 XA] CA Sι; ex A *corr.* to XA Sκ; GA Cζ Eμ Oα Oη Oκ Oσ Pψ Qα Vα Vυ; GA *corr.* to XA Mκ; SA Vκ; SA *corr.* to TA Sθ Sλ; TA Bα Bζ Cβ Cδ Cθ Ev Mγ Oπ Pφ Vε Vv; TA vel XA Eo; XI Pα Vπ et.] *add.* est Cε; *add.* remanebit Vv; *add.* remanebit quoque Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mγ Mθ Mκ Mv Oα Oη Oκ Oπ Pλ Pφ Pψ Qα Sθ Sλ Vα Vβ(*interlin.*) Vε Vσ Vχ; *add.* remanebitque Oα Oσ Vυ arcus] *om.* Bα Bζ Cβ Cδ Cθ Eμ Mθ Mκ Mv Oα Oη Oπ Pφ Pψ Qα Vα Vσ Vυ; *canc.* Eζ; remanebit quoque Si QC] AC Lγ; CQ Qδ Rβ; FC Oη; Q Sι; QO Pα; QS Vυ; QT Bι Mθ Oκ Vε Vκ Xβ; QX Aα Ev Vπ; *add.* remanebit Rε QC ... Arietis] Arietis scilicet QC Eo pone] pones *many*; compones Cζ Oη; *add.* ex alia parte Qα arcum.] *interlin.* Cβ; *om.* Bι arcum HO sicut] *om.* Qα Vυ HO] BO Vπ; FS *corr.* to HS Mκ; HC Nα; HE Cη Eμ Mθ Oη; HG Mv Pψ Qα Vε; HS Ev Oσ Sθ Vα; HS *corr.* to HO Oα; *corr.* to HO Sλ; *add. and canc.* et arcum OR Pγ HO ... SX] GH et arcum VT.ST Vε sicut arcum HS] *om.* Oπ arcum.] *om.* Xα HS] HC Nα; HG Sι; HO Pγ; *corr.* from HST Sθ
- 17-18 HS ... arcum.] *om.* Pψ
- 17-19 Post ... Capricorni] *marg.* Pα; *om.* Fβ Mφ Pν Vι



seek the arc which runs through points F, K, and G and it will cut the circle of signs at points Q and X, and arc SX will be the sign of Scorpio, and arc NQ the sign of Taurus, and arc XA will remain as the sign of Libra, and arc QC as the sign of Aries. After this construct arc HO equal to arc HS and

arcum OR sicut arcum SX, eritque arcus RC signum Piscis et arcus OR signum Aquarii,  
 et arcus HO signum Capricorni. Post hec etiam pones arcum ZV sicut arcum ZN et arcum  
 20 VP sicut arcum NQ, eritque arcus AP signum Virginis et arcus PV signum Leonis, et arcus

- 18 OR<sub>1</sub>] eG Cζ Eμ; EN Oη; OI Bε Cι Eη Eα Eβ Fα Fζ Lβ Lγ Lε Lη Nδ Nε Oξ Oτ Oυ Pα Pδ Pθ  
 Pλ Pμ Qβ Qγ Qδ Rβ Rδ Rε Sδ Tδ Xα Xβ; OK Sι; OT Vχ; OZ Bα Bγ Vψ; RG Mv; SG Oα Oσ Qα  
 Vα Vυ; SG *corr.* to OG Sθ; SG *corr.* to OR Mκ Sλ; ST Cβ Ev sicut ... OR<sub>2</sub>] *om.* Ev SX]  
 SG Cζ Eμ Mθ Mv Nε Oα Oη Ok Oσ Pψ Qα Vα Vυ; SG *corr.* to ST Sθ Sλ; SG *corr.* to SX Mκ;  
 ST Bα Bζ Cβ Cδ Cθ Ev Mγ Oπ Sι Vε Vυ; STLX Eo arcus<sub>1</sub>] *om.* Cη Pτ arcus<sub>1</sub> ... et]  
*om.* Bη Wβ RC] BT Cθ; c Sι; CG Cζ Mθ Oα Oη Ok Oσ Pψ Qα Sθ Vα; CG *corr.* to RC Mκ  
 Sλ; CT Ev Sκ; eG Eμ; IC Bε Cι Dγ Dη Eα Eβ Eη Fα Fζ Lβ Lε Lγ Lη Mδ Nδ Nε(?) Oξ Oτ Pα  
 Pδ Pλ Pμ Qβ Qγ Qδ Rβ Rδ Rε Sδ Tδ Xβ; IC *corr.* to IT Oυ; RG Mv; RT Oζ Vε; RX Pφ; ST *corr.*  
 to RC Bζ; TC Mo; TG Vυ; VT Eo; ZC Bγ signum<sub>1</sub>] *om.* Bα; *add.* in Lβ; et ... Aquarii] *om.*  
 Pλ; *marg.* Pρ Piscis] Piscium Vψ arcus<sub>2</sub>] *om.* Bα Vε OR<sub>2</sub>] AT Vε; CS *corr.* to  
 OR Mκ; GS Mθ Mv Oα Ok Oσ Pψ Qα Sθ Vα Vυ; GS *corr.* to OR Sλ; TK Ev; OI Bε Fα Fζ Lβ Lγ  
 Lε Lη Mδ Nδ Nε Oξ Oτ Oυ Pα Pδ Pμ Qβ Qγ Qδ Rβ Rδ Rε Sδ Tδ Xα Xβ; OI *corr.* to OR Oζ;  
 OZ Bα Bγ Pυ; OX Mo; SE Cζ; VE Eμ Oη signum<sub>2</sub>] *om.* Bα
- 19 et arcus] hoc Taurus Eδ arcus] *om.* Bα HO] BO Vπ; EH Cζ Eμ Oη; HD Qδ; HS Oα  
 Oσ Vυ; SH Ev Mθ Mv Ok Pψ Qα Sθ Vα; SH *corr.* to HO Sλ signum] *om.* Bα et<sub>1</sub> ...  
 Capricorn] *om.* Eη; *marg.* Bε; *add.* 1-line gloss Cζ Post hec] Postea multi; Post some;  
*om.* Nα; Et hec Qδ Post ... arcum<sub>1</sub>] Pones etiam post arcum Dη etiam] *om.* Bα  
 Bε Bζ Cδ Cζ Cι Eβ Eη Fζ Lβ Lγ Lε Lζ Lη Mγ Mδ Nδ Nε Oζ Oξ Oτ Oυ Pδ Pθ Pυ Pρ Pτ Pφ  
 Pψ Qα Qβ Qδ Rβ Rδ Rε Sι Sλ Tδ Vυ Vπ Vσ Vψ Xβ ZV] CG Mv; HS *corr.* to ZG Pψ; RB  
 Rδ; RX Nα; TG Vυ; ZB Cε Vκ; ZG Bα Cβ Cδ Cζ Cθ Eμ Ev Mγ Oα Oζ Oη Ok Oξ Oπ Oσ Oτ  
 Pα Pγ Pδ Pθ Pφ Qα Sθ Sι Sλ Vα Vε Vυ; ZG.LF Eo; ZH Mη; ZN Aα Bη Mθ Sκ Wβ; ZNV Bθ  
 Vπ; ZP Vχ ZV sicut arcum] *om.* Eζ arcum<sub>2</sub>] *om.* Bζ; *add.* and *canc.* NQ eritque  
 arcus Pγ ZN] CN Mv; GN Oπ; HS *corr.* to ZN Pψ; RN Rδ; TN Vυ; XA Pρ; ZM Bα; ZT Vε;  
 ZV Pα Wβ; ZVN Bθ Vπ; et v<sup>a</sup> Aα ZN ... arcum<sub>3</sub>] *om.* Nα Rβ Xα
- 19-20 Capricorni ... arcum<sub>4</sub>] *marg.* Vσ arcum VP] *om.* Sθ; GC Mγ arcum VP sicut] *om.*  
 Vπ
- 20 VP] GT Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Mθ Oα Ok Oπ Oσ Pψ Qα Sλ Vα Vε Vυ Vυ; GT.PX Eo;  
 GV Sι; NVP Qδ Rβ; PN Bη Pρ Wβ; PV Vχ; RX Nα; ST Mv Oη; ZV Pυ arcum] *om.* Bα Fβ  
 NQ] MF Oη; NA Eη; NF *corr.* to NQ Ev; NO Fβ Pα; VQ Bη Cζ Pρ Wβ; ZN *corr.* to NQ Qγ  
 arcus<sub>1</sub>] *om.* Cζ Eμ Ev Mv Oα Oσ Pψ Vα Vυ; *marg.* Mκ eritque] erit Nδ; *ms* Mγ:  
*end of f. 15<sup>ob</sup>; f. 16 missing; begins again at Cap. 13 line 4 (f. 17<sup>ra</sup>)* AP] AT Bα Bζ Cβ Cδ Cζ  
 Cθ Eμ Ev Mθ Mv Oα Oη Oπ Oσ Pψ Qα Sθ Sλ Vα Vε Vυ; AV Vχ; AX.VX Eo; A per Nα; V Sι  
 signum<sub>1</sub> ... arcus<sub>3</sub>] *om.* Pδ et<sub>1</sub> ... Leonis] rep. Wβ arcus<sub>2</sub>] *om.* Bα PV]  
 CG *corr.* to RG Sλ; GT Oα Oσ Sθ Vυ; NPN Wβ; PB Oζ Vκ; PN Bη Fζ Lγ Lη Mδ Nε Pμ Pυ Pρ  
 Qγ Qδ Rδ Tδ; PN *corr.* to PV Oξ; PVN Bθ; PX Mo; QT Ev; TG Bα Bζ Cβ Cδ Cζ Cθ Eμ Eo Mθ  
 Mv Oη Ok Oπ Pψ Qα Vα Vε; VG Sι; VN Vπ; VP Rε Vχ signum<sub>2</sub>] *om.* Bα arcus<sub>3</sub>] *om.* Bα
- 20-21 Virginis ... VZ] Leonis VS signum Virginis et arcus PN Rβ et arcus<sub>3</sub> ... [Cancr] *marg.*  
 Qα

arc OR equal to arc SX, and arc RC will be the sign of Pisces and arc RO the sign of Aquarius, and arc HO the sign of Capricorn. After this also take arc ZV equal to arc ZN and arc VP equal to arc NQ, and arc AP will be the sign of Virgo, and arc PV the sign of Leo, and arc

VZ signum Cancri.

Similiter si poneres arcum DL 3 gradus, et arcum BM similiter, esset arcus [HS]

21 VZ] [*illeg.*]Z Cζ; GT Vα; GX Vε; GZ Bα Cβ Cθ Ev Eo Mθ Mv Oα Oκ Oπ Oσ Pψ Qα Sθ St Vv;  
NZ Nε Pq; PX Vχ; <sup>T</sup> C Bζ; VC Sκ; VO Bη; VR Rδ; XV Nα; ZG Cδ Sλ signum] *om.* Bα Ra  
Cancri] Capricorni Qα

21-23 signum ... ZN] *om* Bζ

22 Similiter<sub>1</sub>] Et similiter *many*; etiam Dγ; sic Vε Similiter ... gradus] *om.* Qα si]  
*om.* Fβ Qδ Rβ poneres] poneris Mv; pones Bε Eα Eβ Eδ Eη Fα Fβ Lβ Lγ Lε Mδ Mθ  
Oζ Oη Oκ Oξ Oτ Oυ Pα Pδ Pλ Pμ Pν Pq Qβ Qγ Qλ Rδ Sδ Sθ Tδ Vv Vυ Xα; poteris Vε  
arcum<sub>1</sub>] *om.* Cε Nα; gradus Vv; *add.* uniuscumque Cθ DL] AX.DL Pλ 3] 3<sup>es</sup>  
Sθ; tres *some*; trium Bα Eη Ev Pφ Qδ; 30 Bη Dη Eα Eδ Vβ Wβ Xα; 30 Rε; 33 *corr.* to 3 Vψ  
gradus] graduum Aα Bv Rε Vπ; gradibus Bι; *add.* quorum quilibet Bη Pq Wβ; *add.*  
quorum quilibet valet 10 [*or x*] Cβ(*interlin.*) Bε Cε Cι Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη  
Mυ Mφ Nδ Nε Oξ Oζ Oτ Oυ Pα Pδ(valeret) Pθ(valeret) Pλ Pμ Pν Qβ Qγ Qδ(*add.* g<sup>a</sup>) Qλ  
Qμ Rβ(quodlibet; *add.* g<sup>a</sup>) Rδ(valent) Sδ Tδ Vι(quolibet) Vψ Wα Xβ; *add.* vel unius gradus  
sicut 30 eodem modo distingueretur St arcum<sub>2</sub>] aacarcus Mv BM] BL Oπ; BLM  
Qδ; HM Xβ; LG Bε; LM Fβ Lβ Lγ Lε Lη Mδ Nδ Oζ Oυ Pα Pλ Pν Qβ Qγ Sδ Tδ; VM Vκ; VN Eo  
similiter<sub>2</sub>] *add.* BN Eo; *add. interlin.* scilicet 3 gradus Cβ; esset arcus HS] *om.* Pμ  
HS] Cζ Eμ Oα Oη Oσ Pψ Qα St Vυ; HG Vα; HO Aα Bγ Bε Bη Bθ Bι Bκ Cβ Cδ Cε Cη  
Cθ Cι Dγ Dη Eα Eβ Eδ Eζ Eη Ev Eo Eτ Ev Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mφ Mκ Mo Mυ  
Nα Nδ Nε Oζ Oξ Oπ Oτ Oυ Pα Pγ Pδ Pθ Pλ Pν Po Pq Pτ Pυ Pφ Qβ Qγ Qδ Qλ Qμ Ra Rβ  
Rδ Rε Sβ Sδ Sθ Sκ Tδ Vβ Wβ Vε Vι Vκ Vν Vπ Vσ Vχ Vψ Wα Wι Xα Xβ; *corr. ex* HO Mη;  
HX Bα; HZ Mθ Oκ; H scilicet Z Mv; MS *corr.* to HO Sλ

22-23 et arcum BM ... gradus<sub>1</sub>] *repeat* Bθ HS ... arcus] *om.* Mλ

VZ the sign of Cancer.

Similarly, if you constructed arc DL as 3 degrees and arc BM in the same way, arc HS would be

3 gradus ex [Sagittario] et arcus [ZN] 3 gradus ex [Geminis]. Hoc modo divides

23 3<sub>1</sub>] tres *some*; trium Βα Βε Ευ Qδ Vπ; *om.* Dη; 30 Βη Εα Εδ Nα Qα Rε Vβ Wβ Xα  
 gradus<sub>1</sub>] *om.* Pτ; graduum Αα Rε Vv Vπ; *add.* et arcus Vv ex<sub>1</sub> ... gradus<sub>2</sub>] *om.* Βκ  
 Sagittario] Cζ Εμ Οη; Capricorno Αα Βα Βγ Βε Βη Βθ Βι Cβ Cδ Cε Cη Cθ Dγ Dη Εα  
 Εο Ευ Εδ Εζ Εη Εν Ετ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mv Mo Mv Mφ Nα Nδ Nε  
 Oα Oζ Oκ Oξ Oπ Oσ Oτ Ου Pα Pγ Pδ Pθ Pλ Pμ Pν Po Pρ Pτ Pυ Pφ Pψ Qα Qβ Qγ Qδ Qλ  
 Qμ Rα Rβ Rδ Rε Sβ Sδ Sθ Sλ Sι Sκ Tδ Vα Vβ Vε Vι Vκ Vv Vπ Vσ Vυ Vχ Vψ Wα Wβ Wι  
 Xα Xβ [Sagittario] ... ex<sub>2</sub>] *om.* Cε Lβ ZN] Βη Cζ Cη Εμ Ετ Nε Οη Pδ Pθ Pρ Pτ Sι  
 Wβ; CG Mv; RN Rδ; RV Fζ; RX Nα; TG Vυ ; XV Qδ; [*illeg.*]Z Eο; ZB Qγ Vκ; ZG Βα Cβ Cδ Cθ  
 Εν Mθ Oα Oκ Oπ Oσ Pψ Qα Qμ Rα Sθ Sλ Vα Vε Vv; ZP Vσ Vχ; ZV Αα Βγ Βε Βθ Βι Cι  
 Dγ Dη Εα Εβ Εδ Εζ Εη Ευ Fα Fβ Lγ Lε Lζ Lη Mδ Mη Mκ Mλ Mo Mv Mφ Nδ Oζ Oξ Oτ  
 Ου Pα Pγ Pλ Pμ Pν Po Pυ Pφ Qβ Qλ Rβ Rε Sβ Sδ Sκ Tδ Vβ Vι Vπ Vψ Wα Wι Xα Xβ; *add.*  
 qui est arcus Geminorum Sι 3<sub>2</sub>] trium Βα Qδ Rβ Vπ; tres *many*; 30 Βη Εδ Nα Rε Xα  
 gradus<sub>2</sub>] graduum Rε Vv Geminis] Cζ Εμ Οη; Cancro Αα Βα Βγ Βε Bζ Βη Βθ  
 Βι Βκ Cβ Cδ Cε Cη Cθ Cι Dγ Dη Εα Εδ Εζ Εη Εν Eο Eτ Ευ Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ  
 Mθ Mη Mκ Mλ Mo Mv Mv Mφ Nα Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Ου Pα Pγ Pδ Pθ Pλ  
 Pμ Pν Po Pρ Pτ Pυ Pφ Pψ Qα Qβ Qδ Qλ Qμ Rα Rβ Rδ Rε Sβ Sδ Sθ Sι Sκ Sλ Tδ Vα Vβ Vε  
 Vι Vκ Vv Vπ Vσ Vυ Vχ Vψ Wα Wβ Wι Xα Xβ; Capricorno *corr. to* Cancro Qγ Hoc]  
*add.* igitur Cδ modo] *add.* utimur ut iam dictum est Cδ

23-24 Hoc ... figura] *om.* Βα

3 degrees of Sagittarius,<sup>6</sup> and arc ZN 3 degrees of Gemini. In this way you will divide the

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<sup>6</sup> If one follows the diagram and the lettering used for dividing the zodiac into its signs, almost all the manuscripts insert the wrong signs – Capricorn for Sagittarius, and Cancer for Gemini – in this sentence. This may stem from an error in an early ms (C $\eta$ , dated AD 1276 – see introduction) where the names in the diagram have been shifted clockwise by one sign. In line 21, designating the arc as HO would be correct for Capricorn and ZV (corrupted to ZG) would be correct for Cancer. (Where the mss do read HS and ZN, often this corresponds to the lettering in the diagram for Capricorn and Cancer. And as has been mentioned, V and N were often interchanged by scribes.)

Note: in the correct version the parts divided off in this example would be the final 3 degrees of the sign.

universum circulum signorum per singulos gradus, ut patet in hac figura.

24 universum] *interlin.* Cθ; *om.* Bζ Cζ Eμ Eo Mv Mo Oα Oη Ok Oσ Pφ Pψ Qα Sθ Sλ Sι Vα Vσ Vυ Vχ; zodiacum sive Cδ; *add.* scilicet Cθ circulum] *om.* Bθ Vπ signorum] *om.* Mv Mφ Vι per ... gradus] certissime Pψ singulos] *add.* dies Ne; *add. and canc.* dies Lγ singulos ... figura] signa et partes signorum et per gradus si placet, sicut vides hic Cδ gradus] *om.* Ok ut ... figura] *om.* Ev Mv Oη Pψ; eodem modo Sι; et est figura Vυ; et hec est figura Bζ Cβ Cζ Cθ Eμ Eo(hoc) Mθ Mκ Oα Ok Oπ Oσ Pψ Qα Sθ Vα Vε Vσ Vχ; ut in figura Bε; ut in figura precedenti patet Dη; *add. interlin.* que prenotata Eμ ut] *om.* Eζ; sicut Rδ patet] *om.* Cε Rδ; patebit Nα hac] *om.* Aα Bγ Bθ Cη Dγ Lη Ev Mη Mλ Nα Pτ Qγ Vι Vπ Wβ; sua Xα; subsequenti scripta Fβ; *add.* sequenti Pφ figura] *add.* intucti(?) Vι; que sequitur ex alia parte quia hic non [*illeg.*] capitulum etc. Rδ; *add.* postposita Bη; *add.* precedenti Mη; *add.* subsequenti que talis est Pq; *add.* sequenti Rα Tδ Vβ; *add.* subscripta Lε; *add.* transacta Pυ; *add.* Requir~infram libro magistri Johannis de Simdis istam et omnes alias figurarum Xα<sup>7</sup>; *add.* (*later hand*) Figura est post textum astrolabii ad iste signum \* Qμ(*links to fol. 153'*); *add.* 4-line gloss Cζ; *add.* *Addendum 9-1: many*

figura] *add.* Oη.<sup>8</sup>

DE CONSTITUTIONE ZODIACI ET EIUS DIVISIONE.

Statue circulum super lineam AO ita quod transeat per LT, et sit circulus zodiaci. Deinde divide circulum ABCD per 360 gradus. Post hec pones arcum E ut similem dimidio declinationis Ptholomei. Deinde iunges A cum T et abscindat diametrum super K, qui est punctus medius inter polum zodiaci et polum mundi. Posita regula super 280 gradus limbi ex una parte et super 45 ex altera, et concordat cum cenith capitis in linea medii celi.

figura] *add. in marg.* Vβ:

Nota quod secundum quosdam potest dividi zodiacus per lineas rectas super totam declinationem, sicut per arcus super mediam declinationem. Tamen non videtur esse sufficiens, quia aliqualis esset ibi error, si aliquis subtiliter investiget. Unde levius et melius est per ascensiones.

Nota quod meliori modo et certiori dividitur zodiacus per ascensiones signorum, que sibi debentur in circulo directo, et unumquodque signum in gradus similiter secundum ascensiones, que gradibus debentur. Et accipiuntur iste ascensiones in tabula, ascensiones signorum in circulo directo. Et hoc modo dividunt facientes astrolabium.

<sup>7</sup> At the beginning of the text, ms Xα attributes this treatise to John of Sacro Bosco; see Prologus, line 1. "Iohannis de Simdis" is unknown; perhaps *Simdis* is really *Sundis*, i.e., Stralsund, the Hanseatic city on the Baltic Sea in northeastern Germany.

<sup>8</sup> This additional material was included by Gunther as part of his text (p. 205), but in fact it appears in only this one manuscript. Moreover, whoever prepared the Latin for Gunther dropped a whole line ("zodiaci [5<sup>th</sup> line] ... limbi [6<sup>th</sup> line]") from the transcription and misread "45" [line 6] as "AO", or "45", "centro" [line 7] for "cenith", and "capitis" [line 7] as "capreis", thus destroying the sense of the sentence.



entire circle of signs into individual degrees, as shown in this figure.

## [ ADDENDUM 9-1 ]

Aα Bγ Bε Bη Bθ Cε Cη Cι Dη Eα Eβ Eδ Eζ Eη Eο Eτ Eυ Fα Fβ Fζ Lγ Lε Lη Mδ Mo Mυ Mφ Nε Oζ  
 Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Po Pρ Pτ Pφ Qβ Qγ Qδ Qλ Qμ Rβ Rδ Sδ Sκ Tδ Vβ Vι Vπ Vχ(marg.)<sup>9</sup>  
 Vψ Wα Wβ Wι Xβ

25 Potest etiam aliis 3 modis dividi zodiacus. Primo per lineas rectas super totam declinationem, ut in precedenti per arcus super dimidium declinationis. Secundo per tabulas ascensionum signorum in circulo signorum, et hoc utimur modo scilicet trahendo lineam rectam a puncto E per zodiacum et per ascensionem signi sive gradus.

- 25 Potest] Post hoc *many* Potest .. dividi] *twice* Rβ; *illeg.* Cε etiam] *om.* Eη; autem Aα Bθ Eυ Vπ 3] tribus *some*; 2 Nε Wα zodiacus] *add. in marg.* 2° [*illeg.*] alios 3 modos dividendi zodociacum. Et primo, primum. 2°, 2<sup>m</sup> quem servamus. 3°, 3<sup>m</sup> modum. Hii autem modi sunt additi, nec habent figuram preter primus Vβ Primo] *om.* Cε; *add. in marg.* Primo per lineas rectas Eα rectas] *add. de quorum in sequenti figura.* Et Vβ totam] *om.* Mυ Vι Wα
- 26 ut] *ut corr. to* videlicet Pρ; non poc Eο; *add. interlin.* id est scilicet Pρ precedenti] *add. interlin.* scilicet figura Vβ per] super Fβ; *om.* Bα super] secundum Eο Eτ dimidium] . . . Vψ; circulum Nε; *add. interlin.* scilicet arcui Vβ Secundo per] 3° per Nε; super Qδ; *add.* 2° Eα(marg.)
- 27 ascensionum] *om.* Vψ in] ut patet in Qβ signorum<sub>2</sub>] directo Bη Bθ Cη Cι Eη Eο Eυ Fα Nε Pδ Pθ Pλ Pρ Pτ Rδ Vβ Vπ Wβ; recto Cε Dη Eδ Eζ Eτ Mo Mυ Po Qμ Sκ Vψ Xβ; *add.* directo Qδ; *add. in marg.* signorum Fα utimur] *ut. . .* Vψ modo] melior modo Bε scilicet] *om.* Pρ
- 27-28 modo ... gradus] *om.* Aα Bγ Bη Bθ Cη Eδ Eζ Eμ Eο Eτ Mo Pτ Qμ Sκ Vπ Vχ Wι Wβ; *marg., late hand, garbled* Po scilicet trahendo] subtrahendo Cε
- 28 trahendo] atrahendo Qδ per] *twice* Cε ascensionem] declinationem Pδ Pθ Vψ; declinationem *corr. to* ascensionem Oτ; *add.* vel declinationem Oξ Pφ
- 28-29 ascensionem ... per<sub>2</sub>] *om.* Nε

<sup>9</sup> Due to the tight binding of ms Vχ, the first part of each of the 10 lines of this marginal addition is not readable.

## [ ADDENDUM 9-1 ]

25           The zodiac can also be divided in three other ways. First through straight lines using the entire [obliquity],<sup>10</sup> as in the preceding through arcs using half the [obliquity]. Second, by tables of [right] ascensions of the signs in the circle of signs, and we use this method, that is, by drawing a straight line from point E through the zodiac and through the [right] ascension of the sign or degree.<sup>11</sup>

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<sup>10</sup> Straight lines from the projection of the pole of the ecliptic to points on the equatorial circle (i.e., to 30°, 60°, 90° etc. along the equatorial circle) also cut off equal arcs on both the equatorial circle and the ecliptic. See Thomson, *Jordanus de Nemore*, pp. 66-67, and Proposition 4 and commentary, pp. 142-143.

Samsó notes that this method is found in Ptolemy, *Planaesphaerium*, chapter 15 (*On Both Sides*, p. 421).

<sup>11</sup> Knowing the right ascension (along the equator) of the beginning of each sign in the zodiac (e.g., as found in the table in Addendum 9-2), then straight lines from these points on the equator through the pole (i.e., great circles through the pole and the points on the equator) will cut off appropriate arcs of the ecliptic. See Thomson, *Jordanus de Nemore*, pp. 62-64, and Proposition 4 and commentary, pp. 142-143 and Samsó, *On Both Sides*, pp. 423-424.

A similar but inaccurate method (often known as “false right ascensions”) involves drawing straight lines from 30° arcs along the equator to the pole, cutting off arcs on the ecliptic. For the problem with this “method” see Thomson, *Jordanus de Nemore*, p. 64.

30 Tertio modo per circulos transeuntes per declinationes cuiuslibet gradus signorum. Et si declinatio sit australis, accipe eam extra equinoctialem ex A versus D; si sit septentrionalis, accipe intra ex A versus B ponendo regulam super punctum D et super declinationem versus quamcumque partem fuerit declinatio accepta, scilicet ex A versus D vel ex A versus B.

- 29 Tertio] iii Aα Vπ; In Bθ Ev; *add.* 3<sup>o</sup> Eα(*marg.*); *add.* autem] Bγ Cη Pτ Vβ Wβ modo] *om.* Bε Pφ circulos] *om.* Eo; singulas Pτ; singulos gradus Vβ per] *om.* Pτ declinationes] declinationem par(?) Rδ cuiuslibet] *om.* Vχ; uniuscuiusque Bγ Bη Cη Pτ Wβ signorum] *om.* Cε; *add.* vel per declinationem unius signi vel duarum signorum Qμ Et] que Pα si] sit *or* sic Vψ; *add.* sit *or* sic Nε
- 29-33 Et ... B] Eβ(*very faint*) Lβ(*very faint*) Po(*later hand in marg., partly cut off*) Qμ(*later hand*); *om.* Aα Bγ Bη Bθ Cε Cη Eδ Eζ Ev Eo Eτ Mo Pτ Rβ Sκ Vβ Vπ Vχ Wβ
- 30 eam] *add. and canc.* versus Eα
- 30-31 si ... versus] *om.* Nε Vψ
- 31 accipe intra ex A] *marg.* Oξ intra] eam Mδ Nδ; numerum Rδ A] ea Qγ ponendo] *add.* ipsam Nε; *add.* semper Cι Pδ Rδ D] CB Pφ
- 32 fuerit] fuerint Pφ declinatio accepta] *om.* Pφ
- 33 D] B Cβ Mφ Mv Pφ Vι Wα versus B] *om.* Oξ B] D Mφ Mv Vι Wα; *add.* Possunt leviori modo extrahi signa zodiaci ex gradibus limbi sive in marginalibus. Nam Capricornus constituit 32 primos gradus, Aquarius constituit 30 sequentes, Pisces 28 sequentes usque ad caput Arietis. Deinde Arietis continet 28 sequentes, Taurus 30, Gemini 32 usque ad caput Cancri. Cancri continet 32, Leo 30, Virgo 28 usque ad caput Libre. Libra occupat 28, Scorpio 30, Sagittarius 32 usque ad caput Capricorni. Quos gradus singulis signe annotatos divide eos in 30 gradus equales secundum divisionem orizontium sive in singulos aut binarios aut quintarios secundum quod astrolabium tuum fuerit magnum. Ev

The third way is through circles passing through the declinations of any degree of the signs. And if the declination is southern, draw it outside the equatorial [circle, i.e., the celestial equator]<sup>12</sup> from A towards D; if it is northern, draw it inside from A towards B, placing the rule on point D and on the declination towards whichever side the drawn declination is, that is, from A towards D or from A towards B.<sup>13</sup>

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<sup>12</sup> The circle through the equinox/equinoxes (*equinoctius diei*) is the circle through the beginnings of Aries and Libra, that is, the celestial equator. Henceforth this phrase will be translated as “celestial equator”.

<sup>13</sup> By drawing circles parallel to the equatorial circle at appropriate declinations, these circles will cut the ecliptic at the desired points. However, this method depends on having a table of declinations for the beginning points of the signs along the ecliptic. It is also not very accurate – or at least very difficult to be accurate – because the angle of intersection is always less than the obliquity of the ecliptic making the precise point of intersection very difficult to determine. See Thomson, *Jordanus de Nemore*, p. 66, and Proposition 4 and commentary, pp. 142-143.

## [ ADDENDUM 9-2 ]

*in margins, or indented into the text at the margin: Mu Mφ Oξ Ov Pα Po<sup>14</sup> Wα*

NOTA: Ascensiones signorum per quos dividitur zodiacum

35	Sagittarius Capricornus Gemini Cancer	} } } }	32 g <sup>a</sup>	13 m <sup>a</sup>
40	Aries Libra Pisces Virgo	} } } }	27 g <sup>a</sup>	53 m <sup>a</sup>
45	Taurus Scorpio Leo Aquarius	} } } }	29 g <sup>a</sup>	54 m <sup>a</sup>

34 per ... zodiacum] *om.* Oξ Ov Pα Po

36 32] 23 Pα Po

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<sup>14</sup> Most of names of the signs are cut off.

## [ ADDENDUM 9-2 ]

NOTE: [Right] ascensions of the signs by which the zodiac is divided<sup>15</sup>

Sagittarius	}	32 degrees	13 minutes
Capricornus			
Gemini			
Cancer			
Aries	}	27 degrees	53 minutes
Libra			
Pisces			
Virgo			
Taurus	}	29 degrees	54 minutes
Scorpio			
Leo			
Aquarius			

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<sup>15</sup> These are (fairly accurate) right ascensions used in the second method noted above in Addendum 9-1. These right ascensions for the beginnings of the signs are: Aries, 0°; Taurus, 27° 53'; Gemini, 57° 47'; Cancer, 90°; etc. In modern notation these would be: Aries 0<sup>h</sup>; Taurus, 1<sup>h</sup> 51<sup>m</sup> 32<sup>s</sup>; Gemini, 3<sup>h</sup> 51<sup>m</sup> 8<sup>s</sup>; Cancer, 6<sup>h</sup>; etc.

The “correctness” of these right ascensions depends of course on the value used for the angle of the ecliptic; and the “usefulness” of the degree of accuracy exhibited here depends on the craftsmanship of the engraver.

[ FIGURA 9 ]

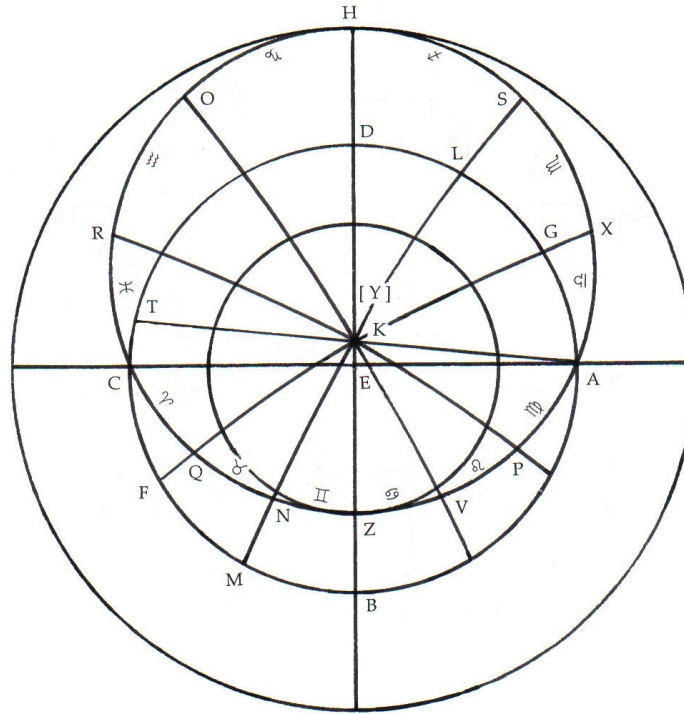


Figura divisionis zodiaci per arcus super medie declinationis polum /  
 Figure of the division of the zodiac using arcs through the pole of half the declination

[Complete diagram] Bα Bγ Bε Bι Bκ Cβ<sub>1</sub>(fol. 52<sup>v</sup>) Cβ<sub>2</sub>(fol. 52<sup>v</sup>) Cδ Cη Cθ Cι Eα Eβ(faint) Eη<sup>16</sup>  
 Eμ<sub>1</sub>(fol. 53<sup>v</sup>) Eμ<sub>2</sub>(fol. 53<sup>v</sup>) Eν<sup>17</sup> Eτ Eυ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mν Mo Mυ(fol. 406<sup>v</sup>)  
 Nδ<sup>18</sup> Nε Oζ Oκ<sup>19</sup> Oξ Oπ<sub>1</sub>(fol. 50<sup>v</sup> bottom left) Oπ<sub>2</sub>(fol. 50<sup>v</sup> bottom right) Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Po

<sup>16</sup> In Eη the figure is partly symmetrical around diameter BH. Thus L and G are also found in arc DC of the equatorial circle.

<sup>17</sup> The figure in Eν is oriented 90° counterclockwise. Some letters are oriented horizontally, and some vertically, making them at times difficult to decipher. As well it is partially symmetrical around diameter BH; thus L and G are also found in arc DC of the equatorial circle, and F and M in arc AB.

<sup>18</sup> In ms Nδ, Figura 9 is combined with Figura 10. Only the lettering relevant to Figura 9 is recorded here.

<sup>19</sup> In Oκ the figure is symmetrical around diameter BH, with the left side repeating the right side. Thus L and R (not G) are also found in arc DC of the equatorial circle, and F and M in arc AB.



P $\rho$  P $\tau$  P $\upsilon$  P $\psi$ <sup>20</sup> Q $\beta$  Q $\gamma$  Q $\delta$  Q $\lambda$ (*fol. 185<sup>v</sup>*) Q $\mu$ (*fol. 153<sup>r</sup>*) R $\delta$  S $\beta$  S $\delta$  T $\delta$  V $\alpha$  V $\beta$  V $\iota$ (*fol. 332<sup>r</sup>*) V $\kappa$  V $\sigma$  V $\chi$  W $\iota$   
X $\beta$

[*Partial diagram*] B $\theta$  E $\circ$  R $\alpha$  V $\epsilon$  W $\alpha$

[*Outline, or space only*] A $\alpha$  B $\zeta$  C $\epsilon$  D $\eta$  E $\zeta$  L $\beta$  M $\phi$  N $\alpha$  O $\alpha$  P $\nu$  P $\phi$  Q $\alpha$  R $\beta$  S $\theta$  V $\nu$  V $\pi$  V $\upsilon$  V $\psi$

[*No space*] D $\gamma$  E $\delta$  O $\eta$  S $\iota$  S $\lambda$  X $\alpha$

P $\theta$  “J”

[*Combined with Fig. 7 and 8*] B $\eta$  E $\circ$  W $\beta$ <sup>21</sup>

[*Includes Fig. 8*] C $\beta_1$  R $\epsilon$  S $\kappa$

[*Combined with Fig. 10*] M $\delta$

[*Note: Lines MKL and FKG should be arcs, but in some mss these are drawn as straight lines: B $\alpha$  B $\epsilon$  C $\theta$  E $\nu$  E $\upsilon$  F $\beta$  P $\lambda$  P $\circ$  P $\tau$  P $\psi$  Q $\delta$  Q $\lambda$  T $\delta$  V $\epsilon$  V $\kappa$  V $\sigma$  X $\beta$ . Mss B $\eta$ , M $\nu$ , M $\upsilon$ , S $\beta$ , and V $\iota$  have straight lines drawn from K. Mss C $\theta$ , O $\pi_1$  and W $\alpha$  have no arcs drawn.]*

[*Caption*]

Figura ... polum] C $\iota$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\eta$  M $\kappa$  N $\epsilon$  O $\zeta$  O $\xi$  O $\tau$  O $\upsilon$  P $\alpha$  P $\delta$  P $\tau$  Q $\beta$  Q $\gamma$  Q $\delta$  Q $\lambda$  R $\delta$  S $\delta$  T $\delta$  X $\beta$ ;  
F $\beta$ (*repeated in marg.*); P $\rho$ (*twice*); *illeg.* E $\beta$ ; *om.* B $\alpha$  B $\iota$  B $\kappa$  C $\beta_1$  C $\beta_2$  C $\theta$  E $\mu_1$  E $\mu_2$  E $\nu$  M $\theta$  O $\kappa$  O $\pi_1$  O $\pi_2$  P $\lambda$   
P $\psi$  S $\beta$  V $\alpha$  V $\epsilon$  V $\sigma$  W $\alpha$  V $\upsilon$ ; Cumque feceritis circulum signorum etcetera O $\sigma$ (*later hand*); Divisio  
zodiaci per arcus super demidium tocius declinationis E $\alpha$ ; Figura descriptionis zodiaci per arcus  
(*add. interlin. super polum*) medie declinationis R $\epsilon$ ; Figura divisionis circuli signorum per signa et  
gradus super medium declinationis B $\gamma$ ; Figura divisionis zodiaci Q $\mu$ ; Figura divisionis zodiaci  
super medie declinatione polum cum figura inscriptionis stellarum fixarum N $\delta$ ; Figura  
inscriptionis et divisionis zodiaci per arcus super mediem declinationis per lineas curves et per  
totum declinationem per lineas rectas S $\kappa$ ; Hec est figura benefacta secundum artem L $\zeta$ ; In hec  
figura punctus K est punctus medius inter polum mundi et polum zodiaci in que se intersecant  
sex circuli dividentes tam equinoctialem quam zodiacum in xii partes equales quod facere non  
possent ubi essent eorum thercerto(?) C $\delta$

Figura] *add.* inscriptionis B $\epsilon$  divisionis] F $\alpha$ (*twice*); inscriptionis E $\eta$  zodiaci]  
circuli signorum E $\tau$  E $\upsilon$  M $\eta$  M $\nu$  M $\circ$  M $\upsilon$  P $\circ$  P $\upsilon$  V $\iota$  V $\kappa$  V $\chi$  W $\iota$ ; *add.* id est circuli signorum V $\beta$ (*and*  
*add. interlin. uno scilicet modo*) per arcus] *om.* E $\upsilon$  M $\delta$  M $\eta$  V $\iota$  W $\iota$  per arcus super medie  
declinationis polum] *om.* P $\gamma$ ; super totam declinationem P $\mu$  super] *om.* B $\theta$  super ...  
polum] *om.* C $\eta$  medie declinationis polum] mediam declinationem E $\tau$  E $\upsilon$  F $\alpha$  M $\eta$  M $\lambda$  M $\nu$   
M $\circ$  P $\circ$  P $\upsilon$  V $\kappa$  V $\chi$ ; mediam declinationem signorum M $\upsilon$  V $\iota$  polum] *om.* B $\theta$ ; *add.* cum figura  
inscriptionis stellarum fixarum M $\delta$

[*Lettering on the diagram*]

A] B $\alpha$  B $\gamma$  B $\epsilon$  B $\eta$  B $\theta$  B $\iota$  B $\kappa$  C $\beta_1$  C $\beta_2$  C $\delta$  C $\eta$  C $\theta$  C $\iota$  E $\alpha$  E $\beta$  E $\eta$  E $\mu_1$  E $\mu_2$  E $\nu$  E $\tau$  E $\upsilon$  F $\alpha$  F $\beta$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\zeta$  L $\eta$   
M $\delta$  M $\eta$  M $\theta$  M $\lambda$  M $\circ$  M $\upsilon$  N $\delta$  N $\epsilon$  O $\zeta$  O $\kappa$  O $\xi$  O $\pi_1$  O $\sigma$  O $\tau$  O $\upsilon$  P $\alpha$  P $\gamma$  P $\delta$  P $\lambda$  P $\mu$  P $\circ$  P $\rho$  P $\tau$  P $\upsilon$  P $\psi$  Q $\beta$  Q $\gamma$   
Q $\delta$  Q $\lambda$  Q $\mu$  R $\delta$  R $\epsilon$  S $\beta$  S $\delta$  S $\kappa$  T $\delta$  V $\alpha$  V $\beta$  V $\epsilon$  V $\iota$  V $\kappa$  V $\sigma$  V $\chi$  W $\beta$  X $\beta$ ; *om.* B $\theta$  M $\kappa$  W $\iota$ ; *cut off* O $\pi^2$  W $\alpha$ ; X M $\nu$

<sup>20</sup> Ms P $\psi$  is partly symmetrical around diameter BH.

<sup>21</sup> Mss B $\eta$  (fol. 120<sup>r</sup>), E $\circ$  (fol. 186<sup>r</sup>), and W $\beta$  (fol. 1<sup>va</sup>) have Figures 7, 8 and 9 all superimposed as one diagram. In E $\circ$  the lettering for Figure 9 is not included and in W $\beta$  an attempt has been made to distinguish the figures in part by the use of different coloured inks. For the captions, see Figure 7.

B] Βα Βγ Βε Βη Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη  
 Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ  
 Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Va Vβ Vi Vκ Vσ Vχ Wα Wβ Xβ; *om.* Bθ Mκ Vε Wι C] Βα Βγ Βε Βη Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ  
 Mθ Mη Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ  
 Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Va Vβ Ve Vi Vκ Vσ Vχ Wβ Xβ; *om.* Bθ Mκ Wα Wι D] Βα  
 Βγ Βε Βη Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη  
 Mθ Mλ Mν Mo Mu Ne Oζ Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ  
 Qμ Rδ Re Sβ Sδ Sk Tδ Va Vβ Vi Vκ Vσ Vχ Wα Wβ Xβ; *om.* Bθ Mκ Nδ Pψ Vε Wι E] Βα Βγ Βε  
 Βη Βι Βκ Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mθ Mλ Mν Nδ Ne Oζ Ok  
 Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Va  
 Vβ Ve Vκ Vσ Vχ Wβ Xβ; *om.* Bθ Cβ<sub>1</sub> Εμ<sub>2</sub> Mη Mκ Mo Mu Vi Wα Wι; κ Εμ<sub>1</sub> F] Βα Βγ Βε Βη Βι  
 Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Mλ Mν Mo  
 Mu Nδ Ne Oζ Ok Oξ Oπ<sub>122</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qλ Qμ Rδ Re  
 Sβ Sδ Sk Tδ Vβ Vi Vκ Vσ Vχ Wβ Xβ; *illeg.* Εβ; *om.* Bθ Mκ Qδ Va Ve Wα Wι G] Βα Βγ Βι Βκ  
 Ββ<sub>2</sub> Cδ Cθ Cι Εα Εβ Εη Εν Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mη Mu Oξ Oπ<sub>1</sub> Ot Ou Pa Pγ Pδ Pλ Pμ Pτ Pυ  
 Qβ Qγ Qδ Qλ Qμ Re Sβ Sδ Sk Tδ Vβ Vi Vκ Vσ Vχ Wβ Xβ; *illeg.* Mθ; *om.* Be Βη Cβ<sub>1</sub> Cη Bθ Et Mδ  
 Mκ Mλ Mν Mo Nδ Ne Oζ Po Pρ Pψ Rδ Va Ve Wα Wι; R Ok; T Εμ<sub>1</sub> Oσ; x Εμ<sub>2</sub> Oπ<sub>2</sub> H] Βα Βγ  
 Βε Βη Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Mλ  
 Mν Mo Mu Nδ Ne Oζ Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ  
 Qμ Rδ Re Sβ Sδ Sk Tδ Va Vβ Ve Vi Vκ Vσ Vχ Wα Wβ Xβ; *om.* Βη Bθ Et Mκ Wι κ] Βα Βγ Βε  
 Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mθ Mλ Mν<sup>23</sup>  
 Mu Nδ Ne Oζ Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rδ  
 Re Sβ Sδ Sk Tδ Va Vβ Ve Vi Vκ Vσ Vχ Wβ Xβ; *om.* Βη Bθ Mη Mκ Mo Wα Wι; *add.* polum zodiaci  
 Cδ; *add. above κ centrum zodiaci* Cδ L] Βα Βγ Βι Βκ Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν Ετ  
 Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mη Mθ Mν Mo Mu Ne Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa Pγ Pδ Pλ Pμ Po  
 Pρ Pτ Pυ Qβ Qγ Qλ Qμ Re Sβ Sδ Sk Tδ Vβ Vi Vκ Vσ Vχ Wβ Xβ; *om.* Be Βη Bθ Cβ<sub>1</sub> Mδ Mκ Mλ Nδ  
 Oζ Pψ Qδ Rδ Va Ve Wα Wι M] Βα Βγ Βε Βη Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εη Εμ<sub>1</sub> Εμ<sub>2</sub> Εν  
 Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oπ<sub>124</sub> Oπ<sub>2</sub> Oσ Ot Ou  
 Pa Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Va Vβ Vi Vκ Vσ Vχ Wβ Xβ;  
*illeg.* Εβ; *om.* Bθ Mκ Ve Wα Wι; F Qδ N] Βα Βγ Βε Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εη Εμ<sub>1</sub> Εμ<sub>2</sub>  
 Εν Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mθ Mλ Mν Mo Mu Ne Oζ Ok Oξ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Ot Ou Pa  
 Pγ Pδ Pλ Pμ Po Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Va Vβ Vi Vκ Vσ Vχ Xβ; *illeg.* Εβ;  
*om.* Bθ Mκ Wα Wι; v Βη Nδ Pρ Wβ; z Ve O] Βα Βγ Βε Βη Βι Βκ Ββ<sub>1</sub> Ββ<sub>2</sub> Cδ Cη Cθ Cι Εα Εβ  
 Εη Εμ<sub>2</sub> Ετ Ευ Fα Fβ Fζ Λγ Λε Λζ Λη Mδ Mη Mλ Mν Mo Mu Nδ Oζ Oξ Ot Ou Pa Pγ Pδ Pλ Pμ Po  
 Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Vβ Vi Vκ Vσ Vχ Wβ Xβ; *om.* Bθ Mκ Ne Ve Wα Wι;  
 E Εμ<sub>1</sub> Oπ<sub>1</sub>; M Oπ<sub>2</sub>; S Ev Ok Oσ Pψ Va; •f• Mθ P] Βγ Βε Βη Βι Βκ Εα Εβ Εη Ετ Ευ Fα Fβ Fζ Λγ  
 Λε Λζ Λη Mδ Mη Mλ Mν Mo Mu Nδ Ne Oζ Oξ Ot Ou Pa Pγ Pδ Pλ Pμ Pρ Pτ Pυ Qβ Qγ Qδ Qλ  
 Qμ Rδ Re Sβ Sδ Sk Tδ Vβ Vκ Wβ Xβ; *om.* Bθ Mκ Wα Wι; Q Ok; T Βα Cβ<sub>1</sub> Ββ<sub>2</sub> Cδ Cθ Εμ<sub>1</sub> Εμ<sub>2</sub> Εν  
 Mθ Oπ<sub>1</sub> Oπ<sub>2</sub> Oσ Pμ Po Pψ Va Ve Vi; v Vσ Vχ; *on equatorial circle* Cη Cι Q] Βα Βγ Βε Βη Βι Βκ

<sup>22</sup> In Oπ<sub>1</sub>, F is also on arc AB.

<sup>23</sup> In Mν, κ is on top of E.

<sup>24</sup> In Oπ<sub>1</sub>, M is also on arc AB.

Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eν Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μλ Μν Μο Μυ  
 Νδ Νε Οζ Οκ Οξ Οπ<sub>1</sub> Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ  
 Sδ Σκ Τδ Vβ Vι Vκ Vσ Vχ Wβ Xβ; *illeg.* Eβ; *om.* Bθ Mκ Wα Wι; F Vα; N Vε R] Bα Bη Bι Bκ  
 Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cθ Cι Eτ Eυ Fζ Λζ Μη Μλ Μν Μο Οπ<sub>2</sub> Ρρ Ρτ Qμ Rδ Sβ Vβ Vκ Vσ Vχ Wβ; *illeg.* Mθ;  
*om.* Bθ Mκ Vε Wα Wι; G Pψ; H Eν; I Bε Cη Eα Eβ Eη Fα Fβ Λγ Λε Λη Μδ Μν Νδ Νε Οζ Οξ Οτ Ου  
 Ρα Ρδ Ρλ Ρμ Ρυ Qβ Qγ Qδ Qλ Rε Sδ Σκ Τδ Vι; R *corr.* to I Xβ; T Oπ<sub>1</sub>; V Oσ; Z Bγ Pγ; α Po; ζ Vα; 6  
 Eμ<sub>1</sub> Eμ<sub>2</sub> Oκ s] Bα Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eν Eυ Fα Fβ Fζ Λγ  
 Λε Λζ Λη Μδ Μη Μθ Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οπ<sub>1</sub> Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ  
 Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ Sδ Σκ Τδ Vα Vβ Vι Vκ Vσ Vχ Wβ Xβ; *illeg.* Eτ; *om.* Bθ Mκ  
 Wι; v Vε T] Bα Bγ Bε Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cθ Cι Eα Eβ Eη Eν Eτ Eυ Fα Fζ Λγ Λζ Λη Μδ Μη Μλ  
 Μο Μυ Οζ Οξ Οπ<sub>1</sub> Οπ<sub>2</sub> Οσ Οτ Ου Ρδ Ρλ Ρμ Ρο Ρυ Qβ Qδ Qλ Qμ Rε Sβ Sδ Τδ Vα Vβ Vι Vκ Vσ Vχ  
 Wβ Xβ; *om.* Bη Cη Fβ Λε Mθ Bθ Mκ Μν Νε Ρα Ργ Ρρ Ρτ Ρψ Qγ Rδ Σκ Vε Wα Wι; o Eμ<sub>1</sub> Eμ<sub>2</sub> Oκ; R  
 Νδ v] Bγ Bε Bι Bκ Cι Eα Eβ Eη Eμ<sub>1</sub> Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μλ Μν Μο Μυ Νδ Νε  
 Οζ Οξ Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ Sδ Τδ Vβ Vκ Xβ; *om.* Bθ  
 Mκ Pψ Wα Wι; A Vι; B'Σκ; C Vε; G Bα Cδ Eμ<sub>2</sub> Eν Mθ; N Bη Oκ Pρ Wβ; P Vσ Vχ; S Eτ; 6 Cβ<sub>1</sub> Cβ<sub>2</sub> Cθ  
 Oπ<sub>1</sub> Oπ<sub>2</sub> Vα; *on equatorial circle* Cη x] Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cη Cι Eα Eβ Eη Eτ Eυ Fα Fβ  
 Fζ Λγ Λε Λζ Λη Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οξ Οτ Ου Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ  
 Qδ Qλ Qμ Rδ Rε Sβ Sδ Σκ Τδ Vβ Vι Vκ Vσ Vχ Wα Wβ Xβ; *om.* Bθ Mκ Wι; *cut off* Oπ<sub>2</sub>; A Eν Oπ<sub>1</sub>  
 Vα; G Eμ<sub>1</sub> Eμ<sub>2</sub> Mθ Oκ Pψ; T Bα Cδ Cθ; v Oσ Vε z] Bα Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι  
 Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eν Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Oπ<sub>1</sub>  
 Oπ<sub>2</sub> Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Rε Sβ Sδ Σκ Τδ Vα Vβ Vι Vκ Vσ Vχ  
 Wβ Xβ; *illeg.* Eβ; *om.* Bθ Mκ Pψ Wα Wι; G Vε; R Rδ *add.* γ] Bε Bι Cη Eβ Eη Eμ<sub>1</sub> Fβ Fζ Λγ Λε  
 Λη Μδ Νδ Νε Οζ Οξ Οτ Ου Ρα Ρλ Ρρ Ρτ Qβ Qγ Qδ Qλ Qμ Rδ Sδ Τδ Wβ Xβ; L' Σκ

[Signs of the zodiac<sup>25</sup>]

Aries] Bα Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη  
 Μθ Mκ Μλ Μν Νδ Νε Οζ Οξ Oπ<sub>2</sub> Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ  
 Rε Sβ Sδ Σκ Τδ Vβ Vε Vκ Vσ(at point c) Vχ Wβ Wι Xβ; *illeg.* Eβ; *om.* Bθ Eν Μο Μυ Oκ Oπ<sub>1</sub> Ρμ Vα  
 Vι Wα; Taurus Cη Taurus] Bα Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα  
 Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Mκ Μλ Μν Νε Οζ Οξ Oπ<sub>2</sub> Oσ Oτ Oυ Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ  
 Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ Sδ Σκ Τδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *illeg.* Eβ; *om.* Bθ Eν Μο Μυ Νδ Oκ  
 Oπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Gemini Cη Gemini] Bα Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eη  
 Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Mκ Μλ Μν Νε Οζ Οξ Oπ<sub>2</sub> Oσ Oτ Oυ Ρα Ργ Ρδ  
 Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ Sδ Σκ Τδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *illeg.* Eβ; *om.* Bθ  
 Eν Μο Μυ Νδ Oκ Oπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Cancer Cη Cancer] Bα Bγ Bε Bη Bι Bκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ  
 Cη Cθ Cι Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Mκ Μλ Μν Νε Οζ Οξ Oπ<sub>2</sub> Oσ  
 Oτ Oυ Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ Sδ Σκ Τδ Vβ Vε Vκ Vχ Wβ Wι Xβ;

<sup>25</sup> In ms Qδ, sector AKH is divided into 4 parts, with an extra line from κ to between Scorpio and Sagittarius. Scorpio and Sagittarius thus lie between δ and σ, and Libra between σ and χ; the arc between χ and Α is blank. As well, L marks the intersection of the equatorial circle and the extra line of division between Sagittarius and Scorpio (i.e., it has moved counterclockwise from its normal position). Also M floats on the equatorial circle, half way along the arc of Gemini.

In ms Cη, all the signs have been shifted clockwise by one. This may explain why the signs are mismatched in line 23 (q.v.)

*illeg.* Εβ; *om.* ΒΘ Εν Μο Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Leo Cη Leo] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Μο Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Virgo Cη Virgo] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μο Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Libra Cη

Libra] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νε Οζ Οξ Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vσ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μο Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Wα; *cut off* Οπ<sub>2</sub>; Scorpio Cη Scorpio / Scorpius] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μο Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Sagittarius Cη Sagittarius] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νδ Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μο Μυ Νδ Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μο Μυ Οκ Οπ<sub>1</sub> Vα Vι Vσ Wα; Capricornus Cη Capricornus] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eβ Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νδ Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *om.* ΒΘ Εν Μο Μυ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Aquarius Cη

Aquarius] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *illeg.* Εβ; *om.* ΒΘ Εν Μο Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Pisces Cη Pisces] Βα Βγ Βε Βη Βι Βκ Cβ<sub>1</sub> Cβ<sub>2</sub> Cδ Cη Cθ Cι Eα Eη Eμ<sub>1</sub> Eμ<sub>2</sub> Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μη Μθ Μκ Μλ Μν Νε Οζ Οξ Οπ<sub>2</sub> Οσ Οτ Ου Ρα Ργ Ρδ Ρλ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Σκ Tδ Vβ Vε Vκ Vχ Wβ Wι Xβ; *illeg.* Εβ; *om.* ΒΘ Εν Μο Μυ Νδ Οκ Οπ<sub>1</sub> Ρμ Vα Vι Vσ Wα; Aries Cη

[Other information]

Tropic of Cancer] *om.* Βι Cβ<sub>2</sub> Cθ Eμ<sub>1</sub> Eμ<sub>2</sub> Eν Λζ Οπ<sub>1</sub> Οπ<sub>2</sub> Ρτ Vε equatorial circle] *add.* circulus Arietis et Libre ΡQ(*om.* circulus) Ρτ zodiac] *add.* zodiacus Βγ; *add.* 30 in each sign Cδ; *add.* 10 20 30 in each sign Βγ Μλ Μν Ρο Ρυ Σκ Vβ Wι; *add.* 5 10 ... 25 30 or 10 20 30 in each sign Βε Eα

Tropic of Capricorn] *om.* Βι Cβ<sub>2</sub> Cθ Eν Λζ Οπ<sub>1</sub> Οπ<sub>2</sub> Vε

*add.* A, B, C, D, H, L, T as in Fig. 7 Cβ<sub>1</sub>; *add.* A, B, C, D as in Fig. 7 Eτ Μν line AKT] *om.* Μν ΡQ Ρψ Wα; *add.* declinatio media Βγ Ρυ Vβ; *add.* dimidium declinationis Cι Fζ Λγ Λε Λη Μκ Νε Οξ Ου Ρα Ρλ Ρτ Qβ Qγ Qμ Sδ Tδ Wβ; line AK only Ρο; *add.* line KC Ρο *add.* line AY extended to equatorial circle Βγ Βε Cη Cι Eβ Eη Fβ Λγ Λε Λη Μδ Μκ Νδ Νε Οζ Οξ Οτ Ου Ρα Ρδ Ρλ Ρμ Ρο(*om.* Υ) Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Rδ Sδ Σκ(AL') Tδ Vβ Wβ; *add.* at intersection C Βε; *add.* at intersection R' Eβ Eη Λγ Λη Μδ Οζ Οτ Ρλ Qμ; *add.* at intersection T Νδ; *add.* declinatio Wβ; *add.* declinatio tota Βγ Cι Μκ Οξ Qμ Rδ Vβ *add.* line YS Ρυ; *add.* tota Ρυ arc RKP] *om.* Cβ<sub>2</sub> Οπ<sub>2</sub>; extended to equatorial circle Eν(lettered HGKTF) ΡQ(lettered RKPT) Ρτ(lettered RTKP) arc OKV] *om.* Cβ<sub>2</sub> Οπ<sub>2</sub>; extended to equatorial circle Βε(lettered OLKV) Eν(lettered SLKGM) ΡQ(lettered OKVδ) arc MKLS] *om.* Οξ *add.* arc AKC Βι Eη Λζ Μλ Ρκ ΡQ Ρυ Vβ Vχ arc KO and equatorial circle] Μ Λε

*add.* meridies | occidens | septentrio | oriens Βγ Μδ Νδ ΡQ(*om.* septentrio) Re

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## [CAPITULUM 10.] DE INSCRIPTIONE STELLARUM FIXARUM

Cumque diviserimus circulum signorum certissime, oportet nos postea describere stellas fixas in circulo signorum. Cuius rei exemplar est ut ponamus stellam

- 1 De ... fixarum] *om.* Aα Bα Bγ Bκ Cβ Cδ Cε Cθ Dγ Eα Ev Lη Mv Mλ Nα Oα Oπ Oσ Pγ Pφ Rα Sβ Sθ Sι Vε Vκ Vv Vχ Xα Wα; Capitulum de impositione stellarum fixarum in rethe Bζ Bι Pτ(*om.* Capitulum) Vv; De compositione stellarum fixarum in reti Rε; De compositione stellarum in circulo signorum Mθ Oκ; De descriptione stellarum fixarum in rethi Bη Wβ; De impositione stellarum Pν; De impositione stellarum fixarum Xβ; De impositione stellarum fixarum in rethi Vβ; De impositione stellarum fixarum in rethi secundum distanciam earum ab equinoctiali Dη; De ordinacione stellarum fixarum in circulo signorum Qα(*marg.*); De positione stellarum in circulo signorum Eμ Mκ Pψ Sλ Vσ; De positione stellarum in circulo signorum et rethe Cζ; De positione stellarum in rethe in circulo signorum, cum longitudine sua ab equinoctiali cum gradu cum quo venit ad medium celi, id est declinatione sua Oη; De scriptione stellarum Rubrica Bθ(*add. in marg.* De inscriptione stellarum); Hic de situatione stellarum et primo septentrionalium, secundo meridionalium, tertio rethis expositioni Bι(*in marg., later hand*); Sequitur de inscriptione stellarum fixarum in rethe in eius zodiaco Cη; Tria pars in qua docet situationem stellarum Lζ(*marg.*); 10<sup>m</sup> Bε(*marg.*)
- 1 *before* De] *add.* Capitulum Fβ De] *add.* impositione vel Ev inscriptione] descriptione Nδ fixarum] *om.* Bε Cι Eδ Eζ Mη Nε Pδ Po Qμ Vψ; z̄ ei Bθ; *add.* in rethi Wι; *add.* in zodiaco Qβ; *add.* Capitulum Qλ
- 2 Cumque] Cum *some; add.* autem Rε; *add.* a' [autem?] Vv Cumque diviserimus] Postquam diviseris Cδ signorum] *add. interlin. [illeg.]* signa et gradus Oα certissime] *om.* Mδ Nδ Qδ Rβ; *add. interlin.* secundum priorem capitulum Eδ oportet] o Sk nos] *om.* Cδ Sλ; *add.* certissime Rβ nos ... describere] *om.* Bα postea] *om.* Ev Ev Pq; certissime Qδ
- 3 describere] scribere Fβ Vv; <sup>d</sup>describere Cβ fixas] *om.* Bα in circulo] *marg.* Mκ cuius] *om.* Ev; cuiuscumque Nα rei] *add.* figura Xα; *add.* signorum Eδ est] *om.* Bη Cη Wβ Xα ponamus] ponam Fβ; ponas Cδ; *add.* quamlibet Bα; *add.* unamquamque Bζ Pτ Pφ Rε Vv; *add.* nec unamquamue Sθ stellam] *om.* Mv Pψ Vα Vv; *marg.* Oσ Sλ; *interlin.* Cθ Oα; stellarum Rε; stellas vel stellam Fβ Pα; eam Qα
- 3-5 stellam ... sic] *om.* Nα

[CHAPTER 10.] ON INSCRIBING THE FIXED STARS<sup>1</sup>

When we have divided the circle of signs with very great precision, we should next mark the fixed stars along the circle of signs. To illustrate this, let us suppose a star

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<sup>1</sup> This is a fairly standard method for placing the stars in the rete. It is also found in the Maslama's extra chapter (Samsó, *On Both Sides*, p. 424).

- cum longitudine sua ab equinoctio diei cum gradu qui venit ad medium celi cum ea.  
 5 Et hoc fit sic: Ponemus circulum equinoctii diei, scilicet circulum Arietis et Libre ABCD, et diametra abscondant se super E; et sint super circulum signorum AZCH. Et
- 4 cum<sub>1</sub>] cumque Eζ; in Vψ longitudine] latitudine *late mss* Bε Eα Eβ Eμ Fα Fζ Lβ Lγ Lε Mδ Nδ Oζ Oξ Oτ Pλ Pμ Pν Pρ Qβ Qγ Qδ Rβ Sδ Tδ; longitudinem(*expunged*) vel(*expunged*) latitudinem Ov; *add.* id est declinatione sua Eμ(*interlin.*) Mκ(*interlin.*); *add. interlin.* latitudine Qλ; *add. in marg.* quod sciemus ex tabula Eα; *add. interlin.* id est distantia Vβ sua] *om.* Bε Cζ Eβ Eη Fζ Lβ Lγ Lε Pα Oζ Oξ Oτ Pλ Pμ Pν Pρ Qλ Sδ Tδ Wα(*interlin.*) Xβ ab] *om.* Cζ; sub Mv equinoctio] equinoctiali Bα Pφ; *add.* id est equinoctiali circulo Cζ Eμ(*interlin.*) Mκ(*interlin.*) equinoctio diei] equinoctiali circulo Oη diei] *om.* Sι cum<sub>2</sub>] *interlin.* Mκ; *om.* Vv gradu] *add.* zodiaci Sι qui] *add.* hinc in sequentibus in multis locis longitudo ponitur per latitudinem ut patet hic in isto xisicto(?) Similiter ponas et est ubi d[icitu]r(?) longitudo id est declinatio et Xβ celi] celum Ev Oπ Vχ celi] *add.* secundum Alfragani capitulorum 33 Sι<sup>2</sup> ea] *add.* stella Bα Cι Eα Eβ Eη Fα Fζ Lβ Mδ Mη Mo Mφ Nδ Ne Oζ Oξ Oτ Ov Pα Pδ Pθ Pλ Pμ Pρ Qβ Qγ Qδ Qλ Qμ Rβ Rδ Sδ Tδ Vψ Wα Xβ; est stella Pν; ipsa stella Cδ Sλ; stella Fβ; *add. interlin.* stella Oα
- 4-5 diei ... sic] et cum gradu cum quo fit in medium celi sic Bα
- 5 fit] facies Cδ Sλ; est Mv; sit Pα Qγ Sδ Vσ Vv sic] *om.* Xβ; secundum quod dicimus Bζ Cζ Eμ Ev Eo Mθ Mκ Mν Oα Oη(secundum *interlin.*) Oκ Oπ Oσ Pφ Pψ Qα Rε Sθ Sι Vα Vε Vν Vχ; secundum quod dictum est Cβ Cθ ponemus] pone Cδ Sλ; ponendum Xβ; *add.* eum Vv; *add.* sic Lε Tδ equinoctii (*and elsewhere*)] equinoxii Oη diei] *om.* Bα Bε scilicet] *om.* Dη; id est Mv; qui est Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mκ Mν Oα Oπ Oσ Pψ Qα Rε Sθ Sι Sλ Vε Vν Vπ Vσ Vv Vχ circulum<sub>2</sub>] *om.* Bα Vκ Libre] *add.* scilicet Bη Ev Oσ Pα Vα Vv
- 6 abscondant] scindant Bα et<sub>2</sub>] *ms* Oπ *ends* super<sub>1</sub>] *add.* punctum Dη super E sint] *marg.* Mκ sint] *om.* Cζ Fβ Eμ Oη sint super] sicut sit Xα AZCH] AZ\$CH Bα; ZACH Bη Wβ et<sub>3</sub>] *many om.*

<sup>2</sup> Aḥmad ibn Muḥammad ibn Kathīr al-Farghānī, ca. 820–after 861. The reference here is not easily traced. He wrote a 30-chapter summary of Ptolemaic astronomy (*Jawāmi‘ ʿilm al-nujūm wa-uṣmūl al-ḥarakāt al-samāwīya* / *Compendium of the science of the stars and the foundations of the celestial motions*) but this text is not likely to be referenced here. He also wrote a treatise on the astrolabe (*Kitāb fī ṣanʿa al-aṣṭurlāb* / *Treatise on the Construction of the Astrolabe*) which contains only seven chapters. The closest texts are either Chapter 3, section [4] or Chapter 6, section [1]. See al-Farghānī, *On the Astrolabe*, ed. Richard Lorch (Stuttgart: Franz Steiner Verlag, 2005), pp. 77 ff. and 345 ff. However, this text was never translated into Latin which makes this reference to it problematic.



with its distance<sup>3</sup> from the celestial equator [and] with the degree which reaches the middle of the sky with it.<sup>4</sup> And this is done as follows: We will place the circle of the celestial equator, that is, the circle of Aries and Libra, ABCD and its diameters should intersect at E; and let AZCH be on the circle of signs. And

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<sup>3</sup> I read *longitudo* as “distance”. Gunther (along with some of the medieval scribes, particularly later ones) attempted to co-ordinate the use of *longitudo* and *latitudo* (which Gunther sometimes substituted, one for the other, in both the Latin and the English without comment) with either right ascension and declination, or celestial/ecliptic longitude and latitude.

The text, however, actually uses a conflation of these two systems, that is, (modern) declination (from the equatorial circle) for the north/south position, while measuring the east/west position along the ecliptic. For the latter the text then uses the hour circle through the equatorial poles and through the given point along the ecliptic to position the star east/west. This is a “right ascension” positioning, but where the east/west degree given in the text will differ from the true right ascension figure (along the equatorial circle) as a result of the obliquity of the ecliptic. (In the Middle Ages, this measure was known as “mediation”.)

<sup>4</sup> That is, with the point on the ecliptic (using the coordinate system of this text) which crosses the meridian at the same time as the star – mediation.

ponemus exemplum nostrum in una stella ex stellis quarum longitudo est ab equinoctio diei versus septentrionem sitque illa stella *Vultur volans*. Et abscindemus ex puncto D versus C quantum longitudo eius est ab equinoctio diei, et est 7 gradus et 25 minuta;

- 7 ponemus] ponamus Vχ nostrum in una] in Sλ; in una Aα Bθ Bι Bκ Cε Dγ Dη Eα Eδ Eζ Eτ Ev Lζ Mλ Mo Nα Pγ Pv Po Pτ Qδ Rα Rβ Re Sβ Sι Sκ Vβ Vπ Wβ Wι Xα; ut una Bγ Bη Cη Pv Vκ Vχ; in Bα Cδ Vε; nostrum in Bζ Cβ Cθ Eμ Ev Eo Lβ Mv Oα Oσ Pψ Qα Sθ Vv Vv; nostrum Vα ; unum in una Mv Mφ Wα in una *in marg.* Mκ stella] *om.* Nα Re Vβ(*add. interlin.* scilicet stella) ex stellis] *om.* Bα quarum] cuius Bα; quorum Mφ longitudo] *om.* Xα; latitudo *later mss* Bε Eα Eβ Eη Lβ Le Lη Oζ Oξ Oτ Ou Pλ Pμ Pv Pq Qβ Qγ Qδ Sδ Tδ
- 8 diei] *om.* Bα septentrionem] *add.* Non curetur de illa stella nec de gradibus eius quia hoc quod dicit gracia exempli est ut sciamus collocare stellas in rethi. Ponentur autem in suis gradibus per tabulam que in fine compositionis posita est. Cζ Oη illa] ipsa Ev; ista Nα stella] stella stella Vκ; *om.* Oκ Pq Vultur] extra Qβ volans] *marg.* Oξ; *add. in marg.* Non curetur de de(!) stella nec de gradu eius quia hoc quod dicit gracia exempli est ut sciamus collocare stellas in rethi. Ponentur autem in suis gradibus per tabulam que in fine compositionis posita est Eμ et] hoc Wβ abscindemus] abscindens Oκ; abscindes Cδ; abscindet Cβ Cθ Mv Oα Oσ Pτ Pφ Qα Re Vα Vv; abscindit Pψ; scindemus Eζ ex] a Cι; ut Bα ex puncto] *om.* Qγ puncto] *add.* arcus Bε Eη D] *add. interlin.* scilicet [...?] circulo Arietis et Libre in primo gradu Capricorni Cβ
- 8-9 versus ... diei] *om.* Vι
- 9 C] D C Sι; T Dη; *add. interlin.* Id est usus circulus signorum cum circulo Arietis et Libre scilicet versus punctum gradum Arietis Cβ quantum] quanto Sι; quem Oη longitudo] latitudo *later mss* Bε Eα Eβ Eη Fζ Lβ Lγ Le Oζ Oξ Oτ Ou Pλ Pμ Pv Pq Qβ Qγ Qδ Sδ Tδ; *corr. to* latitudo Pα; *add.* est ab equinoctio diei et longitudo Sβ; *add. interlin.* id est declinatio Eμ eius] cuius Mκ est<sub>1</sub>] *om.* Bε Ev Oζ Rα diei] *om.* Bα Bε Eβ Eη Fα Fβ Fζ Lβ Lγ Le Lη Mδ Nδ Oτ Ou Pα Pλ Pq Qγ Qλ Xβ; stellam Oζ; *add.* versus septentrione Qα; *add. and canc.* versus meridiano sitque illa Cε et<sub>1</sub>] *add.* longitudo eius(cuius Vε) ab equinoctio diei Aα Bθ(sed long~) Bκ Cβ Cθ Dγ Ev Lζ Mλ Rα Vε Vκ Vπ(sed long~) Vχ et est<sub>2</sub>] *om.* Bζ Eζ Oζ Pλ Xα; est *corr. interlin.* to scilicet Qμ; hoc Oκ; hec/hoc est Cδ Eμ Mκ Mv Oη Oσ Pφ Pψ Vα Vβ Vσ Vv Vv; id est Pq; scilicet Bα Bε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lγ Lβ Le Lη Mη Mv Mφ Nε Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pv Qβ Qγ Rδ Sδ Sι Tδ Vι Vψ Wα Xβ est<sub>2</sub>] *om.* Vε; *add. in marg.* ab Sι 7] 7 *corr. to* 28 Bη; 4 Oα Oσ Qλ Vα Vv Wα; 8 Mθ Mv Pψ Qα Sθ Sι Vσ; 10 Nα; 14 Vχ; 18 Bα Bκ Cβ Cθ Dγ Ev Lζ Mλ Pτ Pv Pφ Re Sβ Sλ Vβ Vε Vκ Vv; 18 *corr. to* 4 Cδ; 18 *corr. to* 4, *all canc. and add. in marg.* 7 Mκ; 28 Bζ Cζ Eμ Oη Oκ; 28 *corr. to* 7 Eo(*marg.*) et 25 minuta] *om.* Cη; *add. in marg.* Bγ 25] *corr. from* 5 Lγ minuta] menses Bζ

for our example we will take one star from among the stars whose distance from the celestial equator is towards the north and let this star be *Vultur volans*.<sup>5</sup> And from point D toward C we will cut off the degree to which its distance lies from the celestial equator, and it is  $7^{\circ} 25'$ ;<sup>6</sup>

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<sup>5</sup> *Vultur volans* (also known as *Altair*) is  $\alpha$  *Aql*. See Lists of Fixed Stars – Appendix I.

<sup>6</sup> This measure, sometimes (especially in star tables) denoted as “latitude,” is actually equivalent to our declination. The modern (2000 CE) declination of  $\alpha$  *Aquila* is  $+08^{\circ} 52'$ . Because of the precession of the equinoxes the declination of the star in the Middle Ages would be less than the modern figure. In Kunitzsch’s edition of medieval star tables, declinations of  $6^{\circ}$  (1 table),  $6^{\circ}25'$  (2),  $6^{\circ}30'$  (1), and  $7^{\circ}$  (4) and latitudes of  $29^{\circ}4'$  (1),  $29^{\circ}10'$  (7) and  $29^{\circ}30'$  (1) are found; the difference arises because some of the “latitudes” are measured from the ecliptic (Paul Kunitzsch, *Typen von Sternverzeichnissen in astronomischen Handschriften des zehnten bis vierzehnten Jahrhunderts* [Wiesbaden: Otto Harrassowitz, 1966], *passim*).

In my Lists of Fixed Stars (below, Part III) Tables 1, 1A, and 3B give declinations of  $7^{\circ} 0'$ .

- 10 et est arcus DT. Iungemusque T cum A et abscindet diametrum super punctum K. Et ponemus punctum E cuspidem, et faciemus circulum secundum quantitatem longitudinis E ex K et est circulus KM, vaditque per stellam. Post hoc aspiciemus punctum qui cum ea est in medio celi ex circulo signorum; hoc est 16 gradus ex
- 10 arcus] circulus Nα et est arcums] *om.* Pτ DT] DC Aα Eζ Ev Pγ Po Pφ; DN Pq; DV Nα Iungemusque] Iungemus *some* Iungemusque ... A] *marg., corr. from* M N D E Z T cum A Bη; in .N.D.E.Z. T cum A Wβ T] C Pφ; D Vε; N Pq A] *om.* Eδ; *add. interlin.* que est in opposita sectioni scilicet in primo gradu Libre Cβ abscindet] abscindent Bθ Dγ Mo Pγ Sk Vβ Xα; abscindat Qα; abscindes Cζ; abscindimus Ou Vψ; abscindit Pφ; *add. interlin.* scilicet TA Vβ diametrum] *add.* DB Dη; diametra Pφ K] B Si; *add.* intra equinoctialem Bε Bη Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mo Mφ Nδ Nε Oζ Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pν Pq Qβ Qγ Qδ Qλ Rβ Rδ Sδ Tδ Vι Vψ Wα Wβ Xβ; *add.* extra equinoctialem Cε
- 11 ponemus] pones Cδ Sλ punctum] *om.* Sι E] *om.* Cζ Cε; C Vε; S Nα; *add.* eiusdem Bγ Cη punctum] *interlin.* Oα; *om.* Cι faciemus] facies Cδ Fβ Sλ circulum] *om.* Cε secundum] *om.* Ev
- 11-12 Et<sub>1</sub> ... κ] *om.* Oη
- 12 longitudinis] latitudinis Bε Eα Eβ Eη Fζ Lβ Lγ Lε Lη Mδ Nδ Oζ Oξ Oτ Ou Pλ Pμ Pν Pq Qγ Qδ Rβ Sδ Tδ; *corr. to* latitudinis Pα; *add. interlin.* id est distancie Mκ E ex κ] *om.* Lβ; EK Bα Bε Fβ Pq Xβ κ ... circulus] *om.* Pθ est] *om.* Wβ; erit Xα KM] K Pq; KN Vε vaditque] invaditque Pq; vadetque Rε vaditque per stellam] et illum describitur Vultur Bα per] *om.* Bζ Xβ stellam] *add.* equidistantem equinoctiali Dη Eτ; *add.* illam Qδ Rβ post hoc] Post Oη; Postea Aα Bθ Ev Qβ Sδ Vα Vι Vπ aspiciemus] aspiciamus Cζ; aspice Pφ; aspicie Bα Cδ Vν; aspicias Vε; accipe Bζ Si; accipiemus Ev Oξ Ou Pλ Pμ Pν Pq Qβ Qγ Tδ Vι Wα; *corr. from* accipiemus Mκ; excipiemus Mν; *add.* E Si
- 13 punctum] gradum Mν qui] *om.* Rε; quod Vψ qui ... est,] cum quo sit Mθ cum] *om.* Bζ Xβ; *suprascr.* Mη ea] ea stella Bε Eα Eβ Eη Fα Fβ Lβ Lγ Lε Lη Mδ Mo Mφ Mν Nδ Oζ Oξ Oτ Ou Pλ Pμ Pν Pq Qβ Qδ Qλ Rβ Sδ Tδ Vι Wα Xβ; eo Aα Bγ Bζ Bη Bθ Bι Cε Cζ Cη Cι Dγ Eδ Eζ Ev Eτ Ev Lζ Mη Mλ Mν Nα Oα Oη Oσ Ok Pγ Pδ Pθ Po Pυ Pφ Pψ Rα Sβ Vα Vβ Vε Vκ Vπ Vυ Vχ Vψ Wβ Wι Xα; *add. interlin.* ea stella Eμ; *add. interlin.* id est stella Oα; *add in marg.* stella Pα; Vulture Bα ea est] eo gradu sunt Si est,] *om.* Wι; sit Bα Cδ Cθ Eo Mκ Mν Oα Ok Oσ Rε Sθ Sλ Pψ in] *om.* Mη ex] in Pφ ex circulo signorum] *om.* Vυ hoc] hec *many* hoc/hec est] et est Bγ Cε Cη Dη Pα Pτ Wβ; hoc Mθ Ok; hoc est in Aα; id est Ev; scilicet Bα; *add.* in Ev; *illeg.* Eη 16] 13/13<sup>us</sup> Aα Bα Bγ Bζ Bη Bι Bκ Cβ Cδ Cε Cζ Cθ Dγ Dη Eζ Eμ Ev Eo Eτ Ev Lβ Lζ Mη Mθ Mκ Mλ Mν Mo Nα Oα Oη Ok Oσ Pγ Pδ Po Pτ Pυ Pφ Pψ Qα Qγ Qδ Rε Sβ Sθ Si Sκ Sλ Tδ Vα Vβ Vε Vκ Vν Vσ Vυ Vχ Wι; 13 *corr. to* 33 Rα; 18 Mδ; 26 *corr. to* 13 Eδ; in 3 13 Bθ Vπ gradus] graduum Rε; *add.* distancia Pα ex<sub>2</sub>] *om.* Bα; a Xα
- 13-14 ex Capricorno] a linea(?) Cε; signi Capricorni Bκ
- 13-16 puctum ... quarum] *very faint* Lβ

and this is arc DT. And we will join T with A and cut the diameter [BD] at point K. And we will take point E as the centre, and we will construct a circle with radius EK, and this is circle KM, and it passes through the star. After this we will observe the point on the circle of signs which is in the middle of the sky with it [i.e., the star];<sup>7</sup> this is 16 degrees

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<sup>7</sup> This is “mediatio coeli” or “mediation” which is neither right ascension nor longitude. Instead it is the position of the point on the ecliptic which passes the meridian at the same time as the observed star (in other words, it uses the same hour line as right ascension, but gives the position of that hour-line in reference to the ecliptic). It is often denoted in astrolabe star tables as “longitudo”.

- Capricorno, qui est punctus L. Deinde iungemus L cum E abscindetque linea LE  
 15 circulum KM super M. Punctus ergo M est cuspis *Vulturis volantis*. Similiter pones  
 universas stellas quarum longitudo est ab equinoctio diei ad septentrionem.
- 14 Deinde] Post hoc Bγ Bη Cη Pα Pτ; Post Bα Wβ qui] ubi Vε qui ... L<sub>1</sub>] *om.* Cε  
 L<sub>1</sub>] *om.* Mλ; A Nε; B Bζ; I Sκ; S Bε; V Eo iungemus] *margin.* Sβ; iunge Cδ Oη Rε  
 Vν; iungas Vε; iunges iungemus Nε L<sub>2</sub>] ut Cε; I Sκ; S Bε; V Eo E] C/T Nε; DE  
*corr.* to E Eδ abscindetque] et abscinde Eν; et abscindet Bα linea] *om.* Eo;  
*repeated* Oζ LE] ZE Bζ; SE Bε; LC/LT Nε; LEZ Qδ; LD(?) Wι; LO Vε
- 15 circulum] *add. and canc.* circulum Cθ KM] LM Eδ super] *add.* punctum Bθ Eν  
 Mδ Pτ Qβ Vβ(*interlin.*) Vν Vπ super M] *om.* Sθ M<sub>1</sub>] O Cε Punctus] *om.* Bθ  
 Eν Vπ Punctus ergo] cuspis vero Vν ergo] igitur *some* M<sub>2</sub>] O Cε; *corr. in*  
*margin. from* T Eδ; *corr. from* TH Pτ cuspis] cuspidem *and add. and canc.* L cum E Cη;  
*corr. from* cuspidem Bζ; cuspidis Sκ; punctus Mδ Nδ Rδ; *corr. from* punctus Vχ; *add.* id est  
 centrum Cζ; volantis] *interlin.* Vχ; *om.* Bα; *add.* qui vocatur Altair Cζ(Altayr)  
 Eμ(*interlin.*) Mκ(*interlin.*); *add.* ut patet in figura Nα Rε; *add.* ut hic in sequenti pagina Pν  
 similiter] scilicet Vε pones] ponas Bα Eβ Eμ Fβ Lγ Lε Lη Mν Mν Mφ Nα Nδ  
 Oζ Oη Oκ Oσ Oτ Pλ Pμ Qα Qβ Qγ Qλ Sδ Sι Vα Vε Vι Vσ Xβ; pone Bε
- 16 universas] alias Bα; omnes Cδ Sλ longitudo] latitudo *later mss* Bε Eα Eβ Eη Fζ Lβ  
 Lγ Lε Mδ Nδ Oζ Oξ Oτ Oυ Pλ Pλ Pμ Qα Qδ Sδ Tδ; *corr. to* latitudo Pα; *add. interlin.* id est  
 distancia Mκ; *add. in margin.* id est distancia Pα est] *om.* Bη equinoctio] initio  
 Mν equinoctio diei] equinoctiali Bα; *add.* et declinatio Eα; *add.* id est declinatio Bε  
 Cι Eβ Eη Fα Fβ Fζ Lγ Lβ Lε Lη Mδ Mη Mν Mφ Nδ Nε Oζ Oξ Oτ Pδ Pθ Pν Pρ Pλ Pμ Qβ  
 Qγ Rδ(*om.* diei) Sδ Tδ Vι Vψ Wα Xβ ad] *om.* Eζ Eo Pα; versus Bα Bζ Cβ Cδ Cζ Cθ  
 Dη Eμ Eν Mθ Mκ Mν Oα Oκ Oσ Pφ Qα Rε Sι Sλ Vβ(*add. interlin.* al' ad) Vε Vν Vσ Vυ Vχ  
 septentrionem] meridiem Cε Dη; *add.* Ita quod cadant omnes intra circulum ABCD  
*and in margin.* Quamplura exempla non habent istam litteram "Ita quod cadant omnes intra  
 circulum ABCD" sed caret Vβ; *add. in margin.* Ita quod cadant omnes intra circulum ABCD  
 Vσ; *add.* Lζ 18 lines marked "va .. cat" Cum autem vis ponere aliqua stella in zodiaco  
 secundum hanc doctrinam computabis in circulo Arietis et Libre diviso tot gradus quanta  
 est eius longitudo a puncto D versus C si stella illa fuerit septentrionalis; et si fuerit  
 meridialis computabis a puncto D versus A et fac notam in dyametro HB ubi dyameter a  
 regula tangitur. Deinde pones unum pedem sexte [= circini?] super E et alium super illa  
 notam et fac circulum occultum et postea considera in quo signo sit ista stella et pone  
 regulam super tot gradum illius signi in zodiaco quanta est est(!) eius latitudo et super E et  
 fac lineam occultam ab illo gradu usque in E et ubi illa linea secat illum circulum ibi  
 debet esse punctus seu summitas illius stelle.

of Capricorn,<sup>8</sup> which is point L. Then we will join L with E,<sup>9</sup> and line LE will intersect circle KM at M. Thus point M is the position of *Vultur volans*. Similarly you will place all stars whose distance is to the north of the celestial equator.

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<sup>8</sup> The right ascension of  $\alpha$  *Aquila* (2000 CE) is 19<sup>h</sup> 51<sup>m</sup> or 27° 45' along the celestial equator from D. This figure would have to be modified to allow for the precession of the equinoxes from the thirteenth century (about 10° less) as well as being translated to the ecliptic (i.e., converted to “mediation”). In Kunitzsch’s edition of medieval star tables, mediations/longitudes/right ascensions of 10° (1 table), 10°28' (1), 14° (1), 14°26' (1), 16° (2), 16°30' (1), 17° (2), 17°15' (1), 17°48' (2), 18°30' (1), 20°30' (1), 21° (1), 21°59' (1), and 22°49' (1) are found (Kunitzsch, *Typen von Sternverzeichnissen*, passim).

In my Lists of Fixed Stars (below, Part III) Tables 1 and 1A give a mediation of 16° 0' and Tables 3A and 3B give a mediation of 14°.

<sup>9</sup> In stereographic projection this is equivalent to drawing a great circle through the equatorial poles, that is, drawing an equal-hour line.

Postea ponemus aliud exemplum in stella cuius longitudo ab equinoctio sit versus septentrionem, et sit ipsa stella *Cor Tauri*. Abscindemusque ex puncto D versus C longitudinem eius ab equinoctio diei, quia longitudo eius versus septentrionem est

- 17 Postea] Post hoc *many* Postea ponemus] Item Bα Bζ Cδ Eο Pφ Rε Sι Sλ Vv  
ponemus] *om.* Cδ Vψ; pones Eα aliud] *om.* Eη Oζ Pλ Pρ Qβ Xβ; alium Oη; ad  
Fζ Lβ Pθ Pμ Qβ Qλ Sδ Vψ; aliquid Nα; illud Bζ aliud exemplum] *om.* Bε  
exemplum] *add.* est Cδ in] *add.* alia Bα Bε Bζ Cδ Eβ Eο Fβ Lε Pδ Pτ Pφ Rδ Rε  
Sδ Sι Sλ; *add.* altera Vv in stella] *om.* Bη Wι stella] *add.* alia Cι Eα Eη Fζ Lβ Lγ  
Mδ Mκ Mv Mφ Nδ Oζ Oξ Oτ Ov Pα(*interlin.*) Pθ Pλ Pμ Pρ Qβ Qγ Qδ Qλ Qμ Rβ Sδ Wα  
Xβ cuius] alicuius(?) Pv longitudo] latitudo Eα; *add.* *interlin.* id est declinatio  
Mκ ab] *add.* ipso Sι Vv equinoctio] equinoctiale Bα; *corr.* ex equinoctiale Pθ;  
*add.* diei Eν Eο Qα Pφ Sι Vv Vv; *add.* earum Rδ; *add.* *interlin.* sit etiam Pα sit] *om.* Rβ  
Sι; diei Rε; est Bα Bγ Bζ Bη Cδ Cη Dη Eν Eο Nα Pτ Pφ Sλ Vv Wβ; fit Mθ Oκ; *add.* etiam  
Eβ Eη Fα Fβ Lβ Lγ Lη Mφ Oζ Ov Pα(*interlin.*) Pδ Pλ Pν Pρ Sδ
- 17-18 Postea ... septentrionem] *om.* Mv
- 18 septentrionem] *add.* meridiem Qδ et sit ipsa stella] et si sic ipsa stella Eν; et sit etiam  
stella ipsa Xβ; et sit illa stella Dη Mv Pλ Pρ Sβ; et sit ipsa Qα; et sit ista stella Eα; etiam et  
sit ipsa stella Cθ; sitque illa Bα; sitque illa stella Pφ Rε Vv; sitque ipsa stella Cδ Sλ  
Cor Tauri] *add.* *interlin.* sive oculus Cβ Cδ Sλ; *add.* id est Aldebaran Cζ Eμ  
Mκ(*marg.*) Oη(Aldeboran); *add.* Tunc Bα Tauri] Thauri Mo Mv Mφ Vι  
Abscindemusque] Et absconde Sλ ex] a Rε D] A Cζ
- 18-19 Cor ... diei] ab equinoctio diei que est in puncto D longitudinem eius ab equinoctio diei  
versus septentrionem. Sitque T Pφ versus C] *om.* Rε; *in marg.* Pα; versus  
septentrionem scilicet C Vv
- 19 C] *om.* Pρ; CT Eδ Pο; E(*corr.* to C) Pα longitudem] latitudinem *later mss* Bα Bε Eα Eη  
Fα Fζ Lε Oζ Oη Oξ Oτ Ov Pλ Pμ Pν Pρ Qβ Qγ Qδ Sδ Tδ; *add.* *interlin.* latitudinem Rβ  
eius] cuius Pο; *add.* quia Bζ equinoctio] equinoctiali Bα diei] *om.* Bα;  
versus septentrionem Bζ Wα; *add.* versus septentrionem Fβ Mv Mφ Qλ Vι; *add.* (*i.e.*  
*repeated*) versus C Bε Fζ Mδ Nδ Oζ Oξ Oτ Ov Pλ Pμ Pν Pρ Qβ Qγ Sδ Tδ quia] et Bζ  
Cε Dη Mo Vχ; et quia *many*; sitque T quia Pφ quia ... eius] *om.* Rε quia ...  
septentrionem] que latitudo Bα longitudo] latitudo Oζ longior Rδ; *add.* *interlin.*  
latitudo Rβ diei] *add.* (*i.e. repeated*) versus C Lβ eius<sub>2</sub>] *om.* Sκ; est Mκ est]  
*om.* Rε Xα
- 19-20 et 14 gradus] *marg.* Oτ est ... est] *marg.* Lε



After this we will take another example of a star whose distance from the [celestial] equator is toward the north, and let it be the star *Cor Tauri*<sup>10</sup> itself. And we will cut off from point D towards C its distance from the celestial equator, since its distance towards the north is

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<sup>10</sup> *Cor Tauri* (also known as *Aldebaran*) is  $\alpha$  *Tau*. It is more properly known in Latin as *Oculus Tauri*, because this star actually is the eye of the Bull and not the heart. See Lists of Fixed Stars – Appendix I.

- 20 14 gradus, et est arcus DN. Iungemusque A cum N et extrahemus eum donec abscindat HB super S. Deinde ponemus punctum E cuspidem, et faciemus circulum secundum quantitatem longitudinis ES, et est circulus SF. Deinde aspiciemus punctum cum quo est
- 20 14] 7 Aα Bθ Bκ Eζ Eτ Eυ Lζ Mο Nα Pγ Pο Pτ Pυ Rα Sβ Vβ Vε Vκ Vπ Vχ Wι; 8 Qα; 18 Pφ; 24 Bη Wβ; *add. in marg.* aliter 7 Mθ gradus] *om.* Mη; graduum Aα Bθ Pα Rε; *add.* et 30 minuta Bγ Bη Cε Cη Dη(minutorum) Pα(minutarum) Wβ; *add.* scilicet Eν; *add.* et 40 minuta Oη; *add. interlin.* al' graduum Vβ et<sub>1</sub>] *add. interlin.* [illeg.] Cβ est] *interlin.* Rε arcis] gradus Nα DN] BN Qα; DAN Pφ; DV Wι; N Lβ; diei *corr. in marg.* to DN Pμ iungemusque] et iungemus Bα; iungemus Bκ Cβ Cι Eβ Eυ Fβ Nδ Oυ Pμ Pρ Qδ Qλ Rδ Sδ Tδ Vα; iunge ergo Cδ Sλ; iungemus ergo Dη; iungendusque Pφ; *corr. from* igitur similis Eδ; *add.* igitur Vσ; *add. in marg.* igitur Mκ A cum N] dcn Vε N] DN Mν; *add.* per lineam Cδ Sλ Vσ et extrahemus eum] et abstrahemus Eα Pφ; et extrahe eam Sλ; producendo Bα extrahemus eum donec] *om.* Vχ eum] *interlin.* Pα; *om.* Aα Oξ Vε; cum Qα; eam Mκ abscindat] abscindet Cβ Cζ Cη Cθ Dγ Eδ Lβ Lζ Mλ Mο Oζ Pγ Pμ Pρ Pτ Pυ Qγ Vα VβνVχ; abscindant Eβ; abscindent Mυ Mφ Oξ Oυ Pν Qβ Qλ Sδ Xβ abscinderit Rδ; *add.* diametrum Sβ Vσ; *add. interlin.* diametrum sive lineam Sλ; *add.* lineam Bγ Cη Eτ Pτ Sκ Vβ(*interlin.*) Wβ; *add. and canc.* lineam Pα; *add.* et extrahent Mη
- 20-21 extrahemus ... lineam] abscindet diametrum Cδ
- 21 HB] DB Cδ Eο; HDB Cβ; QB Wβ; THB Vπ; *add.* dyametrum Qδ Rβ; *add.* diametrum sive lineam Bε Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ(*partly in marg.*) Pδ Pθ Pλ Pμ Pν Pρ Pυ Qβ Qγ Qλ Qμ Rδ Sδ Tδ Vι Vψ Wα Xβ; *add. interlin.* scilicet diametrum Cβ; *corr. in marg.* to dyametrum DB Mκ HB ... S] *corr. from* lineam HB super punctum G to HB dyametrum sive lineam super S Pα super] *add.* punctum<sub>1</sub> Bγ Bη Cη Pτ Wβ super S] *om.* Xα S] C Mυ Mφ Vι; G Pγ Vσ Deinde] Et Vχ ponemus] pone Sλ punctum] *om.* Bα Rβ Vχ E] BE Bζ faciemus] facies Cδ
- 22 longitudinis] latitudinis *later mss* Bε Eβ Fα Fζ Lβ Lγ Lε Lη Nδ Oζ Oτ Oυ Pλ Pμ Pν Qβ Qγ Rβ Sδ; S [= scilicet] Sι; *corr. to* latitudinis Pα; *illeg.* Eη ES] *om.* Lβ; EC Nα; EF Mυ Mφ Pφ Vι; EG Oκ Pγ; ESB Bζ; EG Mθ *and add. suprascr.* aliter S ES ... SF] eius in circulo Vε circulus] *add.* scilicet Wβ SF] *marg.* Pτ; CF Mυ Mφ Nα; EP Bζ Pψ; EF Sθ; GF Oη; SC Sκ; SFS Bη Deinde] Post Bα aspiciemus] aspicie Cδ; accipiemus Bη Bθ Pλ Pρ Vπ Vσ Xβ; inspiciemus Rδ; *corr. from* accipiemus Eμ punctum] *om.* Mθ Oκ cum] *suprascr.* Bε; *om.* Eη cum ... est<sub>2</sub>] qui cum eo sit Sι quo] *om.* Aα est<sub>2</sub>] *om.* Sκ; fit Oκ; sit Bζ Cδ Cζ Cθ Eμ Eν Eο Mθ Mν Oα Oη Oσ Pψ Sθ Sλ Vα Vε Vυ Vχ; sit *corr. to* est Mκ

$14^\circ$ ,<sup>11</sup> and it is arc DN. And we will join A to N and extend it until it divides [line] HB at point S. Then we will take point E as centre and make a circle with the quantity of the length [i.e., radius] ES, and this is circle SF. Then we will consider the point

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<sup>11</sup> The present declination of  $\alpha$  *Tauris* (2000 CE) is  $+16^\circ 30'$ . Because of the precession of the equinoxes the declination of the star in the Middle Ages would be less than the modern figure. In Kunitzsch's edition of medieval star tables, declinations of  $14^\circ 12'$  (1 table),  $14^\circ 20'$  (2),  $14^\circ 30'$  (3), and  $15^\circ$  (2) and latitudes of  $-5^\circ$  (1),  $-5^\circ 10'$  (8) and  $-5^\circ 12'$  (1) are found; the difference arises because some of the latter are measured from the ecliptic (Kunitzsch, *Typen von Sternverzeichnissen*, passim).

In my Lists of Fixed Stars (below, Part III) Tables 1, 1A, and 3B give declinations of  $14^\circ 30'$ .

in medio celi ex circulo signorum, hoc est 26 gradus ex Tauro, qui est punctus G,  
 et iungemus E cum G, et extrahes eum donec abscindat circulum FS super punctum F.  
 25 Punctus ergo F est punctus *Cordis Tauri*. Et similiter pones omnes stellas quarum

23 celi] *om.* Nε ex<sub>1</sub>] *om.* Wα hoc est] scilicet Bα; hoc Eν Mθ; ipse est Vι 26]  
*illeg.* Qλ; 2 Mν Mφ Vι; 18 Cη; 20 Bζ Lβ Pρ Vε; xx6 Mκ Pψ; xx6 *corr.* to 26 Vσ; 28 Cε Pτ; 29  
*(later mss)* Bε Bη Cι Dη Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mδ Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν  
 Qβ Qγ Qδ Rβ Rδ Sδ Tδ Wα Wβ Xα Xβ; 426 Sθ gradus] graduum Rε Wι; *add.*  
 tempore compositionis huius tractatus 28 Aα Bθ Eν Vπ; *add. in marg.* 26 gradus ex Tauro  
 tempore compositionis huius tractatus Vσ; *add. in marg. (later hand)* 26 tempore  
 compositionis tractatus Bι ex<sub>2</sub>] cum Vν Tauro] Tauri Bα; Thaurο Mο Mν Mφ  
 Vι; Cancro Pο; tanto Wι; *corr. from* Cancro Eδ; *add. interlin.* aliter Cancro Mθ est<sub>2</sub>]  
*om.* Bα G] S Bη; *corr. interlin.* to F Qμ

23-24 G ... eum] *om.* Sκ

24 iungemus] iunge Cδ Sλ; *add.* -que Cζ Eμ Vσ iungemus ... extrahes] extrahemus Oη  
 E cum G] EG Mκ; cum G Mν; C cum G Vε G] *corr.* to F Qμ; F Mη; H Fα; S Bη; *add.*  
 per lineam Mκ(*marg.*) Vσ; *add.* ut prius Bζ Pρ Rε Vβ(*interlin.*) Vν et<sub>2</sub> ... eum] ut  
 prui(?) precedendo Bα et<sub>2</sub> ... donec] *om.* Cδ extrahes] extrahemus Bε Mφ Cβ  
 Cε Cι Dη Eβ Eδ Eν Eυ Fα Fβ Fζ Lβ Eμ Lε Lζ Lη Mδ Mθ Mο Nδ Oζ Oξ Oτ Oυ Pγ Pδ Pο  
 Pρ Pφ Pψ Rβ Qα Qδ Rε Sι Vβ Vε Vν Vπ Xα Xβ; abstrahemus Bζ; abscindemus Nα  
 extrahas eum donec] *om.* Vχ eum] *om.* Bζ; *add. suprasci.* lineam Mθ  
 donec] *om.* Pδ Vψ; *add. (i.e. rep.)* iungemus ... donec Bη Wβ abscindat]  
 abscindet Cδ Eζ Pο; *corr.* to abscindet Vκ; *add.* cum Nα circulum] *om.* Oκ FS]  
*om.* Eε; CF Mν Mφ Nα Vι Wβ; FG Mθ Oκ Mν Sι Vσ; S Eζ; SC Sκ; SF *many*; ST Pρ; sunt Dγ Eο;  
 secundum Pλ punctum] *om.* Dη F] *om.* Bη; *add. et canc.* punctus Cθ

25 punctus,] *marg.* Pα punctus ergo F] *om.* Pφ ergo] igitur some F] *om.* Eη  
 Cordis] *add.* vel Occuli Rδ Tauri] *om.* Bα Eτ; Thauri Mο Mν Mφ Vι Vπ; *add.*  
*interlin.* sui oculi Cδ; *add.* et c[etera?] Bα; *add. in marg.* Eμ(*end of l.* 26) Mκ Oη; Hoc  
 leviter facies si memoriter retinueris que dicta sunt in(*om.* Mκ) fine illius capituli(*om.* Oη)  
 cuius titulus(circulus Oη) est in initium operis tabularum. Ibi enim docetur qualiter ex  
 circulo Arietis fiat(*om.* Oη) circulus Capricorni sicut(cadet Mκ; dadem Eμ) igitur arte  
 constitues circulum declinationis stelle ab equinoxiali circulo versus meridiem. Ista  
 autem falso et nulla arte(*om.* Oη) hec inanis(*reading* Eμ Mκ) docet (*add.* et nulla arte Oη) et  
 propter hoc diligentius notentur que hic dicta sunt. similiter] super Lβ Vψ  
 similiter pones] supponemus Pυ pones] ponemus Aα Bθ Bι Cβ Cζ Cθ Eδ Eζ  
 Eμ Eν Eυ Mδ Mη Mθ Mκ Mλ Mν Nα Nδ Nε Oα Oη Oσ Pγ Pδ Pθ Pο Pφ Qα Qδ Qμ Rβ Rδ  
 Rε Sβ Sκ Vα Vκ Vν Vσ Vυ Vψ Wι Xβ quarum] quas Bθ

25-26 Et ... septentrionem] *om.* Bα Cδ; Sic et de aliis stellis septentrionalibus Sλ

on the circle of signs with which it is in mid-sky, and this is  $26^{\circ 12}$  of Taurus,<sup>13</sup> which is point G, and we will join E with G and you will extend it until it cuts circle FS at point F. Therefore point F is the position of *Cor Tauri*. And similarly you will place all the stars whose

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<sup>12</sup> Probably all the texts originally had  $26^{\circ}$ , with the 6 morphing into 0 (20), 8 (28), or 9 (29). Gunther's 18 (Cη) seems unique. In general, early manuscripts tend to have  $26^{\circ}$ , and later ones  $29^{\circ}$ .

<sup>13</sup> The right ascension of  $\alpha$  *Tauri* (2000 CE) is  $04^{\text{h}} 36^{\text{m}}$  or  $9^{\circ}$  of Taurus along the celestial equator. This figure would have to be modified to allow for the precession of the equinoxes from the thirteenth century (about  $10^{\circ}$  less) as well as being translated to the ecliptic (i.e., converted to "mediation"). In Kunitzsch's edition of medieval star tables, mediations/longitudes/right ascensions of Taurus  $19^{\circ}18'$  (1 table),  $25^{\circ}20'$  (1),  $26^{\circ}47'$  (1),  $27^{\circ}35'$  (1),  $27^{\circ}39'$  (1),  $28^{\circ}47'$  (1),  $28^{\circ}$  (3),  $28^{\circ}2'$  (1),  $29^{\circ}$  (2),  $29^{\circ}30'$  (1),  $30^{\circ}$  (1), and Gemini  $1^{\circ}26'$  (1),  $1^{\circ}29'$  (1), and  $2^{\circ}$  (1) are found (Kunitzsch, *Typen von Sternverzeichnissen*, passim).

In my Lists of Fixed Stars (below, Part III) Tables 1 and 1A give a mediation of  $29^{\circ} 0'$  and Tables 3A and 3B give a mediation of  $28^{\circ}$ .

longitudo est ab equinoctio versus septentrionem.

Si vero fuerit longitudo earum ab equinoctio diei versus meridiem, accipies longitudinem earum ex D versus A, et iunges A cum illa longitudine accepta, et extrahes lineam donec abscindat lineam BH, cadetque extra circulum equinoctii versus meridiem

- 26 longitudo] latitudo Bε Eα Eη Fζ Oη ab] *om.* Eυ equinoctio] *add.* diei Bζ Cβ Cθ  
Eο Mκ Mν Oα Oη Oκ Oσ Qα Rε Sθ Sι Vα Vε Vσ Vυ septentrionem] *add.* 7-line gloss  
Cζ; *add. marg. note – l. 25* Eμ
- 26-27 est ... longitudo] *marg.* Bη septentrionem ... versus] *om.* Cε Wβ Xα
- 26-30 septentrionem ... versus] *om.* Bζ
- 27 Si] *add. in marg. (later hand)* De situatione stellarum meridialium Bι fuerit] *interlin.*  
Bγ; *marg.* Wα; *om.* Cη Lγ Mυ Pα Qλ; fuerint *corr. to* fuerit Mκ; *add.* erit Cζ; *add.* stelle Cδ  
longitudo] latitudo (*later mss*) Bε Eα Eβ Eη Fα Fζ Lβ Lε Lη Nδ Oζ Oξ Oτ Oυ Pλ Pμ  
Pν Pρ Qγ Qδ Rβ Sδ Tδ; *corr. to* latitudo Pα; *add.* vel latitudo Xβ earum] *om.* Bη Cδ  
Sλ; stellarum Bα ab] *om.* Sθ; ex Mυ Mφ equinoctio] equinoctiali Lε Lη Oζ  
diei] *interlin.* Vβ; *om.* Bα Bη Bθ Bκ Cι Dγ Eα Eτ Eυ Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mo  
Mφ Oζ Oξ Oτ Oυ Pγ Pθ Pμ Pν Pο Pτ Pυ Qα Qδ Qμ Rα Rβ Sβ Sδ Vι Vκ Vν Vψ Wι Xβ  
accipies] accipie Cβ; accipiemus Aα Xβ; accipiet Eυ
- 28 longitudinem] latitudinem Eα earum] eius Bγ Bη Cδ Cε Cη Dη Pα Qδ; *add.* ab  
equinoctio Bγ Cε Cη Pα Pρ ex D] *om.* Vε ex D versus A] *corr. in marg. from*  
versus ex D Eδ ex D ... iunges] *om.* Pγ et iunges A] *om.* Eδ Eζ Eτ Mo Po Qδ Sκ  
Vβ Vσ Wι iunges] iunge Bε Cι; iungemus Bγ Cε Cη Pα Xβ A<sub>2</sub>] *interlin.* Cδ; *om.*  
Eυ Vψ A cum illa] a Mν; A cum r(!) ille Bε illa] *om.* Bα Bη Cβ Cζ Eδ Eμ Eν Mθ  
Oη Oσ Pφ Pψ Qα Sθ Sι Sλ Vκ Vε Vι Vν Vυ; *in marg.* Mκ; *interlin.* Eα Rε; ista Nα  
longitudine] latitudine Eα accepta] *om.* Bα Bη Cβ Cδ Cζ Cθ Eν Mθ Mν Oα Oη  
Oκ Oσ Pφ Pψ Sθ Sι Sλ Vα Vε Vι Vν Vχ; *in marg.* Mκ; *excepta* Rβ; *add. in marg.* sicut fecisti  
in alia parte Cδ extrahes] extrahas Oυ; protrahas Bα
- 29 donec] *interlin.* Cβ donec ... lineam] *om.* Rα Wα Xα abscindat] abscindet Dγ  
Fα Mν Mυ Oκ Sι Vα; scindat Bα lineam<sub>2</sub>] *om.* Bα Fζ Pν BH] *illeg.* Bη; AB Eζ; BD  
Eδ; DH Bγ Cε Cη Cι Dη Eτ Mη Mo Nα Pγ Po Pυ Qμ Sκ Vκ Wι; *add. interlin.* scilicet  
diametrum Cβ cadetque] cadet Cβ Sθ Mη; *add.* illa sectio Bε Cθ Cι Eα Eβ Eη Fα Fβ  
Fζ Lβ Lγ Lε Lη Mδ Mη Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pδ Pθ Pλ Pμ Pν Pρ Qβ Qδ Qλ Qμ  
Rβ Rδ Sδ Vι Vψ Wα Xβ; *add. interlin.* illa [*illeg.* = sectio?] Oα circulum equinoctii]  
equinoctialem Bα equinoctii] equinoctialem Rδ; *add.* diei Bι Bκ Cβ Cζ Dγ Eμ Eν Eο  
Lζ Mθ Mκ Mλ Mν Oα Oη Oκ Oσ Pψ Pφ Rε Sθ Sι Vα Vε Vι Vκ Vν Vυ Vχ

distance from the celestial equator is towards the south.

If, however, their distance [i.e., of the stars] were to the south of the celestial equator you will take their distance from D towards A, and you will join A with this given distance, and extend the line until it divides line BH, and it will fall outside the circle of the [celestial] equator towards the south,

30 et erit longitudo eius meridiana. Mensurabisque longitudinem et facies circulum qui erit super ipsam longitudinem, sicut fecisti in stellis septentrionibus, si deus voluerit.

30 erit] *om.* Mv Mφ Vv; erunt Bθ; est Bα Bζ Cδ Sι longitudo] latitudo Ea eius] eius eius Pv; *add.* circa Pq meridiana] *add.* id est declinationem Oη; *add.* circulus Q P Bε Eη(*interlin.*) Mensurabisque] mensurabilem seu mensurabisque Xα; mensuraquebis *corr.* to mensura<sup>bis</sup> que Pα; *corr.* from mensurabilisque Po; *add.* (*i.e.*, repeats) ll. 28 (longitudinem) – 30 (mensurabisque) Bε Eη longitudinem] *add.* eius Eμ Oη; *add.* id est declinationem Cζ Eμ(*interlin.*) facies] *add.* in *margin.* Ego Iohannes de Calomonte:<sup>14</sup> Communiter in exemplaribus reperitur sic “Et facies circulum qui erit super ipsam longitudinem sicut fecisti in stellis septentrionibus, si deus voluerit.” Et tunc immediate sequitur hoc capitulum “Cum posueris stellas fixas” et c. Vβ circulum] *om.* Fβ

30-31 et<sub>2</sub> ... longitudinem] *margin.* Bε; *om.* Eη Mv Mφ Vt; in Eζ et<sub>2</sub> ... voluerit] *om.* Bα

31 erit] eat Oσ Pφ; erit *corr.* to eat Sλ super] supra Mθ Qα Rε Sι; *add.* *interlin.* al' supra Vβ ipsam] *om.* Sκ longitudinem] *add.* postea aspice punctum cum quo mediat celum ex circulum signorum Dγ; *add.* Post hoc aspice(accipe Eo; accipies Sι; aspicias Cβ Rε) punctum cum quo(qua Bζ Cβ Eo) sit in medio celi(*interlin.* Pτ)(*add.* circuli Pφ) ex circulo signorum Bζ Cβ(*margin.*) Eo Pτ Pφ Rε Sι Vβ Vv sicut] *om.* Xβ fecisti] *om.* Dη Xα in stellis] *om.* Vv in ... septentrionibus] *margin.* Cδ septentrionibus] *add.* a quo ad E(a DE Bζ; A ad E Eo; A DE Vβ; D est Rε) linea pertracta(contracta Eo; protracta Vβ) continuabitur cum circulo longitudinis ab equinoctio diei(*om.* Bζ) et punctus contactus(contractus Eo) est(erit Rε) punctus stelle Bζ Eo Pτ Vv Vβ si deus voluerit] *om.* Bγ Bη Cε Cη Dη Pq Tδ Vε Vv Wβ; *illeg.* Bκ; *add.* sequitur figura Vκ; *add.* ut patet in presenti figura Sβ

<sup>14</sup> See note to Cap. 7 line 9 (var.).



and it will be its southern distance.<sup>15</sup> And you will measure out the distance and make a circle which will be through this distance, just as you did for northern stars (God willing).

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<sup>15</sup> The example in the diagram is sometimes labelled as *Alchimech*, i.e. *Azimech*, better known as *Spica*, i.e.,  $\alpha$  *Virginis*. See Lists of Fixed Stars – Appendix I.

## [ ADDENDUM 10 ]

Aα Bγ Bε Bη Bθ Cε Cη Cι Dη Eα Eβ Eδ(very faint) Eζ Eη Eτ Eυ Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη  
 Mθ(marg. later hand) Mo Mv Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pο Pρ Pτ Qβ Qγ Qδ Qλ  
 Qμ Rβ Rδ Sδ Sκ Tδ Vβ Vι Vπ Vψ Wα Wβ Wι Xα Xβ

35 Possunt etiam aliter stelle fixe inscribi per secundam tabulam que verificata est ad Parisius per armillas continens stellas cum distancia earum ab orbe signorum, et cum longitudinibus earum secundum veritatem que habentur ex circulo magno eunte per polos zodiaci et per stellas ad eclipticam; cuius modus inscribendi habetur in quodam capitulo in fine compositionis apposito.

- 32 before Possunt] *add.* De eodem Eδ Possunt] Post Qμ etiam] autem Vβ(*add. interlin.* al' etiam) aliter] *marg.* Wα; *om.* Bε Eβ Eη Fβ Lβ Lε Lη Nδ Oτ Oυ Pλ Pρ Qβ Qγ Qλ Tδ Xβ fixe] *om.* Bε Eζ inscribi] *marg.* Wβ; scribi Bη Cε; inl'tipler Mv per] *om.* Wβ secundam] st/n Bη; *add.* scilicet Dη Pτ Vβ Wβ que verificata est] verificatam Bγ Bη Cε Cη Dη Pτ Vβ Wβ; *add.* ad situm Fβ
- 32-33 secundam ... earum] tabulas continentes latitudines stellarum Rδ
- 33 ad] *interlin.* Mη; *om.* Cε Dη Eα Eβ Eδ Eη Fα Fζ Lβ Lε Lγ Lη Mθ Nδ Oζ Oξ Oτ Oυ Pλ Pμ Pν Pρ Pτ Qβ Qγ Qδ Rβ Sδ Tδ Xα ad Parisius] *om.* Bε continens]<sup>16</sup> continentes {armillas} Bγ Bη Cε Cη Dη Eυ Pδ Pτ Sκ Vψ Wβ distancia] *add. and canc.* quod est ipse latitudo Pα earum] quarum Eζ ab] in Pτ orbe] *marg.* Oξ signorum] *marg.* Oυ
- 33-34 stellas ... earum] *om.* Aα
- 34 cum] ad Eυ longitudinibus] longitudo] Cη earum] *om.* Qγ ex] in Sκ circulo] circl'.o. Pθ magno] *om.* Dη; *add. interlin.* (later hand) id est per circulum meridionale Eδ eunte] eunde Pμ; exeunte Qδ Rβ; existente Bθ Vπ
- 34-36 et ... apposito] *illeg.* Eη
- 35 ad] *om.* Eυ Lβ; et Bε Eα Eβ Fα Fβ Fζ Lγ Lε Lη Mδ Nδ Oζ Oξ Oτ Oυ Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Xβ; et *corr.* to ad Wα eclipticam] edipticam Bθ cuius modus] cuius modi Aα; qui modus Bγ Bη Cη Dη Pα Pτ Vβ Wβ inscribendi] describendi Bη; inscribendo Xβ; scribendi Aα habetur] *add.* sic Eδ in] per Dη
- 35-36 cuius ... appositio] quem modum sub iungamus etc. etc. Rδ
- 36 quodam] quo ca° Aα; quolibet Nε quodam ... apposito] capitulum immediate sequens Dη capitulo] tabulo Pλ in fine] *om.* Mv; *add.* sive Mo compositionis] compoti Cη apposito] *om.* Aα; apposita Eζ; composito Lη; opposito Eυ Pμ; posito Eα; *add. later hand* Figura est ad iste signum  $\frac{\Delta}{\ddagger}$  Qμ(*links to fol. 153<sup>v</sup>*)

<sup>16</sup> *Continens* would modify *tabulam que*; *continentes* would modify *armillas*.

## [ ADDENDUM 10 ]

The fixed stars can also be alternatively inscribed by the second table<sup>17</sup> which has been proved near Paris by means of armillas [ i.e., armillary spheres], [a table] containing the stars with their distances from the zodiac, and with their distances according to the truth which they have from the great circle running through the poles of the zodiac and through the stars to the ecliptic; this method of inscribing is contained in a certain chapter appended to the end of the composition.<sup>18</sup>

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<sup>17</sup> Samsó (*On Both Sides*, pp. 424-426) discusses the possibility of identifying the table mentioned here.

<sup>18</sup> See Cap. 22.

[ FIGURA 10 ]

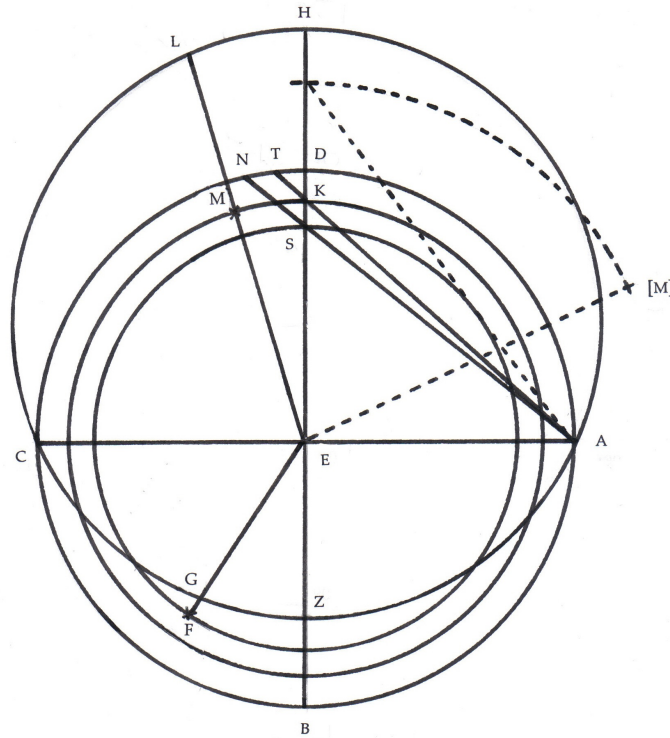


Figura inscriptionis stellarum fixarum secundum latitudines suas ab equinoctiali /  
 Figure of the inscription of the fixed stars according to their latitudes from  
 the [celestial] equator

[Complete diagram] Bα Bγ Bε Bη Bι Bκ<sup>19</sup> Cβ Cδ Cη Cθ Cι Eβ(faint) Eη Eμ Ev<sup>20</sup> Eτ Eυ Fα Fβ  
 Fζ Lγ Lζ Lη Mη<sup>21</sup> Mθ Mλ Mν Mo Nδ<sup>22</sup> Nε Oα Oζ Ok Oξ Oπ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pq Pτ  
 Pυ Pψ<sup>23</sup> Qβ Qγ Qδ Qλ Qμ(fol. 153<sup>v</sup>) Rα Rδ Rε Sδ Sθ Vα Vβ Vε Vi(fol. 332<sup>v</sup>) Vκ Xβ

<sup>19</sup> In ms Bκ the diagram is rotated 90° clockwise.

<sup>20</sup> In ms Ev the diagram is rotated 90° counter-clockwise.

<sup>21</sup> Mη also contains (fol. 39<sup>v</sup>) a second confused figure labelled “Figura inscriptionis stellarum fixarum secundum latitudinem earum ab orbe signorum” with “almuri | ostensor | calculator | divisor” and “wolvellum | rethe | aranea | alkanthabuth | valzagora” in the margin.

<sup>22</sup> In ms Nδ, Figura 9 is combined with Figura 10. Only the lettering relevant to Figura 10 is recorded here.

<sup>23</sup> In ms Pψ the diagram is rotated 90° counter-clockwise.

[*Partial diagram*] Bθ Eα Mκ Mυ Sβ Sκ<sup>24</sup> Tδ Vσ Vχ Wβ Wι

[*Outline or space only*] Aα Cε Dγ Dη Eδ<sup>25</sup> Eζ Eο Lβ Mφ Pν Pφ Qα Rβ Vν Vπ Vυ Vψ Wα

[*No space*] Bζ Cζ Nα Oη St Sl Xα

Pθ “K”

[*Combined with Figure 9*] Lε Mδ

[*Caption*]

Figura ... equinoctiali] Bε Eη Lε Mo Pτ Pυ Oζ Oτ Qβ Rδ Vκ; *om.* Bα Bι Bκ Cβ Cδ Cθ Eμ Ev Lζ Mθ Oα Oκ Oπ Oσ Pδ Pμ Pψ Qδ Rα Sθ Vα Vε; De inscriptione stellarum fixarum Qμ; Figura divisionis circuli signorum super medium declinationem Rε; Figura divisionis zodiaci super medie declinatione polum cum figura inscriptionis stellarum fixarum Nδ Figura] *om.* Fα Pλ inscriptionis] impositionis Bη secundum] cum Bγ secundum ... equinoctiali] *om.* Bη Cη Eβ Eτ Ev Mδ Mη Mλ Mν Vι Lη Pγ latitudines] longitudes Vβ suas] *om.* Bθ Pq; earum Bγ equinoctiali] *add.* circulo Pο; *add.* et cum gradu medii celi Vβ; *add.* et gradibus quibus celum mediant Bγ; *add.* et longitudinem in ecliptica Pq; *add.* et secundum(*om.* Qγ) longitudes earum Nε Pλ Qγ Qλ Sδ; *add.* et secundum longitudes earum et(*om.* Cι) hoc est profunditates graduum earum(*corr. from suas Cι*) in signis in quibus sunt gradus illi Cι Lγ Pα Oξ(*om.* gradus illi) Oυ Xβ; *add.* et secundum longitudes earum id(hoc Fζ) est profunditates ipsarum(*om.* Fζ) in signis in quibus sunt gradus illi Fβ Fζ

[*Lettering on the diagram*]

A] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mλ Mν Mo Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pq Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Sθ Vα Vβ Vε Vι Vκ Xβ B] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mλ Mν Mo Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pq Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Sθ Vα Vβ Vε Vι Vκ Xβ C] Bα Bγ Bε Bη Bι Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mλ Mν Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pq Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rε Sδ Sθ Vα Vβ Vε Vι Vκ Xβ; *om.* Bκ Mo Rδ D] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mλ Mν Mo Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pq Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Sθ Vα Vβ Vε Vι Vκ Xβ; *om.* Nδ E] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mλ Mo Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pq Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Sθ Vα Vβ Vε Vι Vκ Xβ; *om.* Mν F] Bα Bγ Bε Bη Bι Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Ev Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mλ Mo<sup>26</sup> Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pq Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Sθ Vα Vβ Vι Vκ Xβ; *om.* Ev Mν Vε; G Bκ G] Bγ Bε Bι Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Nδ Nε Oα Oζ Oκ Oξ Oπ Oσ Oτ Oυ Pα Pλ Pμ Pο Pq Pτ Pψ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Sθ Vα Vβ Vε Vι Xβ; *om.* Bα Bη Ev Eτ Ev Mη Mθ Mλ Mν Mo Pγ Pδ Pυ Rα Vκ; F Bκ H] Bα Bγ Bε Bη Bι Cβ Cδ Cη Cθ Cι Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ

<sup>24</sup> In ms Sκ the diagram is very confused and without many of the letters. Perhaps this reflects the erroneous or missing letters in the text.

<sup>25</sup> In ms Eδ the diagrams found on these folios do not belong to this text.

<sup>26</sup> In ms Mo, F is in the middle of Gemini.



*an extra line from A, intersection with DH marked as K':* Ετ Μη Μν Ρο Ρυ Ρα Vκ  
*an extra line from A, intersection with DH marked as P:* Ρδ  
*an extra line from A, intersection with DH marked as Q:* Βε Εη  
*an extra circle (or part thereof) through this point of intersection on DH:* Βα Βγ Βε Βη Cη Εη Ετ Fα Fβ  
     Lγ Lη Μη Μν Μο Νε Οζ Οτ Ου Ρα Ργ Ρο Ρτ Ρυ Qβ Qγ Sδ Vβ Vκ Xβ  
*an extra line from A to D extended to the circle of the zodiac* Ρε  
*the extra line from A (to DH) intersects with arc DA at T':* Μν Μο Ρο Ρυ Ρα  
*the extra line from A (to DH) intersects with arc DA at R:* Εη Ετ  
*the extra line from A (to DH) intersects with arc DA at V:* Νδ  
*an extra line drawn from E, through Libra, (intersecting with circle if there):* Ρμ  
*an extra line drawn from E through Libra and marked at the circle as M':* Ετ Ευ Μη Μν Μο Ρο Ρυ Ρα Vκ  
*an extra line drawn from E through Libra and marked at the circle as O:* Βγ Βη Cη Εβ Fα Fβ Fζ Lγ Lε Lη  
     Μδ Νδ Νε Οζ Οτ Ου Ρα Ρο Ρτ Qβ Qγ Qλ Ρδ Sδ Xβ

## [Minor variants]

*line ASN is missing (F and M are on the same circle through K):* Μη  
*D' added where the line from A to line DH intersects with the equatorial circle* Qμ  
*G is placed somewhere in Scorpio which means that F is also in Scorpio:* Cθ Ευ(om. G) Οπ Vε(om. F)  
*G is properly placed but the line GE is extended so that it cuts circle SF at F in Scorpio:* Oξ  
*an extra line from E through Gemini, intersecting with the circle through Q at point P, labelled*  
     “meridiana stella”: Βε Εη

## [Other information]

*add. merides* Μδ Πλ Ρο Qγ      *add. occident* Lη Μδ Πλ Ρο Qγ      *add. septentrio* Μδ Πλ Ρο  
 Qγ      *add. oriens* Lη Μδ Πλ Ρο Qγ

*add. meridianus* Πλ Qγ      *add. equator* Πλ Qγ      *add. circulus Arietis et Libre* Vβ      *add.*  
*circulus Cancri* Vβ      *add. [circulus] Capricornus* Ρο      *add. zodiacus* Oξ

F] *add. Aldebaran* Ρα; *add. Cor Tauri* Βγ Εη Ργ; *add. Cor Thauri* Βε; *add. cuspis Cordis Tauri* Lζ;  
*add. cuspis Aldebaran in 29 Tauri* Μλ; *add. cuspis Aldabaran septentrionalis* Ετ Μο; *add. cuspis*  
*Aldabaran sive Cordis Tauri* Vβ(marg.); *add. Punctus Cordis Tauri* Vβ

M] *add. Altayr* Βγ; *add. centrum Vulturis Volentis* Vβ; *add. cuspis Altair sive Vulturis Volentis*  
 Vβ(marg.); *add. cuspis Vulturis Volentis* Lζ; *add. cuspis Vulturis Volentis septentrionalis* Ετ Μο;  
*add. Vultur Volens* Βε Εη Ργ

*add. M' Auamē* Ρα; *add. M' cuspis Alchimech meridionalis* Ετ Μο; *add. M' cuspis Althimech in 9*  
*Libre* Μλ; *add. O Alchimach* Βγ

*add. M' Alchimech / Libre 9 gradus factus / F Cor Tauri / Tauri factus est* Βι(marg., later hand)

*add. in marg., misplaced from Figure 11:*

almuri | ostensor | calculator | divisor Ρο  
 volvellum | rethe | aranea | [illeg.] utal | [illeg.] Ρο

[CAPITULUM 11.]<sup>1</sup> APTATIO RETHIS SIVE TELE ARANEE

Cumque posueris stellas fixas et diviseris circulum signorum, oportet ut extrahas tabulam et abscindas eam et non dimittas nisi circulum signorum et signa

- 1 Aptatio ... aranee] *om.* Aα Bα Bζ Bι Bκ Cβ Cδ Cε Cθ Dγ Eα Eμ Ev Eo Lζ Mθ Mκ Mλ Mν Nα Oα Oη Oκ Oσ Pα Pγ Pλ Pφ Pψ Qα Rα Rε Sβ Sθ Sι Sλ Tδ Vα Vε Vκ Vν Vυ Vχ Wα Xα; Aptatio aranee Bγ Eζ Nε Pδ Po Qμ Sκ Vψ; Aptatio arenee. Rubrica Cι Eδ; Aptatio aranee sive ethe Wι; Capitulum ii<sup>m</sup> Bε(*margin.*); Compositio arenee Eτ; De aptatione atque explanatione rethis Wβ; De aptatione et aplanatione volveli<sup>2</sup> Vσ; De aptatione rethis Bη Bθ Dη Ev Mη Vβ Vπ; De inscriptione rethis Fβ; Docet perforare volvellum Cζ
- 1 rethis] retis Mδ sive ... aranee *om.* Pτ Pυ tele] thele Fζ Lβ Mφ Oτ Qλ Pμ aranee] *om.* Xβ; *add.* cum stellis fixis et zodiaco ac [*illeg.*] Rδ; *add.* seu valzagore<sup>3</sup>. Rubrica Cη; *add.* seu waz Qλ; *add.* vel de divisione equinocialis circuli per [*illeg.*] describendis Mυ Vι
- 1-4 Aptatio ... lineabus] *very faint* Eδ
- 1-14 Aptatio ... patet] *illeg.* Eη
- 2 Cumque] Cum Nδ Nε Qα Vψ Wι fixas] *om.* Bκ Eo; *margin.* Oκ et] ad Pθ; *add.* de Aα oportet] *interlin.* Bε ut] *om.* Nα; licet Pγ; ut ut Pθ
- 2-3 oportet ... signorum] *om.* Vυ
- 2-14 Cumque ... patet]<sup>4</sup> Post vide punctum cum quo ab medio celi ex circulo signorum sicut prius post extrahas tabulam scindens eum nec dimittas nisi circulum signorum et stellarum et tabulam [*illeg.*] artam que transeat per capite Arietis et Libre et per axem que sit hinc inde abscisa linea tamen meridionali manende illesa et scribes quamlibet .lineam. stellam nomen suum et sit caput Capricorni almuri graduum vel muri id est ostensor graduum. Sitque axis huius tabule cuspis equinoctiali diei. Et hic regula dicitur alancabut id est aranea id est rete (*corr. from recte*). Bα
- 3 extrahas] *corr. from* extrahemus Xα; abstrahas Bζ et<sub>1</sub>] ut Mη abscindas] abscindat Dγ; abscindes Oη Vκ non] nec Mν dimittas] divides eam Vκ nisi] *om.* Qμ Wι; *interlin.* Cδ; ut Pν signa] *om.* Aα Bζ Bθ Bι Bκ Cβ Cδ Cζ Cθ Dγ Eδ Eζ Eμ Ev Eo Eτ Ev Lζ Mη Mθ Mκ Mλ Mν Nα Oα Oη Oκ Oσ Pγ Po Pυ Pφ Pψ Qα Qμ Rα Rε Sβ Sθ Sι Sλ Vα Vβ Vε Vκ Vν Vπ Vσ Vυ Vχ Wι Xα

<sup>1</sup> In a number of manuscripts, this capitulum continues on from the previous one without a break.

<sup>2</sup> *Volvellum*: another name for the rete. See Kunitzsch, *Glossar*, pp. 515-517.

<sup>3</sup> *Walzgora / valzagora*: the surface of a sphere. Here, presumably, the sphere of the stars as projected onto the rete. See Kunitzsch, *Glossar*, pp. 517-518.

<sup>4</sup> Ms Bα (an early ms) replaces the entire capitulum with these few lines.



## [ CHAPTER 11.] THE FITTING OF THE RETE OR SPIDER WEB

And when you have positioned the fixed stars and divided the circle of signs, you should you take the plate and cut away [its central area] and do not stop except for the circle of signs and the indicators<sup>5</sup>

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<sup>5</sup> While many mss omit “signa/indicators” – perhaps confusing it with a “sign [of the zodiac]” – it is necessary to include “signa” in order to make sense of the genitive plural “stellarum fixarum.” A few mss try to rectify the omission by adding “loca” after “fixarum” (l. 4).

- 5 stellarum fixarum. Postquam iunxeris eas circulo signorum, postea lineabis eam et  
planabis eam optime donec sit planatio eius, et distinctio eius cum circulo ita ut non  
augeat nec minuat. Similiter facies cum stellis fixis et planabis eam optime. Et scribes
- 4 stellarum fixarum] stellas fixas S<sub>1</sub> fixarum] *add.* loca Bζ Eo Pτ Vβ Vv  
Postquam ... signorum] *om.* Mv iunxeris] *om.* Mv; iunxis Lβ; *add.* *interlin.*  
stellam Oα eas] *om.* Nδ Pλ; *corr.* *in marg.* from eam Mκ; ea Sδ; eam Bζ Bθ Bι Cβ Cζ  
Cθ Dγ Eδ Eζ Eμ Ev Et Ev Lζ Mη Mθ Mλ(*twice*) Mv Mo Nα Oα Oη Ok Pγ Po Pτ Pv Pφ  
Pψ Qα Qδ Qμ Rα Sβ Sι Sκ Sλ Vα Vκ Vπ Vχ Wι Xα; eam cum Aα Eo; eas in Eα; eam in Vβ  
Vv; omnia Vε; *add.* *interlin.* stellam Eμ; *add.* *interlin.* scilicet tabulam Vβ eas ...  
signorum] eam cum circulo signorum et regulam aliquamtilium arctam que transeat per  
caput Arietis et Libre et per axem qui sit hinc abscisa linea tamen(?) meridionali manente  
illesa(?) Rε circulo] circulum Oη signorum] *add.* et(per Dγ) regulam  
aliquamtilium artam(artem Pφ) que transeat per capud Arietis et Libre(umbre Dγ) et(*om.*  
Vβ) per axem que(et Dγ) sit hinc(hic Vβ) inde(in Vβ) abscisa(excisa Bζ; excisa Eo)  
linea(hu° Dγ) cum(tamen Pφ Sι; tum Vv) meridionali(media Dγ) manende(manente Pφ  
Sι; permanente Bζ Eo; in Ariete Vβ) illesa Bζ Dγ Eo Pφ Sι Vβ Vv postea] Post hoc  
Ev Rε lineabis] liniabis Lε; lunabis Mδ eam] ipsam Dη
- 4-5 eam ... eam] *om.* Mv Mφ Vι eam ... optime] *om.* Mη et planabis] *om.* Eo;  
inplanabis Cε et planabis eam] *om.* Cζ Fζ Wα
- 5 planabis] explanabis Bζ Cβ Ev Mθ Oα Oη Oσ Pφ Pψ Qα Sι Sλ Vv Mv Vα Vε Vσ Vv Vχ;  
*corr.* from exeplanabis Cδ; plana|nabis Xβ planabis eum] plano Bη eam] *om.* Bγ  
Bι Bκ Cβ Cε Dγ Dη Eδ Eζ Eμ Ev Eo Et Fα Fβ Lζ Mδ Mθ Mλ Mv Mo Nδ Oα Oσ Pα Pφ Pψ  
Qμ Rβ Sβ Sι Sκ Vα Vι Vκ Vv Wβ; *interlin.* Vβ eam ... sit] *om.* Qα optime] *marg.*  
Rε sit] *om.* Lγ Oη planatio] explanacio/explanatio Bζ Eo Rε Vv eius<sub>1</sub>] *om.*  
Fβ Mo et distinctio eius] *om.* Vσ eius<sub>2</sub>] *om.* Bγ Bε Bζ Bη Bι Bκ Cβ Cδ Cε Cη Cθ  
Dγ Ev Eo Ev Lζ Mλ Mv Pτ Pφ Qα Qμ Rδ Sβ Vε Vι Vκ Vv Vχ Wβ eius<sub>2</sub> cum ita]  
*marg.* Rε cum] in Bε Eα Fζ Lε Oζ Qβ Qγ; qui Bθ cum circulo] *om.* Bζ Vv  
circulo] tertio Cη; *add.* signorum Sι ita ut] *om.* Oη Qα; et Pφ; ita Vπ Wβ; ita  
quod] Bγ Bη Cε Cη Dη Eζ Eη Pα Pτ; in ut Fβ; ut Bζ Cδ Cζ Eμ Eo Mθ Mκ Mv Oα Ok Oσ  
Pψ Sι Vα Vε Vι Vv Vσ Vv non] *interlin.* Wα; nos Sθ
- 5-6 donec ... optime] *om.* Nα
- 6 augeat] *om.* Xβ nec] donec Xβ; et Wι; neque *some*; vel Bγ Bζ Bη Cη Pα Pτ Wβ  
cum] in Cδ Sλ Vσ; eam Eα stellis] *om.* Mη Nε Pδ Pθ Vψ fixis et] ipsis Qδ  
et<sub>1</sub> ... optime] *om.* Qα et planabis] explanabis Oη Rε Vε; inplanabis Eζ  
planabis] planes Fβ eam] *om.* Cε et<sub>2</sub>] *add.* similiter Dη scribes]  
scribas Wι

of the fixed stars. When you have united them [i.e., the stars] to the circle of signs, you next incise it and flatten it very thoroughly until it is level with it, and the separation of it from the circle [of Capricorn] [is] such that it neither increases nor decreases. You will do the same with the fixed stars, and flatten it completely. And you will inscribe

super omne signum nomen suum et super omnem stellam nomen suum, secundum quod patet in figura.

10 Et sit super caput Capricorni almuri graduum, id est ostensor graduum, quem quidam Latinorum, ut in quodam libro diximus, “calculatorem” dicunt. Et iam

- 7 omne] eum Cζ omne ... super<sub>2</sub>] omne signum *and canc.* Po signum] *om.* Bζ; punctum Bε; *add. interlin. illeg.* Eδ nomen] *interlin.* Wι nomen<sub>1</sub> ... suum<sub>2</sub>] *om.* Eδ Eζ Eτ Nα Pυ Sκ Xα suum<sub>1</sub>] eius Cε suum<sub>1</sub> ... suum<sub>2</sub>] *om.* Bγ Cη Pγ Wι; *marg.* Pα; eius Dη et ... suum<sub>2</sub>] *om.* Aα Bθ Cε Eυ Mο Pτ Pφ Rα Sβ Vκ Vπ super<sub>2</sub>] *om.* Vσ; *corr. from* per Vυ omnem ... suum<sub>2</sub>] *marg. (later hand)* Po stellam] *om.* Cθ suum<sub>2</sub>] earum Bι; *suidem(!)* Qδ
- 7-8 secundum ... figura] *om.* Bη Wβ; que est in hac figura. Oκ; quod patet in figura Xβ; secundum quod est in hac figura Bζ(*add. parens*) Cβ Cζ Cθ Eμ Eν Eο(*add. patet*) Mθ Mκ Mν Oα Oσ Pφ Pψ Sθ Vα Vε Vν(*add. patet*) Vσ Vυ Vχ; secundum quod est in supradicta figura Oη; secundum quod patet in hac figura Eα; secundum quod vides in figura Cδ; ut est in figura Nα; ut est in figura precedenti Pτ; ut est in hac figura Aα Bγ Bθ Bκ Cε Cη Eδ Eζ Eυ Mο Pα Pγ Pο Pυ Vπ Wι Xα; ut est in hac figura sequenti Bι Dγ Lζ Mλ Qδ Rα Rβ Sβ Vκ; ut est in precedenti Vβ(*add. interlin. scilicet invaeditur(!)*); ut in hac figuram posita Rε; ut in presente figura Sκ; ut est in subscripta patet figura Dη; ut in figura Qα; ut patet in figura Qβ; ut patet in sequenti figura Eτ
- 8 quod patet] patet patet Sδ figura] *add. praedicta* Fβ; *add. sequenti* Mδ; *add. in marg.* Hoc(In Mκ) figura non ponitur hinc quare in volvellis astrolaborum satis potest exemplar habere Cζ Eμ Mκ; *add. in marg.* Retis in quo non est [*illeg.*] et oportet quo ad letteram Cδ
- 9 Et] ut Cβ sit] *om.* Mυ Qλ Vε Vι Wα; si Rδ; sint Dκ Mθ sit super] *om.* Eδ; igitur Rε; si sit Pφ; sicut Bθ Vπ; sic Nα super] *om.* Aα Bγ Bζ Bη Bι Bκ Cδ Cε Cη Eζ Eν Eο Eτ Eυ Lζ Mλ Mο Pο Pψ Rα Rβ Sι Sκ Vκ Vν Vυ Vχ Wβ caput] *add. eius* Nε almuri<sup>6</sup> graduum] alimir et g~ vel muri g~ Sι; alium gradum almuri graduum Vπ; almeri vel muri graduum Cβ Cδ Cθ Eμ Oκ Pψ Sλ Vα Vσ; almuri gradus vel muri Vν; almuri gradus vel muri gradus Eο; almuri graduum almuri graduum Pφ; almuri vel muri graduum Cζ Mθ Mκ Mν Oα Oη Oσ Vυ; almuri(*corr. from almeri*) vel muri Vχ {*om. graduum*}; gradus vel mu[ri] gradus Bζ; muri graduum Eν; *add. in marg.* muri Bη id est] vel Qλ id ... graduum<sub>2</sub>] *om.* Bθ Lγ Nε Pγ Pφ Ve graduum<sub>2</sub>] gradubus Bζ; gradus Vν quam] quam *some*; quoniam Pφ
- 10 Latinorum] *om.* Cδ Sλ Vα; Latinos Oκ ut] *om.* Pυ ut ... diximus] *om.* Nα quodam] alio Bζ Cδ Cζ Eμ Eν Eο Mκ Mν Oα Oη Oσ Pδ Pθ Pλ Pμ Pν Pφ Pψ Qα Qβ Qγ Qδ Rε Sθ Sι Sλ Vα Vβ Vν Vσ Vυ Vχ; aliquo Mθ Oκ diximus] *om.* Rβ; dicunt Qδ calculatorem] *add. interlin. vocant* Cβ dicunt] nominant Pφ; vocunt Eα Xβ iam] *add. diximus* Mη

<sup>6</sup> In a number of mss, this is written as “alm<sup>u</sup>ri” which can be read as either *almuri* or *almeri*. For *almuri*, see above, Cap. 1, note to line 5.

on each sign its own name, and on every star its name, as is shown in the figure.

And at the beginning of Capricorn let there be the indicator-muri,<sup>7</sup> that is the indicator of degrees, for which some of the Latins, as we have mentioned in a certain book, use the term “calculator”. And we have already

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<sup>7</sup> For *al-muri / ostensor / calculator*, see Cap. 1, line 5, and note.

scripsimus super eum in figura “almuri graduum”. Sitque axis huius tabule cuspidi circuli equinoctii diei, et iam scripsimus super eum in hac figura “axem”. Cum autem perfecta fuerit eius explanatio atque descriptio, tunc perficietur et hec tabula vocatur

- 11 scripsimus] *add. and canc.* figuram Cβ super] *om.* Nα super eum] *om.* Wι  
in figura] *marg.* Po; scilicet ostensor et Pλ(*interlin.*) figura] figuram Qδ; hac Bζ  
Sθ; *add.* hac Bι Cβ Cε Cζ Cθ Eα Eβ Eδ Eζ Eμ Eο Mθ Mκ Oα Oη Oσ Pψ Qα Vα  
Vβ(*interlin.*) Vε Vν Vσ Vυ Vχ almuri] ac muri Sι; alium Vπ; muri Bζ Cβ Cδ Cζ Cθ  
Eο Eμ Eν Mθ Mκ Mν Oα Oη Oκ Oσ Qα Sθ Sλ Vα Vε Vν Vσ Vυ Vχ graduum]  
gradus Eο Vν Sitque] *corr. from* Estque Eδ; Sintque Sι axis] assis Vπ; *add.*  
scripsimus Bθ huius] *om.* Oκ; istius Rε Sκ; quibus Bη; unius Pμ Vπ Wα huius  
tabule] h[*cut off*] Vχ; *om.* Mθ tabule] *add.* axis Pθ Rδ cuspidis] *repeated* Qδ
- 11-12 almuri ... figura] *rep.* Bγ almuri ... hac] *om.* Pψ; *marg.* Vχ
- 12 circuli] *om.* Bζ Mδ Nδ Rε diei] die Wι; *add. rep. of ll. 10* Et iam ... 12 diei Cηc  
iam scripsimus] *cut off* Vχ super] *om.* Sλ eum] *corr. to* eam Eμ; eam Mθ  
in hac figura] hac Tδ hac] *om.* Cε Dη Nα Pυ; *interlin.* Vβ; *precedenti* Pτ;  
sequente Bε hac figura] figura ac Qδ axem] *assem* Vπ autem] *om.* Rε Vε;  
iam Eο
- 12-13 et ... perficietur] *om.* Qα Cum ... perficietur] *om.* Cδ Sλ
- 13 perfecta] *om.* Eο; *marg.* Rε; *perfc-m* Eμ; *per|facta* Po; *perfectum* Sι fuerit] *om.* Bθ  
explanatio] *complanatio* Vν; *planatio* Oκ atque] *sit que* Fζ tunc] *nunc* Wι  
perficietur] *perfecta facietur* Eδ; *perfc- ficietur* Eζ; *add.* *id est perfecta erit* Fβ et  
hec] *om.* Vε hec] *om.* Cζ; *add.* *est* Sθ Sλ Vβ(*interlin.*); *add.* *precedens* Rα tabula]  
*om.* Dη Pδ Qδ Vπ; *est tabula que]* Bζ Cβ Cδ Cζ Cθ Eμ Eν Eο Mθ Mκ Mν Oα Oη Oκ Oσ  
Pφ Pψ Qα Sι Vα Vν Vσ Vυ Vχ; *add.* *que* Bε Rε Sθ Sλ Vβ(*interlin.*) Vε vocatur] *om.* Pλ  
Pq Vκ

written above it in the figure “the [indicator-]muri of the degrees”. And let the axis of this plate be the centre of the circle of the celestial equator and we have already written on it in this figure “axis”.<sup>8</sup> When, moreover, its exposition has been completed, and its description, then it will be complete, and this plate is called

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<sup>8</sup> While some diagrams for this capitulum have “almuri” written on them, very few have “axis.”

“alhintabuz”, cuius interpretatio est “aranea”, et dicitur “rethe” ut hic.

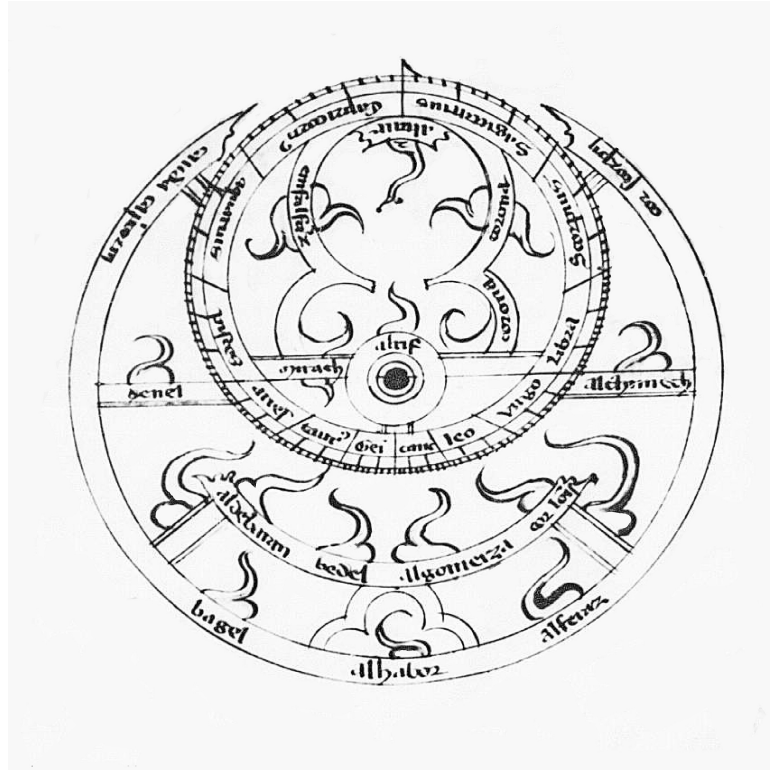
- 14 alhintabuz] alacantabuz *corr. to* alamtabuz Sλ; alancabut Vα; abancabuth Bζ; alahanbuch Aα; alahantabuth Bθ Ev Vπ; alahantabuz Qδ Rβ; alamcabath Vε; alamcabuz/alamtabuz Cβ Cδ Cθ; alancabath Vβ; alancabut Oκ; alancabuz Oα Oσ Pψ Qα Vχ; alangabuz Ev; alantabuch Pφ; alantabur Si; alantaburz Sθ; alantabut Cζ Eμ Mθ Oη Vv; alatanbut Eα; alcamcabuz Cε; alcanthabuth Dη; alhancabuth Bι Vv; alhanchabuch Rε; alhanchabuth Pτ Bη; alhintabaz Qγ; alhintabum Vψ; alhintabur Mδ Tδ Xβ; alhintabut Qμ; alhintabuth Vκ; alhintabuthc Eo; alhintabutz Bε; alhintabuz Cι Eβ Fβ Fζ Lβ Lγ Lε Lη Mκ Mv Mφ Nδ Nε Oζ Oξ Oτ Ov Pδ Pθ Pλ Pμ Pν Qβ Qλ Rδ Sδ Vι Vσ Wα; alhintabu[*illeg.*] Mη] alhintabuth Bγ Cη Wβ; alhintabuz Mv; alhintabuth Pα; alhintabuth Fα; alimcantabuz Mλ; allantabuz Pθ; alman<sup>nach</sup> Po; almicantharat Eδ; alminath Xα; almucantabuz Lζ Sβ; almucanthanth Pγ; almucantharath Eτ Pv Sκ Wι; almucanterath Nα; almuncantabuz Rα; almurath Eζ; almu<sup>rath</sup> Mo; almutantabuz Bκ; almutanthabith *corr. to* almutanthabitz Dγ  
 cuius interpretatio est] cuius interpretatio vocatur Mη; *om.* Mo; et Eδ; id est Aα Bγ Bη Bθ Bι Bκ Cε Cη Dγ Dη Eζ Eτ Ev Lζ Mλ Nα Pα Pγ Po Pτ Pv Rα Sβ Sκ Vκ Vπ Wβ Wι Xα; que interpretatur Qδ aranea] arania Eζ; aranea Qλ; arenea Pτ et dicitur] *rep.* Rδ dicitur] *om.* Pλ; dedz Qλ; que vocatur Bζ; vocatur Cβ Cδ Cθ Ev Eo Mκ Mv Oα Oσ Pφ Qα Sθ Si Sλ Vβ(*add. interlin.* dicitur) Vε Vv Vσ Vv Vχ; vocatur et dicitur Vκ; vocatur etiam Rε; vocatus erit Vα; vocabitur Cζ Eμ Mθ Oη Oκ Pψ; *add.* etiam Bθ Cβ Cζ Eμ Mθ Mκ Mv Oη Oκ Pτ Pφ Pψ Sθ Si Sλ Vβ Vσ Vv Vχ rethe: recte: Si Vα Vσ: rete Bθ Cβ Cδ Cζ Cθ Eμ Mθ Mκ Oκ Pτ Pφ Pψ Sλ Vκ Vv Vχ; rethi Xα; *add.* sive novellum Bι; *add.* vel novellum Rε Vv; *add.* vel volvellum Bζ Eo Vβ(*interlin.*) ut hic] *om.* Bζ Cβ Cδ Cζ Cθ Eζ Eμ Ev Eo Mθ Mκ Mv Nα Oα Oη Oκ Oσ Pγ Pv Pφ Pψ Qα Rε Sθ Si Sλ Vα Vβ Vε Vv Vσ Vv Vχ Xβ; et hoc patet hic Pα; hic Mv Mφ Vι Wα; ffi<sup>a</sup>(?) patet in lateri sequenti Bε; ut Pμ: ut apparet in presenti figura Cε; ut apparet in presenti figura Dη; ut hic patet Bγ Cη Pτ; ut hic patet autem est figura Wβ; ut hic patet etc. etc. Rδ; ut hic sequitur tabula Eτ; ut patet in figura Bη; ut patet in prescripta figura Fβ; *add. in marg.* alamcabuz | aranea | rethe Cδ; *add. later hand* Figura est ad iste signum o-o Qμ(*links to fol. 154'*)



“al-hantabuz”,<sup>9</sup> whose meaning is “spider-web”, and it is [also] called “rete”, as here.

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<sup>9</sup> The Arabic word for rete is *al-ʿankabūt* (العنكبوت), meaning “spider”; the Latin transliterations are multiple. In Latin itself, “aranea” is used both for “spider” and for “spider-web”. See Kunitzsch, *Glossar*, no. 1, pp. 515-517.

[ FIGURA 11 ]<sup>10</sup>

Rethe - Volvellum - Valzagora - Aranea - Alanthabuz /  
 Rete – Volvellum – Walzagora – Spider-web – Al-hantabuz

[Complete diagram] Bγ Bε Bη Bι Bκ Cβ Cη Cθ Cι Eα Eβ Eη Eο Eτ Eυ Fα Fβ Fζ Lγ Lε Lζ Lη  
 Mη Mκ Mλ Mν Mο Nδ Nε Oζ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ (fol. 154<sup>r</sup>) Rα  
 Sβ Sδ Sk (fol. 97<sup>r</sup>) Tδ Vβ Vκ Vσ (fol. 13<sup>r</sup>) Wβ Wι Xβ

[Partial diagram] Bα Eν Mθ Rδ Rε Vε Vχ Wα

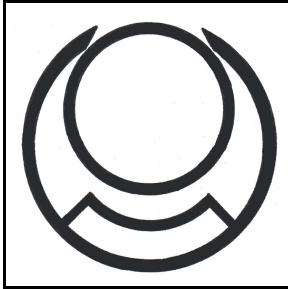
[Outline or space only] Aα Bθ Cε Dγ Dη Eδ<sup>11</sup> Eζ Lβ Mδ Mφ Oα Oξ Pν Pφ Rβ St Vα Vν Vπ  
 Vσ Vυ Vψ

[No space] Bζ Cδ Cζ Eμ Mν Nα Oη Oκ Oσ Pθ Pψ Qα Sθ Sλ Vι Xα

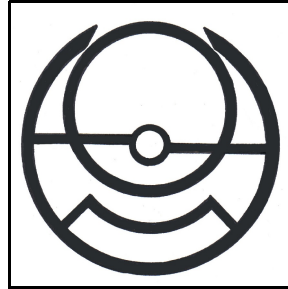
<sup>10</sup> The image here is just a sample, taken from ms Bι.

<sup>11</sup> Ms Eδ: space filled with irrelevant diagrams.

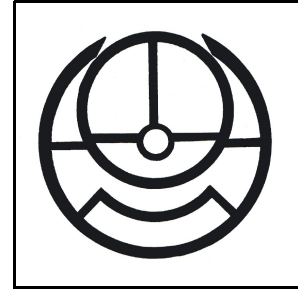
[Rete Strapping Patterns]



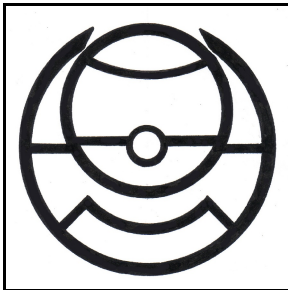
A1: Vε



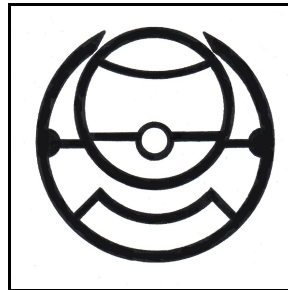
A2: Cβ Cθ



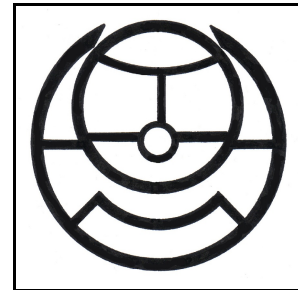
A3: Sκ



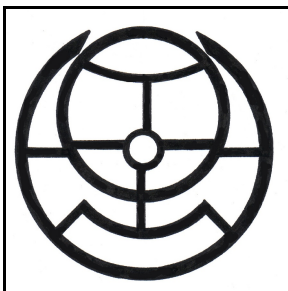
B1: Bη Fβ Nδ Πλ Ρq Rδ Χβ



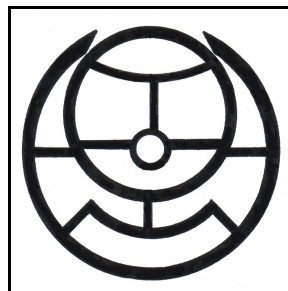
B2: Eη



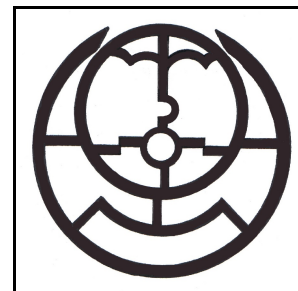
B3: Eα Eo Qδ Tδ



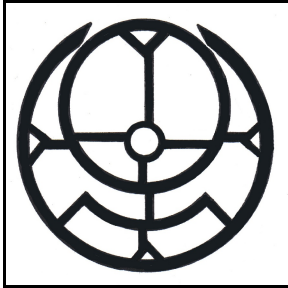
B4: Cη Eβ(?) Fα Fζ Lγ Lε  
Lη Ne Oζ Oτ Ou Pa Pμ Pτ  
Qβ Qγ Qλ Qμ Sδ Wβ



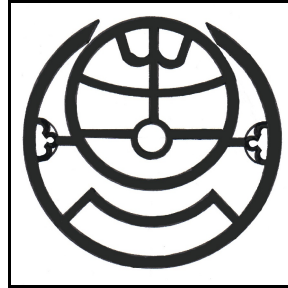
B5: Cι Mκ Pδ



C: Bγ



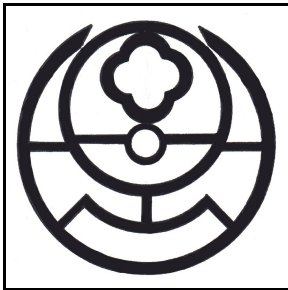
D: Pγ



E: Bε



F1: Vσ Wι



F2: Mη



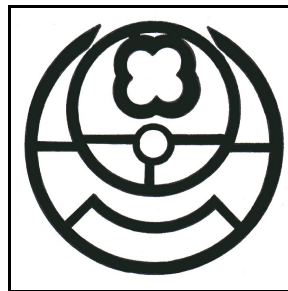
F3: Eτ Eυ Mν Mo Po Pυ  
Vβ Vκ



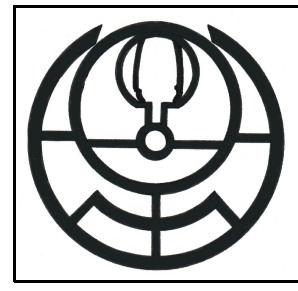
G1: Bκ Lζ



G2: Bι



H: Mλ



I: Sβ



J: Rα

## [Caption]

Rethe ... Alhantabuz] *om.* Βι Βκ Cβ Cθ Cι Eη Eο Eυ Λγ Πγ Ρμ Ρο Ρρ Ρτ Ρυ Ρδ Qδ Σκ Vσ Wι Wβ;  
De preparatione tabule regionis et divisione equinoctis linea Ρρ; Figura rethis vel tele aranee Βε;  
Figura adaptationis rethis et stellarum fixarum in rethi Vβ; Figura adactationis(!) retis et  
stellarum fixarum secundum longitudes suas ab equinoctio Re; Figura vocata rethe, aranea,  
alanathabum, valsaraga Eα; Figura tabule que dicitur rethe, volvellum, valzagora, aranea,  
alhantabuz Fβ(*twice*); Rete Nδ

rethe] Βγ Cη Eο Eτ Eυ Fα Fζ Λε Λζ Λη Μκ Μλ Μο Νε Οζ Οτ Ου Ρδ Ρλ Qβ Qγ Qλ Qμ Ρα  
Sβ Sδ Tδ Vκ Xβ; arecte Eβ; rete Βη Μη Μν; rete perfetum Πγ; rethea Ρα volvellum] Βγ Βη  
Eβ Eο Eτ Eυ Fα Λε Λζ Λη Μη Μκ Μν Μο Νε Οζ Οτ Ου Ρα Ρδ Ρλ Ρρ Qβ Qγ Qλ Qμ Sβ Sδ Tδ Vκ  
Xβ; wolvellum Ρα; wovella Fζ Μλ valzagora] Βγ Eβ Eο Eυ Fα Fζ Λε Λη Μη Μκ Νε Οζ Οτ  
Ου Ρα Ρδ Ρλ Ρρ Qβ Qγ Qλ Qμ Sδ Tδ Xβ; valcagora Eτ ; waldagora Μο; walzagora Βη Λε Μλ;  
walzagorora Vκ aranea] Βγ Βη Eβ Eο Eτ Eυ Fζ Λε Λζ(*twice*) Λη Μη Μλ Μκ Μν Μο Νε Οτ  
Ου Ρα Ρδ Ρλ Ρρ Qβ Qγ Qλ Qμ Ρα Sβ Sδ Tδ Xβ; arane Vκ alhantabuz] Βγ Eβ Fζ Λε Λη Νε Οτ  
Ου Ρα Ρλ Qβ Qγ Qμ; alhamabuz Sδ; alhamtabuth Vκ; alhantabuch Μν; alhantabur Tδ;  
alhantabuth Eτ Eυ Λζ Μη Μο; alhantaleum Xβ; alhantebuz Βη; alhanthabut Cι Ρδ; alhanthabuth  
Μλ Ρα; alhanthubuth Sβ; alhantibur Οζ cursor] Vκ

## [Zodiac]

*Names and divided 10 | 20 | 30:* Βγ Βη Cη Cι Eα Eη Eβ Eο Eτ Eυ(*numbers for Gemini, Cancer, Leo  
only*) Fα Fβ Fζ Λε Λη Μη Μλ Μν Νε Οζ Οτ Ου Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qμ  
Rδ Sβ<sup>12</sup> Sδ(*numbers for Aries and Libra only*) Σκ Tδ Vβ Vκ Wι Xβ

*Names and divided 5 | 10 | 15 ... 30:* Βε

*Names and no divisions:* Βι Βκ Cβ Cθ Λζ Μο Nδ(*Libra and Capricorn only*) Qδ Qλ Πγ Vσ Wβ

## [Other information]

*add.* almuri Βγ Βι Cη Eβ Eη Eο Eτ Eυ Fα Fζ Λη Μη Μκ Μλ(*twice*) Μο(*twice*) Nδ Οζ Ρα Πγ Ρδ Ρλ  
Ρμ Ρο Ρτ Ρυ Qγ Qλ Vκ Wβ Xβ; *add.* almuri | denticulus | ostensor | divisor Βκ; *add.* almuri  
graduum Βε Οτ; almuri vel calculator vel ostensor graduum Eα; muri vel almeri graduum Cβ;  
*add.* axis Cβ; *add.* calculator Eβ Eη Eο Eτ Eυ Fζ Λη Μη Μκ Μλ Μο Οζ Ρα Ρτ Qγ Qλ Wβ Xβ; *add.*  
ostensor Eη Eτ Eυ Μη Μλ Μο Οτ Ρτ Wβ; *add.* ostensor graduum Eβ Eη Fζ Λη Μκ Ρα Qγ Qλ Xβ;  
*add.* denticulus Eη Eυ Μη Ρα Ρτ; *add.* divisor Eβ Eη Eτ Fζ Λη Μκ Μλ Μο Ρα Qλ Xβ; *add.* idem Λζ;  
*add.* muri vel almuri graduum Cθ

[Pointers<sup>13</sup>]

*Too faint:* Qλ

13: Eα

23: Λζ

*Incomplete pointers:* Ρρ Sβ

18: Βκ

26: Eυ

*None:* Cβ Cθ Fβ Vε

20: Βι

27: Βγ Μη Σκ

<sup>12</sup> In ms Sβ the zodiac has been divided into 13 parts, one of which is blank (before Aries), which means that the other signs have shifted counter-clockwise to a greater or lesser extent.

<sup>13</sup> Note: not all pointers have labels, and not all labels have pointers. In ms Rδ the position of the stars are indicated by dots (approximately 38).

28: Eη Pγ	33: Cη Pδ Qδ	37: Nε
29: Vσ	34: Lγ Pα Pμ Xβ	38: Bη Wβ
30: Eτ Mο Ου Tδ Vκ	35: Cι Eβ Lε Lη Oζ Oτ Pλ	43: Bε
31: Mλ Mν Pο Pυ Vβ Wι	Qγ Qμ	
32: Eο Nα Rα	36: Fα Fζ Pτ Qβ Sδ	

## [Star names]

Deciphering the star names as found in the diagrams for Capitulum 11 is very problematic. The choice of stars varies from diagram to diagram. Sometimes the Latin name is used, sometimes a transliteration of the Arabic name; a variety of transliterations exists for each Arabic original and the scribes, not knowing the correct form of a name, would misinterpret their exemplars and create new variants. (For further information on the various stars, see Lists of Fixed Stars – Appendix I.)

Insofar as it has been possible to decipher the stars and their names, I have created the following list. I have started with the beginning of Aries and worked (counter clock-wise) through the signs of the zodiac. I have grouped the variants under the modern star designation for ease of analysis. If a star has not been identified, it has been inserted according to its position vis-à-vis other stars in the diagram.

Note: Some pointers have no names; these have not been noted. A question mark behind a siglum indicates that the reading is probable but not definite.

Note: in mss Bε Eη Pδ Qδ and Tδ, Yed/Aladil/Alhaue are sometimes switched with Wega/Altair/Delphinus.

Note: in ms Rδ, very few names are given and they are mostly illegible. As well, since they are not related to the dots (which in this ms replace the pointers) no attempt has been made to collate them here.

## [ARIES – GEMINI]

ζ Cet (1)<sup>14</sup> [Baten Kaitos/Venter Ceti]: Bacencaytoz Eα Qγ; Bachenkaytoz Pυ; Bantheukaitos Wβ; Baratenkaytoz Pτ; Batencaytoz Bγ; Batenk' Pδ; Batenkaiθos Bε Eη; Batenkaiθoz Cη Eβ? Fβ Fζ Lγ Lε Lη Nε Ου Pμ Qβ Qλ Sδ Tδ; Batenkartoz Fα Qμ; Batenkatoz Sκ; Batenkautos Qδ; Batenkaytar Xβ; Batenkayton Rα; Batenkaytoz Eτ Mκ Oτ Pλ Sβ Vκ; Bathenaytoz Wι; Bathenk' Pγ; Bathenkaitoz Bη; Bathenkayθos Cι; Bathenkayto~ Mλ; Bathenkaytoz Mν Mο Oζ Pο Vβ; Daventanet Pq; Venter Caytet Vε; Venter Chator Cθ; Venter Chitor Cβ; *illeg.* Pα

ζ Cet (2)[Pantakaitos]: Pantaikatoz Sκ; Pantakai Bη Cη Eβ? Fβ Fζ? Lγ Lε Lη Nε Oζ Oτ Pq Qβ Qλ Sδ; Pantakay Fα Ου Pλ Qγ Wβ Xβ; Pantakaytoz Tδ; Pantaketicoz Mκ; Pantekai Pμ; Pantekar Qμ; Pantenkait' Pτ; Panth' Pδ; Panthacayton Eα; Panthakai Eη; Panthakay Bε; Panthakayθos Cι; *illeg.* Pα

θ Eri [Acomar]: Finis Lγ Pq; Finis Arietis Bε; Finis fluxus Bγ Bη Cη Cι Eβ Eη Fα Fβ Fζ Lε Lη Mκ Nε Oζ Oτ Ου Pδ Pκ Pλ Pμ Pτ Qβ Qγ Qδ Qλ Qμ Sδ Tδ Wβ Xβ; Fluxus Eα; *illeg.* Pα

<sup>14</sup> In 30 mss there are two different pointers for ζ Cet, labelled Baten Kaitos and Pantakaitoz. Both appear to be original. See Lists of Fixed Stars – Appendix I.

$\alpha$  Cet [Menkar]: Algenip<sup>15</sup> P $\gamma$ ; Azerikar<sup>16</sup> X $\beta$ ; Mekar Q $\mu$  V $\sigma$ ; Memkar E $\nu$ ; Menbair M $\omega$ ; Menc/t L $\zeta$ ; Mencar T $\delta$ ; Menhar C $\eta$ ; Menk P $\delta$ ; Menkar B $\epsilon$  B $\eta$  C $\iota$  E $\alpha$  E $\beta$ ? E $\eta$  E $\tau$  F $\alpha$  F $\beta$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\eta$  M $\eta$  M $\kappa$  M $\lambda$  M $\nu$  N $\epsilon$  O $\zeta$  O $\tau$  O $\upsilon$  P $\alpha$  P $\lambda$  P $\mu$  P $\omega$  P $\tau$  P $\upsilon$  Q $\beta$  Q $\gamma$  Q $\delta$ ? Q $\lambda$  R $\alpha$  S $\delta$  S $\kappa$  V $\beta$  V $\kappa$  W $\beta$  W $\iota$ ; Menter B $\kappa$ ; Merchm P $\rho$ ; *illeg.* S $\beta$

$\alpha$  Per [Algenib]: Alban? E $\alpha$ ; Alg~ L $\eta$  O $\zeta$ ; Algenib R $\alpha$  V $\beta$ ; Algenub B $\gamma$  F $\zeta$ ?; Algo~ O $\tau$ ; Algon C $\eta$  L $\gamma$  L $\epsilon$  N $\epsilon$  P $\mu$  P $\tau$  Q $\gamma$  Q $\lambda$  Q $\mu$  S $\delta$  T $\delta$ ; Algonue P $\alpha$ ?; Caput Algon B $\epsilon$ ; Fron [= Frons Algonis?] E $\nu$ ; *illeg.* E $\beta$  F $\alpha$  O $\upsilon$  P $\delta$  P $\lambda$  Q $\beta$  V $\sigma$  W $\beta$

$\tau^2$  Eri [Angetenar]: Agentenar X $\beta$ ; Algetenar C $\eta$  E $\eta$  F $\alpha$  F $\beta$  L $\gamma$  L $\epsilon$  L $\eta$  M $\kappa$  M $\omega$  N $\epsilon$  O $\zeta$  O $\tau$  O $\upsilon$  P $\alpha$ ? P $\lambda$  P $\mu$  P $\rho$  P $\tau$  Q $\beta$  Q $\gamma$  Q $\lambda$  S $\delta$  T $\delta$ ; Algetenei Q $\mu$ ; Algeteuan E $\alpha$ ; Algethenar B $\epsilon$ ; Alhaiot<sup>17</sup> E $\nu$ ; Angetenar C $\iota$ ; Augea P $\gamma$ ; Augenenar W $\iota$ ; Augerenax Q $\delta$ ; Augetena B $\eta$ ; Augetenar M $\lambda$  M $\nu$  P $\delta$  P $\omega$  P $\upsilon$  R $\alpha$  S $\beta$  V $\beta$  V $\kappa$  V $\sigma$  W $\beta$ ; Augthenar E $\tau$ ; *illeg.* E $\beta$

$\alpha$  Tau [Aldebaran/Cor Tauri]: Aldeban O $\zeta$  O $\tau$  P $\rho$  W $\iota$ ; Aldebanar W $\beta$ ; Aldebans P $\gamma$ ; Aldebaran B $\gamma$  B $\epsilon$  B $\eta$  B $\iota$  C $\eta$  C $\iota$  E $\alpha$  E $\beta$  E $\eta$  E $\omega$  F $\alpha$  F $\beta$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\eta$  M $\kappa$  M $\lambda$  M $\nu$  M $\omega$  N $\epsilon$  O $\upsilon$  P $\alpha$  P $\delta$  P $\lambda$  P $\mu$  P $\omega$  P $\tau$  P $\upsilon$  Q $\beta$  Q $\delta$  Q $\gamma$  Q $\lambda$  Q $\mu$  R $\alpha$  S $\beta$  S $\delta$  S $\kappa$  T $\delta$  V $\beta$  V $\kappa$  V $\sigma$  X $\beta$ ; Atabanar E $\tau$ ; Cor Tauri B $\kappa$  C $\beta$  C $\theta$  L $\zeta$  V $\epsilon$

$\beta$  Ori [Rigel/Pes Geminorum]: Alhaiot<sup>18</sup> M $\eta$ ; Bagel B $\iota$ ; Pes Geminorum C $\beta$  C $\theta$  V $\epsilon$ ; Regilal T $\delta$ ; Rigel B $\epsilon$  B $\eta$  B $\kappa$  E $\eta$  E $\tau$  L $\zeta$  V $\kappa$ ; Rigib P $\rho$ ; Rigil B $\gamma$  C $\eta$  C $\iota$  E $\beta$  F $\alpha$  F $\beta$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\eta$  M $\kappa$  M $\lambda$  M $\nu$  M $\omega$  N $\epsilon$  O $\zeta$  O $\tau$  O $\upsilon$  P $\alpha$  P $\gamma$  P $\delta$  P $\lambda$  P $\mu$  P $\omega$  P $\upsilon$  Q $\beta$  Q $\gamma$  Q $\delta$  Q $\lambda$  Q $\mu$  R $\alpha$  S $\beta$  S $\delta$  S $\kappa$ <sup>19</sup> V $\beta$  V $\sigma$  W $\beta$  W $\iota$  X $\beta$ ; Rigli E $\alpha$ ; *illeg.* P $\tau$

$\alpha$  Aur [Alhailoth]: Al L $\eta$ ; Alh~ C $\eta$  E $\alpha$  F $\alpha$  N $\epsilon$  Q $\mu$ ; Alha~ L $\gamma$  L $\epsilon$  M $\lambda$  O $\zeta$  P $\alpha$  P $\upsilon$  Q $\gamma$  Q $\lambda$  S $\delta$  T $\delta$ ; Alhae M $\lambda$ ; Alhaioc P $\omega$ ; Alhaios M $\kappa$ ; Alhaiot B $\epsilon$  E $\eta$  V $\kappa$ ; Alhailoth B $\gamma$  R $\alpha$ ; Alhaut O $\tau$ ?; Alhaye S $\beta$ ; Alhayot W $\iota$ ; Ursa<sup>20</sup> L $\zeta$  M $\nu$ ; *illeg.* E $\beta$  E $\tau$  M $\eta$  O $\upsilon$  P $\delta$  P $\lambda$  Q $\beta$

$\alpha$  Ori [Betelgeuse]: Algege T $\delta$ ; Algen P $\rho$ ; Algensasa B $\epsilon$ ; Algente E $\alpha$  E $\omega$ ? W $\iota$ ; Algenza F $\beta$  M $\nu$  P $\lambda$  X $\beta$ ; Algere P $\tau$ ; Algeu P $\delta$ ; Algeusa F $\alpha$ ; Algeuze B $\gamma$  B $\eta$  C $\eta$  C $\iota$  E $\tau$  F $\zeta$  L $\gamma$  L $\epsilon$  L $\eta$  M $\eta$  M $\kappa$  M $\lambda$  N $\epsilon$  O $\zeta$  O $\tau$  O $\upsilon$  P $\alpha$  P $\mu$  P $\omega$  P $\upsilon$  Q $\beta$  Q $\gamma$  Q $\lambda$  S $\delta$ ? V $\beta$  V $\kappa$  V $\sigma$  W $\beta$ ; Algraza Q $\mu$ ; Bedel B $\iota$  B $\kappa$ ; Elgeuze M $\omega$ ; Humerus Geminorum C $\beta$  C $\theta$ ; *illeg.* E $\beta$  E $\eta$  Q $\delta$

<sup>15</sup> Misnamed: Algenip ( $\alpha$  Persei/Algenib) has a declination of about +50°. Kunitzsch, *Sternnamen*, pp. 69, 113.

<sup>16</sup> Erroneous reading of the exemplar by the scribe? “M” becomes “Az” and “n” becomes “ri”?

<sup>17</sup> Misnamed: Alhaiot ( $\alpha$  Aurigae/Capella/Alhailoth) has a declination of about +45°, while the pointer in E $\nu$  is about -15°; its right ascension is also about 1 hour greater.

<sup>18</sup> Misnamed: Alhaiot ( $\alpha$  Aurigae/Capella/Alhailoth) has a declination of about +45°, while the pointer in M $\eta$  is about -10°.

<sup>19</sup> In ms S $\kappa$ , Rigil is misplaced – moved well to the north of the ecliptic.

<sup>20</sup> “Ursa” (“bear”) is a name given to a variety of stars in Ursa Maioris and Ursa Minoris. Usually, however, in these rete diagrams Ursa is found in Cancer or Leo, rather than in Gemini, as here. The position in these two manuscripts is that of  $\alpha$  Aur.

## [CANCER – VIRGO]

α CMa [Alhabor]: Alhabor Mν; Algabor Χβ; Alhabez Wι; Alhabor Bγ Bε Bη Bι Bκ Cη Cι Eα Eβ Eη Eτ Eυ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mλ Mο Nε Oζ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pυ Qβ Qγ Qδ Qλ Qμ Rα Sβ Sδ Sκ Tδ Vβ Wβ; Alhaboz Vσ; *cut off* Vκ; *illeg.* Pτ

α CMi [Algomeiza]: Algemeza Pο; Algom~ Pγ; Algomaza Fβ; Algomeisa Bη Fα Mκ Pλ Qμ; Algomeiza Bι Bκ Eβ Eη Eτ Fζ Lγ Lη Mη Oζ Pα Pδ Pμ Pο Pτ Pυ Qβ Qγ Qλ Sβ Sδ Wβ Wι; Algomera Eα Qδ Χβ; Algomerza Bγ Cη Lζ Mο; Algomeuza Cι; Algomeysa Bε Tδ; Algomeyza Eο Lε Mλ Nε Oτ Oυ Rα Vβ Vκ; Algomeza Mν; Algoumeiza Vσ; Algumeiza Eυ; Moriens Filius<sup>21</sup> Cβ Cθ Vε *add.* Prochion Bε

ρ Pup [Markep]: Marchep Eα; Markab Rα; Marke~ Qλ; Markeb Bε Bη Eη Eτ Mλ Mν Mο Pο Pυ Sβ Vβ Vκ Vσ; Markep Cη Cι Eβ Fα Fζ Lγ Lε Lη Mκ Nε Oζ Oτ Oυ Pα Pδ Pλ Pμ Pρ Pτ Pυ Qβ Qγ Qμ Sδ Tδ Wβ Wι; Market Fβ; Merkep Χβ; Mikel Qδ

α Hya [Alphard]: Alf~ Pδ; Alfarad Bκ Lζ; Alfarath Mκ; Alfart Bγ Bε Bη Cη Cι Eβ Eη Eο Eτ Eυ Fα Fβ Fζ Lγ Lε Lη Mη Mλ Mν Mο Nε Oζ Oτ Oυ Pα Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Sδ Tδ Vβ Vκ Vσ Wβ Χβ; Alferaz Bι; Alfert Pγ; Alfrat Wι; Alpharat Eα

α Leo [Regulus]: Cor Leonis Bγ Bε Bη Bι Bκ Cβ Cη Cθ Cι Eα Eβ Eη Eο Eτ Eυ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mκ Mλ Mν Mο Nε Oζ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Sβ Sδ Sκ Tδ Vβ Vε Vκ Vσ Wβ Wι Χβ; Leo Pρ

β UMa [Merak/Mirak]: Benenar<sup>22</sup> Mη; Benenaz<sup>23</sup> Mν; Egg Eα?; Gel Lζ; Ur Lη; Ursa Bε Cη Eβ Eη Fα Lγ Mλ Nε Oζ Oτ Oυ Pα Pλ Pμ Pο Pτ Pυ Qβ Qγ Qλ Qμ Rα Sβ Sδ Tδ Vβ Vκ Wι; Veniutab<sup>24</sup> Eυ; *illeg.* Eτ Lε

α UMa [Dubhe]: Dibhe Bε; Dubhe Bγ Eα

ι UMa [Talitha]: Egregen[us] Sκ

β Leo [Denebola]: Cau' Nε; Caud' Lη; Cauda Lγ Lε Oζ Oτ Oυ Pα Pλ Pμ Qβ Qγ Qλ Sδ Tδ Χβ; Cauda Leonis Bε Bκ Lζ Pγ; *illeg.* Cη Eβ Fα

<sup>21</sup> See Lists of Fixed Stars – Appendix I for details of this identification/name.

<sup>22</sup> Variant of Benetnasch (η UMa).

<sup>23</sup> Variant of Benetnasch (η UMa).

<sup>24</sup> Variant of Benetnasch (η UMa)? Kunitzsch records “venetuala” as a variant for η UMa (*Typen*, p. 29).



γ Crv (1)<sup>25</sup> [Corvus]: Cauda Leonis<sup>26</sup> Λγ Qγ?; Chorus Pρ; Corus Qμ Vσ; Coruus Bγ Bε Bη Cι Eα Eβ Eη Eο Eτ Eυ Fα Fβ Fζ Lε Lη Mη Mκ Mλ Mν Mo Nε Oζ Oτ Oυ Pα Pγ Pδ Pλ Pμ Po Pτ Pυ Qβ Qδ Qλ Rα Sβ Sδ Tδ Vβ Vκ Wβ Wι Xβ

γ Crv (2) [Algorab/Ala Corvi]: Alacorni Vε; Ala Corui Cβ Cθ; Algor~ Pγ; Algorab Bγ Bε Bη Cι Eα Eβ Eη Eο Eτ Fα Fβ Fζ Lγ Lε Lη Mκ Mλ Mν Mo Nε Oζ Oτ Oυ Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qγ Qβ Qδ Qλ Qμ Rα Sβ Sδ Tδ Vβ Vκ Vσ Wβ Xβ; Cauda<sup>27</sup> Eυ Mη

? In Cancer or Virgo: Algol' Mκ; Algon Sβ

## [LIBRA – SCORPIO]

α Vir [Spica/Alchimeth]: Alazel Cβ Cθ; Alchim[*illeg.*] Pα; Alchim<sup>c</sup> Fα Lη; Alchimec Cι Pδ Po; Alchimech Cη Eβ Eη Mν Oζ Pμ Pρ Pυ Qβ Qγ Qλ Qμ Rα Sβ Sδ Sκ Tδ Vσ Xβ; Alchimet Mκ Vκ; Alchimeth Bγ Bε Fβ Fζ Lγ Lε Mλ Oτ Oυ Pτ Vβ Wι; Alchimoch Eα Alchymech Bι Mo; Alfumech Bη; Alhimeh Nε; Alhimeth Pλ; Allumeth Wβ; Alramech<sup>28</sup> Mη; Althimec Bκ Lζ; Altimeth Eτ; Alutimech Eυ; Spica<sup>29</sup> Bε

η UMa [Alkaid/Benetnash]: Bene Bγ Eβ Fα Fζ Lγ Lε Lη Mλ Nε Oζ Oτ Oυ Pα Pλ Pμ Pτ Qγ Qλ Qμ Sδ Tδ Xβ; Bene~ Eτ; Beneñ Vκ; Benenaz Bε(*later hand*) Mν Po Pυ Rα Vβ Wι; Bennaz Sβ; Benne Qβ; Rebene Fβ; Ursa maior Pρ; *illeg.* Cη

α Boo [Arcturus]: Al Pδ; Alchimet Eυ<sup>30</sup> Mη<sup>31</sup>; Alhimet Vε; Alm Wβ; Alr Fζ? Pτ; Alř Eβ; Alra Bγ Fα Pλ? Qγ; Alra' Mκ Oζ; Alram' Fβ Lγ Lε Lη Nε Oτ Oυ Pα Pμ Qβ Qδ Qλ Sδ; Alrame' Eη; Alramech Cβ Cθ Eτ Mλ Mo Po Pυ; Alrameh Mν; Alramet Rα Vκ; Alrameth Bε Lζ Vβ Wι; Alramich Eο; Alranech Sκ; Alrb' Tδ; *illeg.* Cη Sβ Qμ Xβ

α CrB Afeca Eο; Alf' Pτ; Alfa' Fζ Oτ Pλ Qβ Qλ?; Alfaca Lγ; Alfaz Fα; Alfe Bγ; Alfeca Eτ Mκ Pα Pδ Vκ; Alfeta Sκ; Alfeta Eυ Qδ; Alfetaha id est stella lucida in corona sept[en]trionali Cβ Cθ; Alfecas Bε; Corona Bι(*twice*) Bκ Lζ; Efa' Tδ; Efeca Mη; Effeca Rα; Elfa' Eβ Fβ Lη Nε Oζ Oυ Pμ

<sup>25</sup> γ Crv became duplicated; see Lists of Fixed Stars – Appendix I. Both are shown in 38 mss, separated in declination and right ascension by several degrees.

<sup>26</sup> Misnamed. The pointer in these two mss is definitely Corvus. Cauda Leonis (or simply Cauda) refers to a different star, i.e., β Leonis. But the declination of β Leo is +14° 39', a long ways further north than Corvus.

<sup>27</sup> Misnamed. The pointer in these two mss is definitely Gienah. Cauda (or Cauda Leonis) refers to a different star, i.e., β Leonis. But the declination of β Leo puts it much further north than Gienah.

<sup>28</sup> It appears that the names for α Vir/Alchimet and α Boo/Alramech have been reversed in ms Mη.

<sup>29</sup> In Bε there are two pointers for α Vir, labelled Alchimeth and Spica; the latter appears to be a later addition.

<sup>30</sup> Possibly a variant of “alchimech alramech” (*Typen*, p. 90).

<sup>31</sup> It appears that the names for α Boo/Alramech and α Vir/Alchimet have been reversed in ms Mη.

Qγ Qμ Sδ; Elfaca Bη?; Elfeca Mλ Pο Pυ Sβ Wι; Elfeka Wβ; Elfeol Vε; Elfera Mν; Elfeta Vβ Vσ;  
Elpert Eυ; *illeg.* Cη Lε Xβ

β Sco [Aladil]: Aladil Bη Cη Eβ Fα Fβ Fζ Lγ Lε Lη Nε Oζ Oτ Oυ Pα Pλ Pμ Pρ Pτ Qβ Qγ  
Qλ Qμ Sδ Wβ Xβ; *reversed for α Aql/Altair* Aladil Eη Tδ; Alfadil Bε

δ Oph<sup>32</sup> [Yed]: Bed Sβ; Ged Vσ; Jed Eτ Mη; Yed Bγ Bη Cη Eβ Fα Fζ Lγ Lε Lη Mλ Mν Nε  
Oζ Oτ Oυ Pα Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qλ Qμ Rα Vβ Vκ Wβ Xβ Wι; Yel Fβ; Uda Eυ; *reversed for  
ε Del/Delfinus* Yed Bε Tδ

α Sco [Cor Scorpil]: Cor Leonis<sup>33</sup> Oυ Vκ; Cor Scorpil Bγ Bι Bκ Cη Cι Eβ Eη Eο Eτ Fα Fβ Fζ  
Lγ Lζ Lη Mκ Mλ Mν Mο Nδ Nε Oζ Oτ Pα Pδ Pλ Pρ Pτ Pυ Qβ Qγ Qδ Qλ Rα Sδ Vβ Wι; Cor  
Scorpionis Bε Bη Cβ Cθ Eυ Lε Mη Pο Qμ Sβ Sκ Tδ Vε Vσ Wβ Xβ

λ Sco: Cauda Qμ(?); Cauda Scor[pionis] Bε(*later addition?*)<sup>34</sup>

α Oph [Alhaue, a.k.a. Capud Draconis]: Ahaue Sδ; Alane Mη; Alaue Eα<sup>35</sup>; Alh Qμ; Alha  
Bη Fβ Fζ Lε Lη Nε Oυ Pρ Pτ Qλ Wβ Xβ; Alhaβ Lγ; Alhane Eο Mν Vκ; Alhau~ Sβ; Alhaue Bγ Cη  
Cι Eβ Eτ Eυ Fα Mκ Mλ Oζ Oτ Pα Pλ Pμ Pο Pυ Qβ Qγ Qδ Rα Sκ Wι; *reversed for α Lyr/Vega* Alha  
Tδ; Alhane Bε; Alhaue Eη Pδ Vσ

γ Dra [Etamin]: Cap[ud Serpentis] Bκ; Cap[ud] S[erpentis] Lζ; Taben Eυ; Tova? Wι

? In Libra: Denle Wβ

? In Sagittarius: *illeg.* Mη

#### [CAPRICORN – PISCES]

α Lyr [Wega/Vega]: Vega Bγ Bη Eα Fα Fβ Lη Mη? Mκ Oζ Oτ Pγ Pρ Pτ Qβ Qδ Qλ Sδ Sκ  
Vβ Wβ Xβ; Voora Eυ; Vuega Pυ; We Lζ; Wega Cη Cι Eβ Eο Fζ Lγ Lε Mλ Mν Nε Oυ Pα Pδ Pλ Pμ  
Pο Qγ Qμ Rα Vκ Wι; Vultur Cadens [*position reversed with α Aql/Altair/Vultur Volens*] Cβ Cθ Vε;  
*reversed for α Oph/Alhaue* We Eη; Wega Bε Pδ Tδ; *illeg.* Vσ

α Aql [Altair]: Alcar Xβ; Alchair Sβ; Alkair Bε; Alta Pδ; Altahir Eα; Altair Bη Bι Bκ Cη Cι  
Eτ Eυ Fβ Fζ Lε Lζ Lη Mκ Nε Oζ Oτ Oυ Pα Pλ Pμ Pρ Pτ Qβ Qγ Qλ Qμ Sδ Sκ Vκ Wβ; Altaire Mν;  
Altayr Eβ Eο Lγ Mκ Pγ; Altha Wι; Alhair Fα Mλ Pο Pυ Rα Vβ; Althar Vσ; Althayr Bγ; Vultur  
Volans [*position reversed with α Lyr/Vega/Vultur Cadens*] Cβ Cθ Vε; *reversed for β Sco/Aladil* Altair  
Qδ; Altair Eη Tδ

ε Del [Delphinus]: Del Fα Lη Oζ Pρ Xβ; Delf Fζ Lε Oυ Pτ Qγ; Delfim Eβ; Delfin Bη Cη Cι  
Eτ Fβ Lγ Mλ Mν Nε Oτ Pα Pδ Pμ Pο Pυ Qβ Qλ Rα Sβ Sδ Sκ Vβ Vκ Vσ Wβ; D[e]lfin Eα; Delfinus

<sup>32</sup> Or ε Oph, but the δ Oph is brighter. The two actually are a double star, indistinguishable to the naked eye.

<sup>33</sup> An obvious scribal error.

<sup>34</sup> Identification probable; see Kunitzsch, *Typen*, pp. 82, 115.

<sup>35</sup> The pointer for this star in ms Bε is much further north than normal for α Oph/Alhaue.

Cθ Vε; Delf<sup>n</sup> Pλ; Delphin Eο; Delphinus Cβ; [*position reversed for δ Oph/Yed*] Delf Qδ Tδ; Delfin Bε Eη Qμ

α Cyg [Elrif/Deneb] Alrif Bγ Bι Lζ; De Fβ Tδ; Dea Qλ?; Den Bη Lγ Pλ Pτ Qμ; Dena/Deta Alhαιet Mν; Dene Cη Fα Lε Nε Oζ Oτ Oυ Pμ Qγ; Deneb Lη Pα Qβ Sδ; Deni Wβ; Dens Xβ; Dera Po Pu Vκ; *illeg.* Eβ Vσ

α Cep [Alderamin]: Aldera Mη; Aldira Vβ; Alhera Eυ

ε Peg [Enif]: Enifalfa Lζ; Enifalfaz Bι; Musid' eq' Po; Musida equi Mλ Mν Pu Wι; *illeg.* Vσ

δ Cap [Deneb Algedi]: Cauda Capricorni Bι Bκ Cβ Cθ Lζ Vε; Deneba Mη; Denebagedi Rα; Denebaldegi Mo; Denebalg~ Pγ; Denebalgedi Eτ Mλ Mν Po Pu Vβ Vσ Vκ Wι; Denehal Eυ; Libedeneb Bε Bη Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mκ Nε Oζ Oτ Oυ Pα? Pδ Pλ Pρ Pμ Pτ Qβ Qγ Qδ Qλ Qμ Sδ Tδ Wβ Xβ; Liberneneb Eο

δ Aqr [Skat]: Sceach Bγ Mλ Mν Mo Po Vβ Vκ Vσ Wι; Sceahc Pu; Scehah Sβ; Sechath Rα

β Peg (1) [Markab/Humerus Equi]: Equi Pλ; Equi humerus Qδ; Humerus Equi Bε Bη Cβ Cη Cθ Eα Eβ Eη Eο Eτ Eυ Fα Fβ Fζ Lγ Lε Lη Mη Mκ Mλ Mν Mo Nε Oζ Oτ Oυ Pα Pγ Pδ Pμ Pρ Pτ Pu Qβ Qγ Qλ Qμ Sδ Tδ Vε Vκ Wβ Wι Xβ

β Peg (2) [Alferaz]: Alf Fζ Lη Pτ; Alfam Sβ; Alfam Xβ; Alfar Eο? Mκ; Alfam Oτ; Alfaz Bγ Bη Cη Eβ Fα Fβ Lγ Lε Oζ Oυ Pα Pμ Qβ Qλ Sδ Tδ Wβ; Alferam Sκ<sup>36</sup>; Alferaz Nε Rα Vβ; Alfos Eα?; Crupa Equi Cβ Cθ; Crpua Eτ' i Vε; Elfa' Pλ Qμ; Elfa's Qγ Qδ; *illeg.* Eτ

α Cas [Schedar/Sheidir]: Sc~ Sβ; Sced Mλ Rα; Scedar Sκ

β Cet or ι Cet<sup>37</sup> [Deneb Kaitos]: Cauda Ceti Bε (*later addition*); Cauda Chitor Cβ Cθ; Deneb Bι Bκ Eτ Lζ; Denebcaytoz Oυ; De[neb]caytos Bη; D[e]nebcaytoz Eα; Denebfaytoz Wι; Denebkaim Mν; Denebkaitos Bε Cι Eη; Denebkaiton Qμ; Denebkaitos Mκ Oτ Pα? Pδ Qδ; Denebkaitoz Cη Eυ Fα Fβ Fζ Lγ Lε Lη Mη Nε Oζ Pμ Qβ Qλ Sδ Tδ Vβ; De[neb]kaytoz Wβ; Denebkartoz Eβ Pλ Pτ; Denebkaytor Mo Xβ; Denebkaytoz Mλ Po Pu Qγ Vκ; Denebchaytos Eο; Tenebraitoz Vσ; Veneb kaitoz Pρ; *illeg.* Sβ

β And [01h 09'] [Mirach]: Mirach Bα Bι; Mirat Lζ<sup>38</sup> Vκ

β Per [03h 08m] [Algol]: Algol Eα

? In Aquarius: Pegasus<sup>39</sup> Bε (*later hand*)

? In Aquarius: Alhera<sup>40</sup> Eυ Mη?

<sup>36</sup> The pointer in ms Sκ is significantl into Aries.

<sup>37</sup> The pointers in mss Eυ, Mη and Mo are significantly into Aries.

<sup>38</sup> In Aries in ms Lζ

<sup>39</sup> Possibly ε Peg.

<sup>40</sup> Ms Eυ has two different pointers with this name; the other is α Cep. The same is probably the case for Mη.

? In Pisces: Sichel  $\beta$ ; Slichil  $R\alpha$

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## [CAPITULUM 12.] DE INSCRIPTIONE CIRCULI HEMISPHERII SUPER LATITUDINEM REGIONIS

Post hoc accipies tabulam aliam et ipsa est in qua erit circulus hemisperii et

- 1 De ... regionis] *om.* Αα Βα Βζ Βκ Cβ Cδ Cε Cθ Dγ Eα Ev Lζ Μλ Nα Oα Oσ Pγ Pφ Rα Sβ Sδ Sθ St Vα Vε Vχ Xα; Capitulum. De preparatione [*illeg.*] tabule. De almath' Eo; Compositio tabule regionis Dη; De almicantharath Po; De almicantharath. Rubrica Eδ; De almocantarath Vv; De almucantarath Wt; De almucantaraz Qα(*marg.*); De almucantharath Eζ; De almucantharath Qμ; De almuchantharath Et; De almuchantharath Rε; De circulo emispherii Mv; De constitutione almucantaraz Cζ(almucantazar) Eμ(*marg.*) Mθ(almucantarath) Mκ Oη Oκ Pψ(abmicantesar) Sλ; De constitutione almutaniuz Vσ; De divisione equinoctialis et est tertia pars libri Bγ; De inscriptione vel(*om.* Lε) preparatione tabule regionis et divisione equinoctialis in ipsa Lε Tδ; De modo inscribendi lineas progressionarias sive almucantharath Bt; De preparatione tabule ad almucantarath et eorum figuracione Vv; De preparatione tabule ad almucantharath Pt; De preparatione tabule regionis et divisione equinoctialis in ea Pl Pq; De preparatione tabule regionis et divisione equinoctialis in ipse Bη Lβ Lη Mδ Nδ(ipsa) Oξ(*marg.*; *add.* Rubrica) Pα(*marg.*) Qγ Wβ; De tabula latitudinis Bθ Ev Mη Pv; De tabula latitudinum Vκ(*other hand, marg.*) Vπ; De tabulis latitudinum. Et primo de divisione equinoctialis ad almucantarath Vβ; Preparatio tabule regionis Mo; Preparatio tabule regionis atque divisio equinoctialis in ipsa Xβ; *add. in marg.* Tertia pars principalis: de almuc<sup>rat</sup>, secundo de azimuth, et post hoc oportet tertio de horis et prius "Post hoc" Bt; *add. in marg.* Super hac tabula poteris aponere(?) quod iam docuit facere Eα
- 1 *before* De] Capitulum Bε Fβ De inscriptione] scriptione Oτ circuli] *om.* Cι Lγ Nε Pδ Pθ Rδ Vψ hemisperii (*and elsewhere*) emispherii *many* super] *add.* .12. Qδ super ... regionis] *om.* Fβ; et cetera Sκ regionis] *add.* .b. Pv; *add.* Capitulum 12 *and in marg.* 12<sup>m</sup> Bε
- 2 Post] Postea Bε Rα accipies] accipietis Oκ; *add.* etiam Bζ Pφ St Vv aliam] *om.* Wβ; ut veriter matris Qμ; *add.* ut veriter matris Bζ Eo Mη Pτ Rε(*interlin.*) Vv; *add.* *interlin.* a rete Oα; *add.* quam alancabuz scilicet Qα est] *om.* Vκ; erit Dη erit] *om.* Qλ Wα; erat Ev; eris Cη; est Bζ Mv Pφ; *corr. to* erit Sλ circulus] *marg.* Pv; *add.* *interlin.* ut patet in secunda figura Cδ hemisperii] *add.* id est orizon qui est primus almucantaraz Cζ(*interlin.*; almucantazar) Eμ(*marg.*) Mκ(*interlin.*)
- 2-3 erit ... circuli] *om.* St et circuli] *om.* Eδ Eζ Eτ Po
- 2-15 Post ... reflexa]<sup>1</sup> Accipias<sup>2</sup> tabulam aliam in qua erit circulus emispherii et circuli qui succedunt ei, scilicet almucantarath, id est progressiones solis et hore et azimuth in qua fac circulum Arietis et Libre sicut in rethe et Capricorni et Cancri. Bα

<sup>1</sup> Ms Bα (an early ms) replaces the entire capitulum with these few lines.

<sup>2</sup> Cf II. 2-4.

[CHAPTER 12.] ON THE INSCRIPTION OF THE CIRCLE OF THE HEMISPHERE AT THE LATITUDE OF  
THE REGION

Afterwards, you will take another plate and this is the one in which will be the  
circle of the hemisphere [i.e., the horizon]

circuli qui succedunt ei in directo eius qui dicuntur “almucantherat”, quos Latini vocant “progressiones solis” et “lune hore” atque “azimuth”. Sitque hec tabula maior

- 3 circuli] *margin.* W $\iota$ ; *om.* S $\kappa$  succedunt] *add. in margin.* scilicet ei M $\kappa$ ; *add. interlin.* id est reliqui almucantar M $\kappa$ ; *add. interlin.* [illeg.] O $\alpha$  ei in] eum<sup>3</sup> E $\eta$  O $\zeta$  O $\xi$  O $\tau$  P $\mu$  P $\nu$  P $\rho$  (*add. interlin.* in) Q $\beta$  Q $\gamma$ ; eum in A $\alpha$  B $\eta$  B $\theta$  B $\iota$  C $\beta$  C $\delta$  C $\epsilon$  C $\zeta$  C $\eta$  C $\theta$  D $\gamma$  E $\alpha$  E $\delta$  E $\zeta$  E $\mu$  E $\nu$  E $\tau$  E $\upsilon$  L $\zeta$  M $\theta$  M $\kappa$  M $\lambda$  M $\nu$  N $\alpha$  O $\alpha$  O $\eta$  O $\kappa$  O $\sigma$  P $\alpha$  P $\gamma$  P $\lambda$  P $\rho$  P $\tau$  P $\upsilon$  R $\alpha$  S $\beta$  S $\theta$  S $\kappa$  S $\lambda$  V $\epsilon$  V $\alpha$  V $\beta$  (*add. interlin.* al' ei) V $\kappa$  V $\pi$  V $\sigma$  V $\upsilon$  V $\chi$  W $\beta$  W $\iota$  X $\alpha$ ; eum in *corr.* to ei in B $\gamma$ ; *add. interlin.* id est reliqui almucantaraz E $\nu$  eius] eius Q $\lambda$  almucantherat] al| almucantherath A $\alpha$ ; almucantherat E $\delta$  E $\nu$ ; almucantherath P $\lambda$ ; almucantheraz B $\kappa$  O $\alpha$  O $\eta$ ; almucantherath E $\tau$  P $\nu$  S $\delta$ ; almucantherath O $\xi$ ; almucantherath L $\epsilon$ ; almitantherat C $\theta$ ; almu<sup>ath</sup> E $\zeta$ ; almucantherath P $\alpha$ ; almucantherach X $\beta$ ; almucantherah P $\gamma$ ; almucantherat M $\theta$  V $\alpha$  V $\chi$  (*corr. from* almucantherat); almucantherath B $\theta$  E $\alpha$  E $\eta$  M $\delta$  P $\theta$  P $\phi$  V $\beta$  V $\nu$ ; almucantheraz E $\mu$  M $\kappa$  O $\kappa$  O $\sigma$  P $\psi$  Q $\alpha$  S $\beta$  S $\theta$  S $\lambda$  V $\epsilon$  V $\kappa$ ; almucantheraz C $\zeta$ ; almucanther~ P $\tau$ ; almucantherach N $\delta$ ; almucantherath F $\alpha$  O $\upsilon$  R $\beta$  S $\kappa$  V $\psi$  W $\iota$ ; almucantherath B $\epsilon$  B $\eta$  C $\iota$  E $\beta$  E $\upsilon$  L $\beta$  L $\gamma$  L $\eta$  M $\upsilon$  M $\phi$  N $\alpha$  O $\zeta$  O $\tau$  P $\delta$  P $\mu$  P $\rho$  P $\upsilon$  Q $\beta$  Q $\gamma$  V $\pi$  W $\beta$ ; almucantheraz L $\zeta$  M $\lambda$  R $\alpha$ ; almucantherath N $\epsilon$ ; almucantheraz C $\beta$  C $\delta$ ; almucantherat V $\iota$ ; almucantherath B $\zeta$  D $\gamma$  Q $\delta$ ; almucantherath B $\iota$ ; almucantherath C $\epsilon$ ; almucantherat F $\beta$ ; almucantherath W $\alpha$ ; almucantherath<sup>t</sup> E $\theta$ ; almucantherach R $\epsilon$ ; almucantherath F $\zeta$ ; almucantherath T $\delta$ ; almutanthera<sup>s</sup> V $\upsilon$ ; almu<sup>ath</sup> X $\alpha$ ; almu<sup>ath</sup> M $\theta$  P $\theta$  Q $\mu$ ; almutantherath M $\nu$  S $\iota$ ; almutantherath<sup>h</sup>z V $\sigma$ ; almutantherath M $\eta$  Q $\lambda$ ; almutantherath D $\eta$ ; almutantherath R $\delta$ ; almutantherath'ath B $\gamma$  C $\eta$
- 4 vocant] notant V $\epsilon$ ; *add.* eum in directo eius X $\alpha$  lune] *om.* A $\alpha$  B $\gamma$  B $\zeta$  B $\theta$  B $\iota$  B $\kappa$  C $\beta$  C $\delta$  C $\epsilon$  C $\zeta$  C $\eta$  C $\theta$  D $\gamma$  D $\eta$  E $\delta$  E $\zeta$  E $\mu$  E $\nu$  E $\theta$  E $\tau$  E $\upsilon$  L $\zeta$  M $\theta$  M $\kappa$  M $\lambda$  M $\nu$  M $\theta$  N $\alpha$  O $\alpha$  O $\eta$  O $\kappa$  O $\sigma$  P $\gamma$  P $\theta$  P $\tau$  P $\upsilon$  P $\phi$  P $\psi$  Q $\alpha$  Q $\mu$  R $\alpha$  R $\epsilon$  S $\beta$  S $\theta$  S $\iota$  S $\kappa$  S $\lambda$  V $\alpha$  V $\epsilon$  V $\kappa$  V $\nu$  V $\pi$  V $\chi$  V $\sigma$  V $\upsilon$  W $\iota$ ; hore R $\delta$ ; *add.* et L $\gamma$  V $\psi$  hore] *om.* P $\lambda$  P $\rho$  atque] *om.* A $\alpha$  V $\psi$ ; *erased* V $\kappa$  azimuth] adimuth Q $\beta$ ; amiuth P $\rho$ ; antimuth C $\zeta$ ; arimuth Q $\gamma$ ; arimuth *corr.* to azimuth O $\xi$ ; armivich *corr.* to azimuth W $\beta$ ; atimuth V $\nu$ ; aximuth P $\nu$ ; aximuth M $\nu$ ; azimuth C $\epsilon$  C $\iota$  V $\kappa$  X $\beta$ ; azimuth B $\zeta$  B $\eta$  B $\kappa$  C $\beta$  C $\delta$  C $\theta$  D $\gamma$  E $\theta$  F $\alpha$  F $\beta$  L $\zeta$  M $\theta$  M $\lambda$  O $\alpha$  O $\sigma$  O $\upsilon$  Q $\alpha$  R $\alpha$  S $\beta$  S $\lambda$  (*corr. from* azimuths) V $\alpha$  V $\chi$  (*corr. from* asimuth); azimuth E $\mu$  O $\kappa$  P $\psi$ ; azimuth V $\iota$ ; azsi [illeg.] E $\nu$ ; azum<sup>t</sup> V $\epsilon$ ; azumuh' X $\alpha$ ; azumut W $\alpha$ ; azurimrith N $\alpha$ ; gradus et minuta hore O $\eta$ ; *add.* inscribuntur V $\psi$ ; *add. interlin.* ut patet in tertia figura C $\delta$ ; *add. 2-line gloss* C $\zeta$  Sitque] *add.* etiam P $\gamma$  hec] *om.* B $\zeta$  B $\iota$  X $\beta$ ; ista R $\beta$  maior] *add. and del.* in P $\gamma$
- 4-5 Sitque ... alhantabuz] *om.* M $\nu$  maior tabula] *interlin.* C $\beta$ ; *om.* C $\theta$ ; *add.* id est rethi M $\eta$

<sup>3</sup> In some manuscripts, e.g., O $\tau$  and S $\delta$ , “eū” [eum] could actually be “ei ī” [ei in].



and the circles which follow directly from it, which are called “almucantars”, which the Latins call “the progressions of the sun” and “hours of the moon” and “azimuth”.<sup>4</sup> And this plate should be larger

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<sup>4</sup> Azimuths (lines of equal azimuth) mark angular distances (east/west) in reference to the observer’s zenith point overhead. From the Arabic, *al-sumūt* (السمت). See Kunitzsch, *Glossar*, no. 44, pp. 550-553.

5 tabula alhantabuz per quantitatem limbi. Et quod primum oportet te facere in hac figura facies scilicet circulum maiorem, et sit circulus ABCD et extrahe diametra eius

- 5 tabula] *add.* retis et Rε alhantabuz] rethis et alabut Eo; retis et alamabuch Pφ Sι; alamcabut Cβ; alamtabuz Cδ; alancabū Nα; alancabut Eμ Ev Mθ Ok Pψ Sθ Vχ; alancabuth *corr. to* alantabuth Vβ; rethis et alancabuth Bζ; alancabuz Lζ Oα Oσ Qα; alancabz *corr. in marg. to* alahantabuz Qμ; alancanbut Vε; alanchabut Dγ; rethis et alanchabuth Vν; alantabit Ev; alantabū Eδ; alantabut Oη Vν; alantabuth Cζ; alantabuz Aα Bθ Bκ Cθ Eζ Mλ Mo Po Pv Rα Vπ Wι; alanthabuz Mη; alatanbut Vα; alatantabuz Sλ; alcanbuz Sβ; alcantabum Rδ; alcantabut Eα; alchanchabuz Cε; alhan Pθ; alhancabuth Bη Bι Pτ; alhancabuz Mν; alhanchabuch Rε; alhantabu' Xα; alhantabuch Vκ; alhantabur Pv Pq; alhantabutz Bε Eη Oξ Oτ; alhantabuz Cι Eβ Fα Fβ Fζ Lβ Lγ Lε Mδ Mφ Mκ Nδ Oζ Ou Pδ Pλ Pμ Qβ Sδ Vι Vσ Vψ; alhanthabur Tδ; alhanthabuth Bγ Cη; alhanthabuz Pα Qγ; alhatabur Qδ Xβ; alhatabuz Rβ; alhaurabuch Wβ; alhautabuz Qλ Wα; alkantabuz Nε; allantabuz Pγ; almucantharat Sκ; ascanthabuth Dη; halhantabuz Eτ Lη; *add.* et rethis Pα(*marg.*); *add.* id est rethe alcantabut Eα; *add.* id est rethi Bε Cι Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mo Mφ Oα(*interlin.*) Oζ Oξ Oτ Ou Pα Pθ Pλ Pμ Pv Pq Qβ Qγ Qλ Rδ Sδ Vι Wα Xβ; *add.* id est rethi ahantabu' Xα; *add.* id est rethis Bκ Dη Lζ(*interlin.*) Nδ Nε Tδ Vψ limbi] sibi Eζ; *add.* id est mater *and add. in marg.* aliter ut est Ou; *add.* ut est mater Bε Bζ Cι Eα Eβ Eη Eo Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mν Mφ Nδ Nε Oζ Oξ Oτ Pα(*interlin.*) Pδ Pθ Pλ Pμ Pq Pτ Qδ Qλ Qμ Rβ Rδ Rε Sδ Tδ Vβ(*interlin.*) Vι Vν Vψ Wα Xβ; *add.* ut sit mater Fα; *add. interlin. and marg. gloss* Eμ quod] *om.* Bε Cε Cι Dη Eα Eβ Eδ Eζ Eη Eτ Fα Fβ Fζ Lβ Lγ Lη Mδ Mo Mν Mφ Nα Nδ Nε Oζ Pγ Pδ Pλ Pμ Pv Po Pv Qβ Qγ Qδ Qλ Rβ Rδ Sδ Sκ Tδ Vι Vψ Wα Xα Xβ; *marg.* Wι; hoc est quod Sβ quod ... facere] primum quidam Cδ Sλ primum] primo Dη oportet te] debet Xα te] *om.* Bζ Bη Bθ Bι Bκ Cε Eδ Eζ Eτ Fβ Lζ Pα Pγ Po Qδ Qλ Rα Rβ Rε Sβ Sκ Vε Vκ Wα Wβ; *marg.* Wι; se Sι hac] *om.* Pδ
- 5-6 quantitatem ... circulum] *om.* Ev 5-6 Et ... scilicet] Et primo Qα
- 6 figura] tabula Dη; *add.* ibi superius vides scilicet in predicta Bκ; *add. interlin. [illeg.]* figura Eα facies scilicet] *om.* Dη Eδ Pδ Pq Qδ Rβ; est ut facias Bγ Bζ Bη Cη Eo Pα Pτ Rε Sι(*add.* scilicet) Vβ(*corr. to* facias) Vν Wβ; facias Pφ; facies Cδ Cε Sλ Wι; scilicet Bε Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mν Mφ Nα Nδ Nε Oζ Oξ Oτ Ou Pθ Pλ Pμ Pv Pq Qβ Qγ Qλ Rδ Sδ Tδ Vα Vε Vι Wα Xβ; *add. interlin.* est quod Cβ circulum] *om.* Pv Pq; *add.* qui erit extremitas tabule Cζ maiorem] *add.* qui extremitas tabule est Mκ(*interlin.*); *add.* per extremitatem tabule Bζ Cι Eα Eη Eo Fα Fβ Fζ Lβ Lγ Lη Mδ Mη Mν Mφ Nδ Nε Oζ Oξ Oτ Ou Pα(*marg.*) Pδ Pθ Pλ Pμ Pv Pq Pτ Qγ Qβ Qδ Qλ Qμ Rδ Rε Sδ Tδ Vβ Vι Vν Vψ Wα Xα Xβ; *add.* qui extremitas tabule erit Eμ(*interlin.*) Oη et sit] sitque iste Re circulus] *add.* hic Bγ Cη Pα Wα; *add.* diametri scilicet Vε; *add.* maior Rε ABCD] abut Aα extrahe] *add.* hac Vε diametra] diametros Dη; diametrum Vν eius] *interlin.* Cβ

than the plate of the spider<sup>5</sup> [i.e., rete] by the width of the rim. And what you should first do in this figure, namely you will construct a larger circle, and let it be circle ABCD, and extend its diameters

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<sup>5</sup> See note to Cap. 11, line 14.

quousque se abscindant rectis angulis super E, eritque linea EA linea medii celi, et linea EB linea occidentis, et linea ED linea orientis; linea vero EC erit linea recessionis.

10 Postea pones punctum E cuspidem et facies circulum cuius dimidium diametri sit sicut dimidium diametri circuli Capricorni, quem fecimus in rethi, et est circulus

- 7 quousque] usque Sβ abscindant] abscindat Qγ rectis] retis Pφ; rectam Pγ; *add.* 4/quatuor Nε Vψ Xα angulis] regulis Eo; *add.* sit Vε E] 4 Nε lineā<sub>1</sub> ... celi] *marg.* Mκ lineā<sub>1</sub> EA] *om.* Pυ Xα EA] *om.* Bζ Bθ Vπ; *interlin.* Eδ; EGA Pγ; eius Sβ; ex linea Vε; *add.* illa Eδ EA lineā] E.A.L.M. ea Vψ lineā<sub>2</sub>] *om.* Bζ Cδ Eα Eo Vυ Sλ Xβ medii] ME *corr. in marg. to medii Nε(later hand); add.* diei Oα celi] *add.* vel meridiei Cε Dη
- 7-8 eritque ... EC] *marg.* Bε; et Eυ lineā EB] *om.* Eζ
- 7-9 eritque ... E] *om.* Eη
- 8 EB] DO Vε; EV Pφ lineā<sub>1</sub>] *om.* Bκ Eo Qα Vκ occidentis] occidentalis Cδ Cζ Nα Oη Pυ Pφ Rε Vα Vυ; *add. interlin.* al' occidentalis Vβ et ... orientis] *om.* Lβ ED] E<sub>o</sub> Pγ; CD Vε; *add.* erit Pρ lineā<sub>3</sub>] *om.* Aα Bγ Bη Bθ Bι Bκ Cδ Cη Dγ Eζ Eτ Lζ Mλ Mo Nα Po Qα Qδ Rβ Rε Sβ Sκ Vκ Vπ Wβ Xα; *interlin.* Pα lineā<sub>3</sub> orientis] *marg.* Oξ orientis] evenas Cθ; occidentalis Vι; orientalis Cζ Eμ Nα Oη Pυ Rε Vυ Pφ Sι; *add. interlin.* al' orientalis Vβ lineā<sub>4</sub> ... lineā<sub>5</sub>] *om.* Pρ vero] *om.* Vε EC] ET Xα; LR Vε erit] *om.* Bζ Eτ Fβ Mυ lineā<sub>5</sub>] *om.* Bζ Eτ recessionis] *crossed out* Pρ; medie nocte Bε; septentrionalis Fβ; *add. interlin.* septentrionalis Cβ; *add. interlin.* id est septentrionalis Mθ Vβ; *add. 9-line gloss* Cζ
- 9 Postea] Post hec/hoc *many*: Post Vε Postea ... E] *marg.* Bε pones] *om.* Lβ; pone Cδ Eo Mυ Rε Vυ; ponesque Oη punctum] *om.* Aα Bγ Bθ Bι Bκ Cε Cη Dγ Eτ Eυ Lζ Mλ Nα Pυ Qμ Rα Sβ Vε Vκ Vπ Wβ Wι; *marg.* Pα; *add.* super Vυ punctum E] *om.* Mo cuspidem] cupsides Mo facies] fac Cδ Sλ; faciem Vε cuius] eius Vυ cuius ... diametri] cuius medium diametrum Cε; eius dimidium diametrum Cη dimidium] *om.* Oη; medium Dη Mθ Oκ diametri] diameter Mδ; *corr. from* diameter Vβ
- 10 sit ... diametri] *om.* Mη Pγ Xα; *marg.* Qδ; *marg.* [illeg.] dimidium diametri Eδ sicut] *om.* Aα Bγ Bζ Bθ Bι Bκ Cε Cη Cθ Dγ Eζ Eυ Eo Eτ Eυ Mλ Mo Nα Pα Po Pυ Rα Sβ Vπ Vχ; *interlin.* Wι sicut dimidium] *interlin.* Cβ dimidium] *om.* Bζ Cθ Eυ Mυ; *interlin.* Lζ diametri] *om.* Eα Vχ; *corr. from* diameter Vβ circuli] *om.* Xβ; *repeated* Oτ quem] quid Mυ; quod Cζ Oη; quemadmodum Bζ Eo Eε Vυ; *corr. to* quemadmodum Vβ; o[mn]e (!) Po rethi] rete Cβ Cζ Cθ Eμ Mθ Pφ Pψ Oκ Sθ Sι Sλ Vα Vψ; *rete corr. to* reti Mκ; *rethe* Dγ Eυ Eυ Mυ Oα Oσ Qα Oη Vε Vπ Vυ Vχ Xβ; *reti* Bθ Cδ Vσ; *rheti* Rβ; directi Vκ circulus] *om.* Eυ

until they intersect at right angles at E, and line EA will be the line of mid sky, and line EB the line of the west, and line ED the line of the east; line EC, however, will be the line of recession.<sup>6</sup>

Next you will set point E as centre, and make a circle whose radius should be as the radius of the circle of Capricorn, which we made in the rete, and it is circle

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<sup>6</sup> I am not sure of the meaning of this term as used here. Obviously EA would be the midday (= "mid-sky") line, and EC would be the midnight line. In the *Practica*, Cap. 10 line 2 "recessionis" refers to the sun sinking in the sky after midday. Here, after midnight, it may mean that the sun is returning from the other side of the earth toward the east and dawn.

ZHTK. Deinde facies super hunc circulum alterum qui sit equalis circulo rethis prope eum. Post hoc divides eum per 360 divisiones et scribes in eo numerum sicut vides in hac figura. Fac etiam in ea circulum per quem vadit caput Arietis et Libre, sicut fecisti in rethi qui est circulus LMNS, et circulum Cancri qui est circulus GFQO. Et erit punctus A

- 11 ZHTK] CHTK Eα Xα; RHTK Rδ; SHTK Mν; THTK Vν; ZBCK Aα; ZHCK Bθ; ZH et TH Xβ; ZHETK Mη; ZHH Vε Deinde] Postea Rδ facies] faciemus Rε super] *repeated* Lβ; supra Po super hunc] *om.* Aα Bθ Ev Vπ hunc] *om.* Pλ Xα; istius Eα circulum] *twice* Vε alterum] aliud Bε; alium Qβ; *add. interlin.* circulum Vβ alterum ... rethis] *altet* Vν qui ... rethis] *om.* Cβ Cδ Cθ Ev Mν Oα Oσ Pφ Pψ Qα Sθ Sλ Vα Vν; *marg.* Pα(*partly cut off*) Vχ qui ... prope] *om.* Si circulo] arco Nα rethis] *re* | thetis Po; retis Bθ Eδ Nα Pγ Vψ; zechis Vκ; *add.* his Eζ
- 11-12 Deinde ... eum<sub>1</sub>] *om.* Cζ Mθ Mκ Oη Oκ Vσ
- 12 eum<sub>1</sub>] *om.* Bη Wβ;  $\bar{m}$  Vε; *add.* Hoc non oportet nisi(*om.* Cζ) ut dividatur una quarta eius ut supra docuit ad(et Cζ) hoc ut ex hoc circulo fiat circulus Arietis et si scribitur numerus, scribitur ita ut(quod Mκ) posset deoleri Cζ Eμ(*marg.*) Mκ(*marg.*) divides] dividemus Rε; pones divisiones Eδ eum<sub>2</sub>] *om.* Fα 360] 160 Pψ et scribes] *repeated* Eδ; et scribemus Rε in eo] *om.* Eβ; in eum Rδ vides] fides Mν; videmus Pγ Rε
- 13 hac] *om.* Bζ Bκ Eo Nα Vι Pυ Vν; predicta Pτ; sequenti Dη; sua Bε; *add.* superius Bκ; supposita Rε; *add. interlin.* scilicet presenti Vβ figura] *add.* vel non oportet Qα; *add.* precedentii Sι; *add.* predicta Pυ Fac] *om.* Sκ; Faciemus Rε; Facies Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mκ Mν Oα Oη Oκ Oσ Pφ Pψ Qα Sθ Sι Sλ Vα Vε Vν Vχ; Facit Nα; Arietis Bθ Mθ Vπ etiam] *om.* Dη Mθ Oκ Vε in ea] *om.* Wι ea] *eo many*; *add. interlin.* scilicet figura Vβ circulum] *om.* Qδ; circulum circulum Cζ; *add. interlin.* id est circulum equinoctiale Cβ per] super Vε vadit] *add.* cadit Eζ caput] cadit Rβ sicut] quemadmodum Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mθ Mκ Mν Oα Oη Oκ Oσ Qα Pφ Pψ Rε Sθ Sι Sλ Vα Vβ(*add. interlin.* in al' sicut) Vε Vν Vσ Vυ Vχ fecisti] *om.* Lβ Vε; fecimus Rε
- 13-14 in rethi] *om.* Qλ; *marg.* Wα
- 14 rethi] rethe Dγ Ev Ev Lε Mν Mν Mφ Oα Oη Oσ Pφ Pψ Qα Vε Vι Vυ; rete Cβ Cδ Cζ Cθ Eμ Mθ Oκ Pφ Sθ Sι Sλ Vα Vχ Vψ; reti Bθ Vπ Vσ; rete *corr. to* reti Mκ; rheti Rβ LMNS] FMNS Sι; LMRNS Sθ; LMVS Aα Bθ Sκ; QMNS Vν; QMNL Pφ; ZHTK Nδ<sup>7</sup> LMNS ... circulus<sub>2</sub>] *marg.* Oυ et<sub>1</sub>] *add.* fac Pα circulum] illum Eα GFQO] FGNO Vπ; FGQO Aα Bγ Bθ Bι Bκ Cε Cη Dγ Dη Eζ Eτ Ev Fα Lζ Mλ Mo Nα Pγ Po Pτ Pυ Qδ Rα Rβ Sκ Vκ Wβ Wι Xα; *corr. to* FGFQO Pα; FGQO Sβ; FGTQO Eδ; FGUT Vε; FQO Cι; GFAO Eo; GFKO Eα; GFLO Bζ Vν; GFQR Cβ; GSQO Pφ Sι; QR Nδ erit] *om.* Ev; *interlin.* Xβ; est Lε Vυ; dicitur Vε A] *om.* Bζ Nα Qλ; *interlin.* Wα; AC Vσ

<sup>7</sup> In ms Nδ there is no Figura 12, and the lettering here refers to Figura 13. The ZHTK in line 11 has been marked with erasure dots, while the QR in line 14 does not correspond to any lettering in Figura 13.

ZHTK. Then you will draw over this circle another one [*or over this another circle*], which should be equal to the circle of the rete, near to it. After this you will divide it into 360 parts and write in it [i.e., in each division] the number, as you see in this figure.<sup>8</sup> In addition draw on it the circle though which passes the head of Aries and Libra, just as you did on the rete which is circle LMNS, and the circle of Cancer which is circle GFQO. And point A will be

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<sup>8</sup> Although instructed to divide the Circle of Capricorn, these divisions are not used in the subsequent capitula; only the equivalent divisions of the equatorial circle are used. However, this may simply be a reflection of the instruction to divide the rim of the plate so that these divisions will appear in the final instrument. See Cap. 1.

There is also the possibility that one could use the divisions of the Circle of Capricorn, rather than the divisions of equatorial circle, in placing the stars in the rete since the divisions would be larger and easier to work with. Apparently this is a suggestion of Ibn al-Samḥ (see Samsó, *On Both Sides*, p. 426 note 465).

## 15 locus allidadath que est armilla reflexa.

15 locus] *om.* Cζ Eμ; punctus Rε allidadath] ab Vν; addadath Mη; alhaidith Oυ; alhalacht Mθ; alhlacath Nε; alhtatath Sι; alidadach Vπ; alidadanach Rε; alidadat Mλ; alidadath Bε Bθ Cε Eη Oξ Pυ Qδ Rβ; alidade Eα; alilacahlarateb Eν; alilachat Pψ; alilada Oα Oσ; alilamich Vε; alilarath Eο; alilatach Cζ; alilatat Oη; alilathat Cβ Eμ Sθ Vα; alilathât Cθ; allalachat Mκ; allialachat Oκ; alliba | ath Vψ; allibachach Wβ; allidacahe Cδ; allidachach Bη; allidact/ Nα; allidada Vυ Wι; allidadat Bκ Rα Sβ Vκ; allidadath Aα Bγ Bι Cη Dη Eβ Eδ Eζ Eτ Eυ Fα Fβ Fζ Lβ Lγ Lε Lη Mο Mυ Mφ Oζ Oτ Pα Pγ Pθ Pλ Pμ Pν Pο Pρ Qβ Qγ Qλ Rδ Sδ Sκ Tδ Vι Wα Xα Xβ; allidadach Vβ; alidade Mδ Pτ; allidatach aliladatath Bζ; allilacath Cι Pδ Pφ; allilachat Vσ Vχ; alliladat Lζ; alliladit Dγ; allilath Mν; allilathat Sλ; allithat Qα que] qui *some* est] *interlin.* Wι reflexa] re reflexa Lε; *add.* etc. Rδ; *add.* ut hic Pρ; *add.* ut patet in figura precedenti Fβ; *add. in marg.* Mφ:<sup>9</sup>

Signa	Gradus	Minuta
Aries	15	54
Thaurus	19	53
Gemini	27	52
Cancer	36	34
Leo	39	55
Virgo	[3]9	44
Libra	39	44
Scorpius	39	55
Sagittarius	36	34
Capricorn	[2]7	52
Aquarius	19	53
Pisces	15	58

Virgo 39] *ms* 29; Capricorn 27] *ms* 37

<sup>9</sup> This list in *ms* Mφ gives the rising times in oblique ascension of the zodiacal signs for a latitude of around 48°. The two corrections are necessary in order to preserve the symmetry of the table. These emendations were suggested to me by Julio Samsó, who also notes that there are systemic problems with the list since the oblique ascensions at the end of the signs are off, overall, by 10 degrees, i.e., the sum of the ascensions to the end of Virgo add up to only 175° rather than 180°, and to the end of Pisces to 350° rather than 360°. [Note: there is another such list, without minutes, in *mss* Mφ and Wα at the end of the next capitulum. See Cap. 13, line 21 apparatus criticus.]



the place of the “ring” [i.e., allidadath],<sup>10</sup> which is the armilla reflexa.

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<sup>10</sup> See the note to Cap. 4 line 27.

[ FIGURA 12 ]

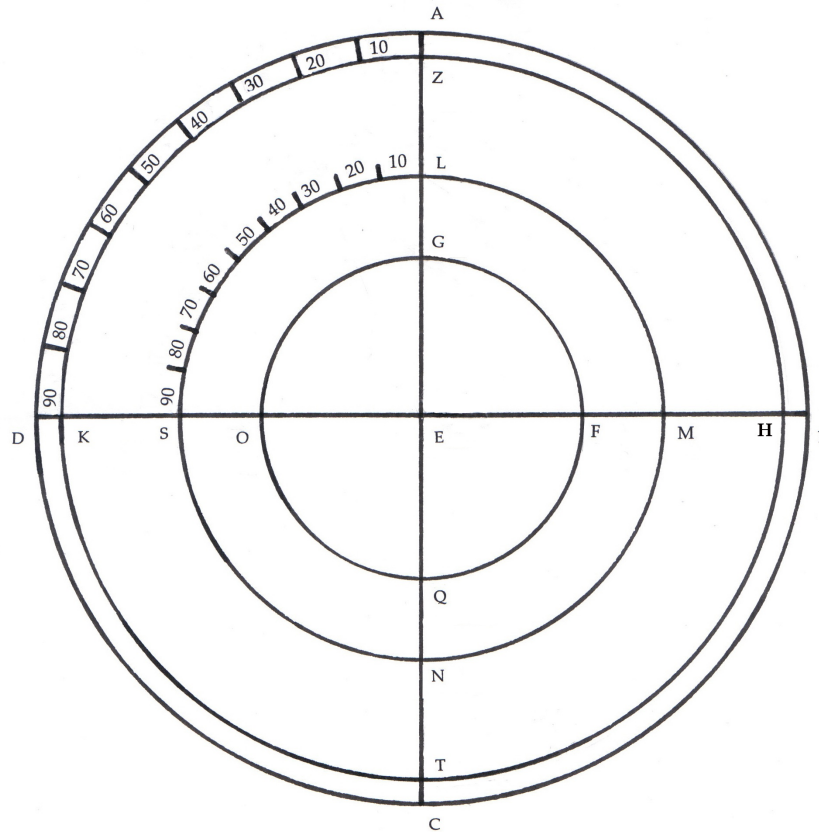


Figura inscriptionis hemispherii super latitudinem regionis /  
Figure of the inscription of the hemisphere at the latitude of the region

[Complete diagram] Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Ev<sup>11</sup> Eτ Ev Fα Fβ Fζ Lγ Lε  
Lζ Lη Mδ<sup>12</sup> Mη Mθ Mκ Mλ Mν Mo Mv Nε<sup>13</sup> Oζ Oκ Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pq Pτ Pv Pψ  
Qβ Qγ Qδ Qλ Qμ(fol. 155<sup>v</sup>)<sup>14</sup> Rα Rδ Rε Sβ Sδ Sθ Tδ Vα Vβ Vε Vi(fol. 332<sup>v</sup>) Vκ Wα Wi Xβ

<sup>11</sup> There are two diagrams in ms Ev. One is simply a quartered circle labelled A, B, C, D, E; the other is more complete and its lettering is given in the apparatus.

<sup>12</sup> The diagram in ms Mδ contains elements from Figura 17 or 18.

<sup>13</sup> The diagram in ms Nε contains the beginning elements of Figura 13, with no lettering. A complete Figura 13 follows on the next folio.

<sup>14</sup> The diagram in ms Qμ (fol. 155<sup>v</sup>) is not linked (like other diagrams) to the text. It also shows indications of the beginnings of Figure 13, which does exist separately.

[*Partial diagram*] Eο Vχ Wβ

[*Outline or space only*] Aα Bζ Bθ Cε Dγ Dη Eδ<sup>15</sup> Eζ Lβ Mφ Oα Pν Pφ Qα Rβ Vπ Vσ Vυ Vψ

[*No space*] Bα Bγ Cζ Nα Nδ<sup>16</sup> Oη St Sκ Sλ Vν Xα

Pθ: "L"

[*Caption*]

Figura ... regionis] Cη Cι Eη Fζ Lγ Oξ Oτ Pδ Pα Pτ Qβ Qγ Qλ Sδ; *om.* Bι Bκ Cβ Cδ Cθ Eμ Ev Lζ Mη Mθ Mκ Mλ Oσ Pλ Pψ Rα Rδ Sβ Sθ Vε Wα; [*cut off*] divisionis equinoctialis [*cut off*] almucantarach Bη; Figura descriptionis *plus long erasure* Rε; Figura divisionis equinoctii Vβ(*add. interlin. al'* equinoctialis); Figura divisionis equinoctialis Eτ Mν Mo Mυ Pγ Po Pυ Vι Wι; Figura divisionis equinoctialis per almucantarath Eβ Fα Lε Ou Xβ Tδ Vκ Wβ (almucantarath Wβ; almucantarath Fα Lε Ou; almucantarath' Xβ; almucantarath Eβ Tδ; almucantarach Vκ); Figura inscriptionis circuli hemisperii super latitudinem regionis et de divisione equinoctialis per almucantarath Oζ; Figura inscriptionis hemisperii super latitudinem regionis et de divisione equinoctialis per almucantarath Qμ; Figura inscriptionis tabule regionis *and* Figura tabule regionis Pρ; Figura preparationis tabule regionis et inscriptionis orizontis cum divisione equinoctialis per almucantarath Mδ; Inscriptione circuli hemisperii et divisione equinoctialis per almucantarath Lη; Hec figura pro almucantarath principio Oκ(*later hand*); Recapitulatio tabule propter facere aa almucantarath Eα; Tabula latitudinis Ev; *add.* Figura capituli 12 Bε inscriptionis] *add.* circuli Fβ Pμ hemisperii] orizontis Bε latitudinem] *om.* Qδ super ... regionis] *om.* Ne

[*Lettering on the diagram*]

A] Bε Bη Bι Bκ Cβ Cδ Cθ Cι Eα Eβ Eη Eμ Eτ Ev Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mν Mo Mυ Ne Oζ Oκ(*twice*) Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Vα Vβ Vε Vι Vκ Wα Wι Xβ; *om.* Cη Ev Fα B] Bε Bη Bι Cβ Cδ Cθ Cι Eα Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mν Mo Mυ Ne Oζ Oκ(*twice*) Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Vα Vβ Vε Vι Vκ Wα Wι Xβ; *om.* Cη; *cut off* Bκ C] Bε Bι Bκ Cβ Cδ Cθ Cι Eα Eβ Eη Eμ Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mν Mo Mυ Oζ Oκ(*twice*) Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Tδ Vα Vβ Vε Vι Vκ Wα Wι Xβ; *om.* Bη Cη Pτ; N' Ev; O' *corr. in later hand to* C Ne D] Bε Bι Bκ Cβ Cη Cθ Cι Eα Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mν Mo Mυ Ne Oζ Oκ(*twice*) Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Tδ Vα Vβ Vε Vι Vκ Wα Wι Xβ; *cut off* Bη Cδ Sθ E] Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mθ Mκ Mλ Mν Mo Mυ Ne Oζ Oκ Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Tδ Vα Vβ Vε Vι Vκ Wα Wι Xβ F] Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mκ Mλ Mν Mo Mυ Ne Oζ Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Tδ Vα Vβ Vε Vι Vκ Wα Wι Xβ; *om.* Mθ Oκ Pμ G] Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mκ Mλ Mν Mo Mυ Ne Oζ Oξ Oσ Oτ Ou Pα Pγ Pδ Pλ Po Pρ Pτ Pυ Pψ Qβ Qγ Qλ Qμ Rα Rδ Rε Sβ Sδ Sθ Tδ Vα Vβ Vε Vι Vκ Wα Wι Xβ; *om.* Eβ Mθ Oκ Pμ Qδ H] Bη Bι Bκ Cβ Cδ Cθ Eα Eβ Eμ Ev Eτ Ev Fα Lε Lζ Lη Mδ Mη Mκ Mλ Mν

<sup>15</sup> Ms Eδ contains other diagrams unrelated to the text.

<sup>16</sup> As indicated in the apparatus criticus, ms. Nδ bases the lettering in this capitulum on Figura 13.

Mv Oζ Ok Oσ Ou Pγ Πλ Po Pρ Pv Pψ Qμ Rα Re Sβ Sθ Tδ Vα Vβ Ve Vi Vκ Wι Xβ; *om.* Bε Cη Ci Eη Fβ Fζ Lγ Mo Ne Oξ Ot Pα Pδ Pμ Pτ Qβ Qγ Qδ Qλ Rδ Sδ Wα; B Mθ κ] Bη Bi Bκ Cβ Cδ Cθ Eα Eβ Eμ Ev Et Fα Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Oζ Ok Oσ Ou Πλ Po Pρ Pv Pψ Qμ Rα Re Sβ Sθ Tδ Vα Vβ Vi Vκ Wι Xβ; *om.* Bε Cη Ci Eη Fβ Fζ Lγ Ne Oξ Ot Pα Pγ Pδ Pμ Pτ Qβ Qγ Qδ Qλ Rδ Sδ Wα; D Mθ; F Ve; O Ev λ] Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eα Eβ Eμ Ev Et Ev Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ne Oζ Oξ Oσ Ot Ou Pα Pγ Pδ Πλ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Sβ Sδ Sθ Tδ Vα Vβ Ve Vi Vκ Wα Wι Xβ; *om.* Ok Pμ Re; T Mθ; *add.* z Bε Eη M] Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eα Eβ Eμ Ev Et Ev Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ne Oζ Oξ Oσ Ot Ou Pα Pγ Pδ Πλ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sθ Tδ Vα Vβ Ve Vi Vκ Wα Wι Xβ; *om.* Ok Pμ; H Mθ; *add.* H Bε Eη; *add.* T Oξ N] Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eα Eβ Eμ Ev Et Ev Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ne Oζ Oξ Oσ Ot Ou Pα Pγ Pδ Πλ Po Pρ Pτ Pv Pψ Qβ Qγ Qλ Qμ Rα Rδ Re Sβ Sδ Sθ Tδ Vα Vβ Ve Vi Vκ Wα Wι Xβ; *om.* Ok Pμ; K Qδ; R Mθ; *add.* T Bε Eη ο] Bε Bη Bi Bκ Cβ Cδ Cη Ci Eα Eβ Eη Eμ Et Ev Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ne Oζ Oξ Oσ Ot Ou Pα Pγ Pδ Πλ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sθ Tδ Vα Vβ Vi Vκ Wα Wι Xβ; *om.* Cθ Mθ Ok Pμ; B' Ev; E Ve Q] Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eα Eβ Eη Eμ Ev Et Ev Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ne Oζ Oξ Oσ Ot Ou Pα Pγ Pδ Πλ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sθ Tδ Vα Vβ Ve Vi Vκ Wα Wι Xβ; *om.* Mθ Ok Pμ σ] Bi Bη Bκ Cβ Cδ Cη Cθ Ci Eα Eβ Eμ Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mθ Mκ Mλ Mo Mu Ne Oζ Oξ Oσ Ot Ou Pα Pγ Pδ Πλ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sθ Tδ Vα Vβ Ve Vi Vκ Wα Wι Xβ *om.* Ok Pμ; B' Ev; G' Mv; κ Mθ; s Ev; *add.* κ Bε Eη; *add.* H Oξ τ] Bη Bi Bκ Cβ Cδ Cθ Eα Eβ Eμ Ev Et Ev Fα Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ok Oσ Ou Pγ Πλ Po Pρ Pv Pψ Qμ Rα Re Sβ Sθ Tδ Vα Vβ Ve Vi Vκ Wι Xβ; *om.* Bε Cη Ci Eη Fβ Fζ Lγ Ne Oξ Ot Pα Pδ Pμ Pτ Qβ Qγ Qδ Qλ Rδ Sδ Wα; c Mθ; i Oζ z] Bη Bi Bκ Cβ Cδ Cθ Eβ Eμ Ev Et Ev Fα Le Lζ Lη Mδ Mη Mκ Mλ Mv Mo Mu Ok Oσ Ou Pγ Πλ Po Pρ Pv Pψ Qμ Rα Re Sβ Sθ Tδ Vα Vβ Ve *(twice)* Vi Vκ Wι Xβ; *om.* Bε Cη Ci Eα Eη Fβ Fζ Lγ Ne Oξ Ot Pα Pδ Pμ Pτ Qβ Qγ Qδ Qλ Rδ Sδ Wα; A Mθ

## [Divisions of the circles]

Capricorn (ZK) divided: 10/20/.../90: Bi Bκ Eβ Eμ Ev Et Ev Fα Le Lζ Lη Mδ Mη Mθ Mκ Mλ Mv Mo Oζ Ok Oσ Ou Πλ Pρ *(all 4 quadrants)* Po Pv Qμ Rα Re Sβ *(all 4 quadrants)* Tδ Wι Xβ

10/20/30/40: Mu arc ZK] 5/10/15 Cβ; 10/20/30 Vi; 360 Pγ arc ZH] 5/10/15 Cβ; 10/20/30 Pγ divided but no numbers: Vβ

Equator divided: 10/20/.../90: Bη Bκ Eβ Eμ Fα Le Lζ Lη Mδ Mθ Mκ Mλ Oζ Ok Ou Πλ Pρ Qμ Rα Sβ Tδ Vκ Xβ 30/60/90: Bi divided but no numbers: Mo Wι

Neither divided: Bε Bη Cδ Cη Cθ Ci Eα Eη Ev Fβ Fζ Lγ Mu Ne Ot Pα Oξ Pδ Pμ Pτ Pψ Qβ Qγ Qδ Qλ Rδ Sδ Sθ Vα Ve Vκ Wα

## [Other information]

*add.* meridies Eα Ev Mδ Πλ Pρ Qλ *add.* oriens Eα Ev Lγ Mδ Ne Oζ Πλ Pρ Qγ Qλ *add.* occidentes Eα Mδ Ne Oζ Πλ Pρ Qγ Qλ *add.* o[ccidens] Lγ *add.* septentio Mδ Πλ Pρ *add.* equale latitudini Cη Lγ Ne Qλ; *add.* latitudo regionis Cη Lγ Ne Qλ Qμ Rδ; *add.* latitudo Qδ *add.* hemisperii Pρ; *add.* circulus emisperii Oξ *add.* linea recessionis id est angulus terre Eα *add.* [illeg. = residuum?] latitudinis Rδ *add.* Cancrī Pρ; *add.* circulus Cancrī Vβ *add.* Arietis Libre Pρ; *add.* ciculum equinoctialis id est Arietis et Libre Vβ *add.* Capricorni Pρ; *add.* circulus Capricorni Vβ

[Additions from Figure 13]

*Lines for drawing first almucantar added* : Bε Cι Eβ Eη Fα Fζ Lγ Lη Mδ Nε Oζ Oτ Pα Pδ Pλ Pμ Pτ  
Qβ Qγ Qδ Rδ Sδ Wα

*First almucantar (horizon) circle added*: Cι Cη Eβ Eη Fα Fβ Fζ Lγ Mδ Nε Oζ Oξ Oτ Pα Pδ Pλ Pρ Pτ  
Qβ Qγ Qδ Qλ Rδ Sδ Wα

*Almucantar lettering added*: Bε(L, M, N)

[CAPITULUM 13.]<sup>1</sup> DE INSCRIPTIONE ALMUCANTHARAT

Post hoc debes facere circulum hemisperii et circulos qui succedunt ei in directo,

- 1 De ... almucantharat] *om.* Aα Bα Bζ Bι Bκ Cβ Cδ Cε Cθ Dγ Eα Ev Eo Lζ Mθ Mκ Mν Nα Oα Oη Oκ Oσ Pγ Pφ Pψ Rα Sβ Sθ Sι Sλ Vα Vε Vκ Vν Vσ Vυ Vχ Xα; Capitulum scientia inscriptionis al~ Fβ(*marg.*); De al~ Pτ; De circulo emisperii quod est primum al~ Qα(*marg.*); De descriptione circuli emisperii et suorum al~ Bη Wβ; De formatione emisperii et al~ et cenith Rε; De inscriptione circuli(*superscr.*) emisperii ad al~ Mη; De inscriptione circuli (h)emisperii et al~ Bθ Ev Fα Pv Vβ Vπ(*add.* Rubricum); De inscriptione circuli emisperii seu orizontis Mo; De inscriptione circuli hemisperii seu orizontis et ipsorum al~ qui dicuntur progressiones solis et lune super ipsam tabulam latitudinis regionis Mδ Nδ; De inscriptione ipsius circuli hemisperii seu orizontis et ipsorum al~ qui dicuntur progressiones solis super ipsam (*add.* tabulam Lη Oξ) latitudinis regionis Lβ Lη Oξ Qγ; De invencione circuli emisperii Dη; Incipit opus Eμ(*marg.*); *add. in marg.* [*illeg.*] Cζ Eδ; *add. in marg.* Capitulum 13 Eβ
- 1 before De] *add.* Capitulum Bε Fβ Lε inscriptione] *add.* circuli Qβ almucantharat] almucant. Wβ; almicant<sup>r</sup> Eζ; almicantarath Rδ; almicantharat Eδ; almuc<sup>r</sup> Fα; almucantarath Bθ Eη Mλ Nε Ou Pδ Qβ Qδ Rβ Vβ Vψ Wα Xβ; almucanterath Sκ; almucantha[*cut off*] Pα; almucantha<sup>ac</sup> Bη; almucantharat Oζ Qγ Vι; almucantharath Eβ Ev Lβ Lγ Lη Mυ Mθ Nδ Oξ Oτ Pμ Pρ Pv Qλ Sδ Tδ Vπ Wι; almucant<sup>t</sup> Qμ; almucant<sup>r</sup> Po; almucantz Qα(*marg.*); almucatharath Cι Mδ; almuchantarach Bγ Pτ; almuchantarath Fβ(*marg.*); almuchantharat Eτ; almuchantharath Rε; almuchatarach Pτ; almuhantarath Bε; almukantarath Fβ; almunacantharath Fζ; almutantharath Lε Pθ Pλ; almuth Mη; almuthantharath Pv; *add.* Capitulum Cη Qλ
- 2 hoc] *om.* Bα debes] deberes Fζ debes facere] fac Bα facere] *add. and canc.* figuram Pα; *add. in marg.* in alia tabula super quam postea ponetur rethe Eα ei] *interlin.* Wι; *om.* Sκ; eum Sλ ei in] eum *corr. to* ei in Bγ; eum in Aα Bη Bι Bθ Cβ Cδ Cε Cζ Cη Cθ Dγ Eδ Eζ Eμ Ev Eτ Ev Lζ Mθ Mκ Mλ Nα Oα Oη Oκ Oσ Pα Po Pτ Pv Pψ Rα Vα Vβ(*add. interlin* al' ei) Vκ Vπ Vσ Vυ Vχ Vε Wβ Xα; in Pρ in directo] *marg.* Sλ directo] id est equidistanter Nε; recto Mν; *add.* eius Fβ; *add.* equidistant<sup>r</sup> Pτ: *add.* et equidistant Bε Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Lβ Mδ Mφ Mυ Nδ Oξ Ou Pα Pλ Pμ Pv Qβ Qγ Qλ Rβ Sδ Tδ Vι Wα Xβ; *add.* et equidistanter Qδ; *add.* et equidistantur Cε; *add.* et equidistent Mo Oζ; *add.* et qui distent Pρ; *add.* id est equidiscordantur Vκ; *add.* id est equidistant Bθ Vπ; *add.* id est (*add. interlin. vel*) equidistanter Vβ (*with deletion dots below*); *add.* id est equidistantes Sκ Xα; *add.* id est equidistantur Aα Bγ Bη Bι Cη Cι Dγ Dη Eδ Eo Eτ Ev Lζ Mη Mκ(*marg.*) Mλ Oτ Pδ Pv Qμ Rα Rδ Rε Sβ Vψ Wβ; *add.* id est equidistant Bκ Eζ Pγ Wι(*corr. to* equidistantes); *add.* id est equidistent Po; *add.* id est qui equidistant Bζ; *add.* id est rath equidistantur Pθ; *add.* vel equidistantii Nα
- 2-3 hemisperii ... circulum<sub>1</sub>] *om.* Sθ in ... almuthanthanth] *om.* Bα

<sup>1</sup> A number of manuscripts continue on from Capitulum 12 without a break.

[CHAPTER 13.] ON THE INSCRIBING OF THE ALMUCANTARS

After this, you ought to make the horizon and the circles which follow directly from it

qui sunt almucanharat. Ponesque circulum Capricorni, circulum ABCD, et abscindant se diametra super punctum E. Circulus vero Arietis et Libre erit circulus ZHTK, et

3 qui sunt] *om.* Ev Mv sunt] *om.* Dη; dicuntur Vv; vocantur Re; *add. interlin.* dicuntur Vβ almucanharat] almicantaraht Ev; almicantarat Bκ; almicantarat *corr. to* almucantarat Vχ; almicantarath Eδ Pλ; almicantaraz Cδ; almicanth Rδ; almicanharach Cε; almicanharath Xα; almichanharath Dη; almu' Vε; almucanharat Pα; almucanharath Eτ; almucanharach Cι; almucantarach Sβ; almucantarat Oκ Pψ Vα; almucantarath Bι Eα Eζ Mδ Mo Nα Ne Oη Oξ Ov Pv Pφ Qμ Rβ St Vβ Vψ Wι; almucantarath *corr. to* almuchanharath Qλ; almucantaraz Eμ Oα Oσ Qα Sλ; almucantazar Cζ; almicanth Fα Lη Pτ; almucanthanth *corr. to* almucanharath Bγ Nδ; almucanharach Re; almucanharat Cθ Eβ Fζ Pq Sκ; almucanharaz Lζ Mλ; almucantraz Cβ; almucatarath Bθ Vπ; almucatharath Aα; almuchantarath Fβ Mκ; almuchantarath Vv Qδ Wα; almuchanth' Eο; almutantarath Vσ Vυ; almutantarath Mv Po; almutanth Lβ Pγ; almutanharath Mη; almutha<sup>AC</sup> Bη; almuthanch' Bζ; almuthanthanth Cη; almuthanharath Pv Ponesque] pones Bζ Cβ Eδ Qλ; pones igitur Bα; *add. super* Bβ circulum<sub>2</sub>] *om.* Bα Bζ Cβ Cδ Qμ Sλ Vυ ABCD] ZHTK Qα abscindant] abscindunt Lε Pφ; abscindat Eα Ev Oκ Pq Vπ; abscindut(!) Qγ

3-5 Ponesque ... a] *om.* Nδ

4 se] *om.* Cζ Eζ Mv; *interlin.* Wι diametra] diametri Dη Eβ super] supra Eζ Eτ Fα Lβ punctum] puncto Eβ E] C Vε circulus<sub>1</sub>] *ms* Mγ resumes (*f.* 17<sup>ra</sup>) vero] *om.* Fα; autem Bε Mγ Vβ circulus<sub>2</sub>] *om.* Bα Bη; *add. and canc.* et Cη ZHTK<sub>1</sub>] EHTK Xα; LMNO Qα; RHTK Nα Rδ; XHTK Mη; .s. HTK Mv; ZHTBR *corr. to* ZHTK Wβ; *add.* divides per 360 Rβ

4-5 et<sub>2</sub> ... A] *om.* Aα Ev; et<sub>2</sub> ... ZHTK] *om.* Cε Eδ Eζ Eτ Mv Pγ Po Pv Sκ Vε Xα; dividens Bθ Vπ; et divide Wι(*add. in marg.* et<sub>2</sub> ... ZHTK); quem divides Nα



which are the almucantars. And you will set out the circle of Capricorn, circle ABCD, and the diameters should intersect on point E. The circle of [the beginnings of] Aries and Libra, on the other hand, will be circle ZHTK, and

- 5 punctus allidadath erit punctus A. Deinde divides circulum ZHTK per 360 divisiones. Postea pones arcum KL sicut latitudinem regionis, et arcum HM similem eius, arcum quoque ZG similiter.<sup>2</sup>
- 5 punctus<sub>1</sub>] punctum Dη; *add. in marg.* Ego Iohannes de Calomonte:<sup>3</sup> Multa ex exemplaria carent hac littera “Et punctus almucantarath erit punctus A. Deinde divides circulum ZHTK,” tamen est utilis et bona et non reputanda pro extrema. Vβ allidadath Bγ Cη Fβ Mφ Oζ Oτ Ov Pλ Pq Pτ Qλ Rδ Vι Wα Xβ; *corr. to* allila CATH Wβ; alarath Vv; alibarach Bζ; alidadarach Rε; alidadath Bε Eη Mu Qδ Rβ; alilacant Bα; alilacath Eα Ev; alilacaz Cζ; alilachacht Eo; alilachaz Oσ; alilarach Mγ; alilatahat Sθ; alilatat Cθ Oη Oκ(*corr. from* alilathat) Vυ Vχ; alilatath Eμ Pψ; alilath Vα; alilathal Cβ; alilathat Mθ; alilathaz Oα; alklathath Nε; alladadat Vκ; alliathat Mκ; allidada Mo; allidadat Bκ Fζ Rα Sβ; allidade Bι; allilacahe Cδ; allilacath Cι Eβ Fα Lγ Lη Oξ Pα Pφ Qγ Tδ Pμ Vψ; allilacaz Dη; alliladat Dγ Lζ Mλ; alliladath Bη Pθ; allilatath Lε Lβ Mη Pv Sδ; allilathat Sλ Vσ; allilathath Mδ Pδ Qβ; allilathaz Qμ; allitatch Sι; almucantarath Vβ; armille Qα erit] *om.* Mu Mφ Qα Vι punctus<sub>2</sub>] *om.* Bα Qα A] *add.* Immo/ymmo(Divides immo Ov) solam quartam ut in proximo apparet ut possint/possunt ex illa quarta(*om.* Ov) sumi omnes latitudines regionum Bη(*om.* ut<sub>1</sub> ... apparet; *add.* et suffit-) Cζ Eμ(*interlin.*) Mκ(*interlin.*; ut<sub>1</sub> ... apparet *crossed out*) Ov(*om.* ut<sub>1</sub> ... apparet) Deinde] *om.* Aα Ev Nδ; Post hoc Bα; circulum ZHTK] *om.* Ev Qα Wι; circulum Arietis et Libre scilicet ZHIK Nδ; *add. interlin.* equis[*illeg.*] Cβ; *add.* qui est Sι ZHTK] *om.* Pq; HTK Pμ; RHTK Rδ; THTK Vυ; XHTK Mη; ZHTLR *corr. to* ZHTK Wβ; Arietis ZT' Qα; ipsum Mo
- 6 Postea] Post hoc *many; om.* Bζ; *add. interlin.* al' Post hoc Vβ arcum<sub>1</sub>] *om.* Mλ Pτ KL] *om.* Eδ; BL Vι; HM in circulo equinoctiale Qα regionis] *add.* versus T Mη; *add. in marg.* adquam vis facere astrolabium per illam tabulam secundum illam regionem Eα arcum<sub>2</sub>] archum *several* HM] *illeg.* Vε; AKM Nα; KM Aα Nε; LBM Bα; YN Qα; *add.* est Fβ similem] consimilem Vπ eius] *om.* Bε Bζ Bη Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Nδ Oζ Oξ Oτ Ov Pα Pλ Pμ Pv Pq Qβ Qγ Qλ Rβ Sδ Tδ Vα Vπ Vυ Wα Xβ; ei Bα Cι Eδ Mη Mu Mφ Nε Pδ Pθ Qα Qδ Qμ Rδ Sι Vι Vψ Xα; eis Vε; *add. interlin.* al' ei Vβ; *add.* versus Z Mη
- 7 quoque] *om.* Bα Bη Cδ Sλ Vυ; *add.* tertium Qμ ZG] Z tertium (?) versus KZG Mη; LG Qα; RG Nα Rδ; TG Nε; TP Vυ; ZS Bη; ¶G Sι similiter] *add.* illi Rε

<sup>2</sup> Some mss (e.g., Wβ) treat *similiter* as the first word of the next sentence.

<sup>3</sup> See note to Cap. 7 line 9 (var.).

the position of the ring [i.e., allidath]<sup>4</sup> be point A. Then you will divide circle ZHTK into 360 divisions. Afterwards you will set arc KL in the same way as [i.e., equal to] the latitude of the region, and arc HM similar [i.e., equal] to it, and likewise arc ZG.

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<sup>4</sup> See note to Cap. 4 line 27 (English).

10 Postea iunges G cum H et abscondet diametrum AC super P, eritque punctus P punctus cenith capitem. Deinde iunges H cum L et abscondet diametrum AC super S. Postea iunges H cum M et extrahes HM quousque iungatur super N, eritque NS diametrum circuli hemisperii, quem divides per medium et facies partem circuli

- 8 Postea] *om.* Ev Vκ iunges] *om.* Qλ; *marg.* Wα G] *om.* Mv; GT Bι G cum H] G<sup>cum</sup> H *corr.* from G CH Pα; G cum M Qα et] *add.* dy[ametrum?] Mv abscondet] *illeg.* Eη; abscondes Bη Cε Cη Dη Eδ Eζ Mη Mo Ov Pγ Pv Po Pτ Wβ Wι Xα; abscondat Bε Cδ Sλ; abscondent Dγ Qα diametrum] *om.* Bζ AC] AT Aα Bι Eδ Fβ Lβ Lζ Mλ Mφ Oξ Pθ Pλ Pμ Pv Po Qβ Qγ Qλ Rα Sδ Wβ Wι Xα super] *add.* punctum Eμ P<sub>1</sub>] B.P Bζ; E Mv; F Ev; P scilicet Lβ eritque] *marg.* Wα; erit Nδ eritque punctus P] *om.* Oη punctus P] *om.* Wι P<sub>2</sub>] *om.* Fβ; C Oζ; F Ev; scilicet P Cβ Oα
- 8-9 eritque ... punctus] post hoc iunges A *with erasure dots*; *add.* pones Vε eritque ... s] *om.* Cε Eη P ... cenith] CE Ne
- 9 punctus] *om.* Bα Bγ Bε Bη Cδ Cη Dη Eτ Mθ Pτ Rβ Sκ Sλ Vε Vσ; puncto Pγ punctus ... s] *om.* Eη cenith] *om.* Fα; cenich Oκ Xβ; cenith Cβ; cenit Bα Cθ Dγ Lζ Oσ Pλ Pφ Rβ Vε Vχ; cen<sup>t</sup> *and add.* in *marg.* zen<sup>t</sup> capitem Bη; cent Ev; cerath *corr.* to cenit Oξ; zenith Bε Pq Vα capitem] *om.* Bα; capitis Pλ Pq; *add.* 4-line comment/gloss Cζ Deinde] Post Bα; KC. Inde Nα Deinde ... s] *om.* Qα iunges] *om.* Dη Vσ H] K Nα L] A Vε abscondet] abscondat Bε Cδ Pq; abscondes Wβ; scindet Bα AC] AT Eβ Eδ Fβ Mφ Nδ Oζ Oξ Oτ Pα Pδ Pθ Pλ Pq Qβ Qγ Qδ Qλ Sδ Vε Vι Wα Xα; HC Aα Lγ Lη Pv Vv super] *om.* Eζ; *add.* punctum Cδ s] B Nα; C Vε; F Pφ; G Vα; G *corr.* to S Pθ; P *corr.* to S Aα
- 10 Postea] Post hoc *many*; Deinde Bγ Eτ Pτ Sκ iunges] iunge Mv; coniunges St Vv; *ms* Oφ *begins* H cum M] A cum G Vε et ... HM] *om.* Nα Rα extrahes] extrahe Cι Eα Qλ; extrahe *corr.* to trahe Pq; prodendes(!) Bα HM] AG Vε; CA Mθ Oα Sθ Vv; CA *corr.* to lineam HM Eμ; CA *corr.* in *marg.* to MH Sλ; lineam CA Cζ Oκ; H in directo Fβ; HM et CA/AC Bα Mκ Rε; M Pψ; MA *corr.* to HM et AC Vχ; MH Cδ Cθ Ev Eo Sι; MH et AC Mγ; MH et cum HC Bζ; MH et HT Vv; MH *and add.* *interlin.* et AC Cβ; TA Mv Oσ; *add.* et dyametra AC Qμ; *add.* et diametra AS Mη; *add.* et AC Vσ; *add.* in *marg.* et HC in alia cum TA Vβ HM [et AC] quousque] *marg.* Mκ quousque] donec Bα quousque iungatur] cum AC Pφ iungatur] coniungatur Bε; iungantur Mη Pq; iungam Aα; *add.* in sumitate protracti diametri Qα; *add.* MH cum AC Bα Bζ Mγ Vv super] cum Dη N] *om.* Lβ; eum Mv; H Cδ; K Pv; S Oζ; V Qα NS] MS Vε; NG Oη; NF Pφ; NG Mv; NR or NT Sκ; VS Qα; S<sup>m</sup> Pq
- 11 diametrum] *add.* <sup>va</sup> AC super S. Postea iunges K cum M et extrahe HM<sup>cat</sup> Ne(= lines 9-10) circuli,] *om.* Bε Eη Qα hemisperii] e emisperii Bζ quem] quam Dη Mη Xα; quod Eα divides] dividimus Eα per medium] *om.* Mκ partem] *om.* Lγ

Afterwards you will join G with H and it will cut diameter AC at P, and point P will be the point of the zenith overhead. Then you will join H with L and it will intersect diameter AC at S. After this you will join H with M and extend HM until it is joined [with the diameter] at N, and NS will be the diameter of the horizon, which you will divide in half and make part of a circle

abscindentem circulum Capricorni super puncta V, F, et est arcus, scilicet VSF; quod si hec pars abierit super punctos H, S, K iam invenisti et opus certissimum est. Si vero aliter fuerit, errasti; reitera ergo opus.

- 12 abscindentem] *add.* quam circuli absindentem Bζ circulum] partem Nα puncta] *om.* Bη; *add. interlin.* C Bθ V, F] C, N, F Vπ; M, S Pq; N, F Cε Ev Nε Sκ; V, S Cη Oσ Pφ et ... VSF] *om.* Oη est] erit Fβ Pλ; si Dη arcus] arcus vel pars Pδ Pθ Rδ; pars Cζ Cε Cθ Eη Eμ Ev Mθ Mκ Mv Oα Oκ Oσ Pψ Sθ Sι Vα Vσ Vv; pars *corr.* to arcus Sλ; pars eius Qα; pars illa Bγ Bη Bθ Bκ Cη Dγ Dη Eδ Eζ Et Ev Lζ Mλ Mo Nα Oφ Pγ Po Pτ Pv Rα Re Sβ Sκ Vε Vβ Vi Vκ Vπ Vχ Wβ Wi Xα scilicet]<sup>5</sup> *om.* Bα Be Bθ Cβ Cδ Cθ Eη Eμ Ev Eo Fα Mγ Mδ Mθ Mκ Mv Nδ Oα Oκ Oσ Oφ Pμ Pq Pφ Pψ Qα Qγ Re Sδ Sθ Sι Sκ Sλ Vα Ve Vv Vπ Vσ Vv Xβ; *erased* Bθ; *N or enim* Vψ; *secundum* Nα; *add.* Arietis Pτ scilicet VSF] .SV.SF. Aα; vel pars scilicet MVSF Nε VSF] EV Lβ; F Bζ; FB Lγ Tδ; FNV Mφ Mv Pμ Vi; FSV Be; FV Eα Eβ Eη Fζ Lη Mδ Oζ Oξ Ot Pα Pv Qδ Rβ Sδ; FVN Pλ; MFS *and illeg. corr.* Pq; NSF Eδ Ev Po; NV Fβ Qλ Wα; NVS Bη; NVSF Cι Pδ Rδ; NVST Wβ; PSF Vπ; SFV Qγ; SV Mδ Nδ(*add. in marg.* F = FSV); SVF Sκ; V Qβ; VF Et Sθ; VLF Ve; YZT Qα quod] *illeg.* Be; et Mκ Pθ Qβ Sδ
- 12-13 quod ... pars] *om.* Dη
- 13 hec] *om.* Qλ pars] *om.* Bγ Bη Cη Pτ Sκ Wβ; *add.* circuli emisperii Bα Bζ Mγ Re Vv abierit] *corr.* to abscinderit Wα; ab'icerit Xβ; abiecerit Oφ(*add. in marg.* al' abscinderit) Vε; abhierit Qα; hierit Bα Fβ; absciderit Bγ Bι Cι Lζ Mo Mv Mφ Nε Vi Vκ; abscidet Bη; abscinderit Aα Bθ Bκ Cε Cη Dγ Eδ Eζ Et Ev Mη Mλ Nα Pδ Pθ Po Pτ Pv Qδ Qμ Rβ Rα Rδ Sβ Sκ Vβ Vψ Wi Xα; abscindit Pγ Vπ Wβ; obierit Pφ; *add.* circulum emisperii Pφ H S K] HCK Ve; HGK Vσ Vv; HK Be Eη; HLK Sκ; HSHK Eζ; M et S Qα iam ... et] *om.* Bα est] *om.* Eo; et est primum almucantaraz scilicet orizon Qα vero] *om.* Qα; autem Be vero ... fuerit] non autem Bα aliter] alibi Eo Mγ Vv
- 13-14 Si ... opus] *om.* Mv
- 14 fuerit] *om.* Mo Mv Mφ Qα Vi; facies Ve; invenisti Eα; *add.* iam Cβ Cδ Cθ Eμ Ev Eo Mγ Mθ Mκ Oα Oη Oκ Oσ Oφ Pθ Pφ Qα Sθ Ve Vv Vv Vχ reitera] *blank* Nα reitera ergo] et iterabis Sι; et reiterabis Bζ Mγ Pφ Vv; et reiterabis igitur Cδ; itera Eα; perterea(?) Sθ ergo] *om.* Bα Cβ Cζ Cθ Eμ Eo Mθ Mκ Oα Oη Oκ Oσ Oφ Pψ Qα Vα Vv Vχ opus] *add.* donec invenisti Fβ; *add.* tuum Dη Xα

<sup>5</sup> *Scilicet* abbreviated can be confused in some mss as part of VSF. When s precedes VF, I generally treat it as *scilicet*.

intersecting the circle of Capricorn on points V and F, and it is this arc, that is VSF; because if this part [i.e., arc] falls on points H, S, K, you have now found [the horizon] and the work is extremely accurate. If, however, it is different, you have erred; therefore, repeat the work again.

15 Postea abscondes ex puncto M versus Z arcum ex tribus gradibus vel 10 vel quotquot vis, et est arcus MR et arcus LQ similiter.<sup>6</sup> Postea iunges H cum Q et abscondet

- 15 Postea] Post hoc non Re abscondes] abscondas Bε; abscondens Pα Xα ex<sub>1</sub>] a Bε Bζ Ea Eβ Eη Eo Fa Fβ Fζ Lγ Lε Lη Mγ Mδ Mu Mφ Nδ Oζ Oξ Ou Pa Pl Pμ Pv Pq Qβ Qδ Ql Rβ Sδ Tδ Vι Vv Wα Xβ; de Lβ ex puncto] om. Cε M] marg. Eo; H Qα versus] super Ea; usque ad Lη; add. arcus Dγ; add. punctum Bε Bη Cι Ea Eβ Eη Fa Fβ Lβ Lγ Lη Mδ Mu Mφ Nδ Oζ Oξ Oτ Ou Pa Pδ Pθ Pl Pμ Pv Pq Qβ Qγ Qδ Ql Rβ Rδ Sδ Tδ Vι Vψ Wβ Wα Xβ Z] om. Mη Vπ; ZG Aα; K Nα; L Qα; R Mγ Rδ; T Sκ Vv; scilicet Mv; et Bζ arcum] om. Pθ Rδ Vψ Wβ; add. et est Nα arcum ... gradibus] arcum DZ corr. to ex 3<sup>bus</sup> gradibus Wα ex<sub>2</sub>] om. Eζ Wι; et ex Cι ex<sub>2</sub> ... vel<sub>2</sub>] erased Pq tribus] 3 / 3<sup>bus</sup> many; 30 BγCη; quibus Bζ Mδ Mλ; add. in marg. id est spacium almucantarath quarum quilibet valitur unam vel 2<sup>am</sup> vel 3, secundum quantitatem tabule secundum quod volueris eam dividere per gradus Ea 10] decem Cε Oη Pl Pφ Wβ; x Cθ Eo Ev Oα Pψ Qδ Rβ Vχ; ex corr. to 10 Mκ; 5 vel 10 Dη; add. in marg. quamvis dicunt omnem 8.10. transcendo 4 Vβ vel<sub>2</sub>] om. Cζ Eζ Xα; aut Ev
- 15-16 vel<sub>1</sub> ... vis] id est x vel ib(?) vel quod volueris Bζ; in 4 secundum quod volueris Ve
- 16 quotquot vis] quantam volueris Ev; quod volueris Oφ Sκ; quot volueris Bα Bγ Cβ Cδ Cζ Cη Cθ Eμ Eo Et Mγ Mθ Mκ Mu Oα Oη Ok Oσ Pφ Pψ Qα Re Sθ Sι Sλ Vα Vβ Vv Vπ Vσ Vv Vχ; quotque vis Vκ; quotquo vis Mη; quotquot volueris Aα Bθ Bι Dη Ev; quot vis Bη Cι Ea Eη Pτ Pv Wβ Wι; quovis Nα; tot quot vis Rδ; add. interlin. al' quotquot Oφ vis] add. quod almucantaraz contineat Qα est] sit Bγ Cη Et Qα Re Sκ; add. eius Cζ arcus<sub>1</sub>] archus Lβ arcus<sub>1</sub> ... et<sub>2</sub>] om. Vα MR] CYR Vκ; HR Nα Qα; MK Cζ Mθ Oη Ok; ML Pv; MN Cε; ON Bη(add. later MR) Wβ; erased, add. interlin. NOZ Pq; add. in marg. Ego Iohannes de Calomonte:<sup>7</sup> Quasi omnia exemplaria carent hac littera "Et similiter totidem ab L versus K. Et est arcus LQ. Et hunc loco illius littere sit "Et arcus LQ similiter"(add. interlin. [illeg.] scilicet ex alia parte). Sua littera prima est clarior pro rudibus. Vβ MR ... similiter] MR et hunc ABL versus K et arcus LQ similiter Bε; ML et similiter accipiatur LQ Bα; MR et similiter totidem ab L versus K est arcus LQ Vβ; MR et TO idem ab L versus K et est arcus LQ. Similiter Mγ; MR et totidem AB versus et est arcus LQ similiter Bζ; MR et totidem ABL versus LZ et est arcus LQ similiter Pτ; MR et totidem ab L versus X et est arcus LQ similiter Vv; MR et totidem ABL versus Z est arcus LQ similiter Eo; MR totidem ab L versus Z et sit arcus LQ similiter Re et<sub>2</sub>] id est Cε et<sub>2</sub> ... similiter] canc. Bε; LQ similiter Vσ arcus<sub>2</sub>] om. Bγ Cη Sκ LQ] HQ Pq; IO Vε; LA Xβ; LK Vψ; LKQ Cε; MQ Oη; NQ ex alia parte Qα Postea] Post hoc many H cum Q] A cum Q Vε; H cum V Nα; M cum Q Qα abscondet] abscondat Pv; abscondes Cζ Cθ Ev Mκ Mo Oα Oη Ok Oσ Oφ Pψ Qα Qβ Vα Vσ Vχ; scindet Bα

<sup>6</sup> In some manuscripts, e.g., Mφ, *similiter* is written as the first word of the next sentence.

<sup>7</sup> See note to Cap. 7 line 9 (var.).



After this, you will cut off from point M towards Z an arc of 3 degrees, or 10, or as many as you wish, and this is arc MR and similarly arc LQ. Afterwards you will join H with Q and it will cut

diametrum super I;<sup>8</sup> deinde iunges H cum R et extrahes lineam donec abscindat diametrum super O. Post hec divides OI per medium et facies partem circuli

17 diametrum] *add.* AC Bα Bζ Bη Dη Eο Fζ Mγ Pφ Rε Sθ Sι Vβ Vν; *add.* AIT Vσ; *add.* NC Cβ Cθ Eα Eβ Fα Fβ Lβ Lγ Lε Lη Mδ Mκ(*interlin.*) Nδ Nε(*or* NT) Oζ Oτ Oυ Pμ Qβ Qγ Qδ Qμ Rβ Tδ Wα Wβ Xβ; *add. interlin.* scilicet NC Vχ; *add.* NS Bε; *add.* NT Cι Eη Mη Mθ Mυ Oξ Pγ Pθ Pλ Pμ Vψ Wδ Xα; *add.* lineam TD PQ; *add.* UT Pδ super I] *om.* Mo; super N *corr.* to NC super N Sλ; similiter N Bα I] H C super N Cδ; Π *or* II Aα Cβ Cζ Cθ; IO Vε; A Bη; C Bθ; L Lγ; N Bζ Mγ Mθ Mν Oα Oη Oκ Oσ Pφ Pψ Sθ Vα Vν Vυ; N *corr.* to I Mκ; O Vπ; TL Eν; v Eυ; *add. interlin.* scilicet punctum diametri Vχ H] *om.* Mν Vσ H cum R] B cum K Vε; M cum K Qα R] K Bκ Mθ Oη Oκ; L Bα; M *corr.* to R Eδ; N Vπ; T Mν; Z Bη Wβ extrahes] extrahas Fζ Lη; protrahes Bα; *add.* diametrum Nε; *add. interlin.* protrahes Vχ lineam] *om.* Fβ; lineas PQ; litteram Bζ abscindat] *illeg.* Eη; abscindant Vσ; abscindas Bη; abscindes Mθ Oκ Wβ; abscindet Aα Bθ Bι Cε Cι Dγ Dη Eζ Eμ Eτ Eυ Lζ Mη Mλ Mo Nα Pγ Pδ Pθ Po Pυ Pψ Qδ Rα Rβ Sβ Vα Vε Vπ Vψ Xα; abscindet *corr.* to abscindat Mκ; abscindetur Bγ Cη Pτ; scindat Eα

17-18 deinde ... O] *marg.* Cθ

18 diametrum] *add.* AC Cζ Eμ Eο Eτ Mθ Mν Oα Oη Oκ Oσ Pτ Pψ Sθ Sι Vα Vν; *add.* AC *corr.* to NC Mκ Sλ; *add.* AN Bα Bζ Mγ Pφ Rε Vβ(*add. in marg. in al' MT*) Vν; *add.* Hs Cδ; *add.* NC Cβ Cθ Eν Oφ Rδ Vχ; *add.* NS Bε Bη Cι Dη Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Qβ Qγ Qδ Qλ Qμ Rβ Sδ Tδ Vι Vσ Vψ Wβ Xα Xβ; *add.* TA PQ; *add. interlin.* vnc Bθ O] *om.* Eζ; D Bζ; OI Qδ O ... divides] *om.* Vψ hec] *om.* Sκ OI] *om.* Wα; OC Oφ; OH Cδ; OII Bη Cβ Cζ Cθ Eζ Mλ Pγ Vν; ON Bα Bζ Bθ Bκ Eδ Eμ Lζ Mγ Mθ Mν Nα Oα Oη Oκ Oσ Po Pυ Pφ Pψ Qμ Rα Sθ Sλ Vα Vε Vκ Vν Vπ; OR Rδ; OV Eυ; H.Q.TI.R Eν; *erasure, add. interlin.* YI PQ per medium] *om.* Bκ; *marg.* Cζ et] A Vε facies] fac Bα Qα partem] *om.* Qα; *repeated* Qδ

<sup>8</sup> The character used in the diagram and/or text of some manuscripts resembles a conjoined double-I, or the Greek letter Π, which can later morph into a lower-case N. The same occurs at line 17 (OI).

the diameter at I; then you will join H with R and extend the line until it cuts the diameter at O. After this you will divide OI in half and make part of a circle

20 abscindentem circulum Capricorni super punctos  $\gamma$ ,  $\chi$ , et est arcus  $\gamma\chi$ . Similiter non cessabis facere donec pervenias ad punctum cenith capitum, scilicet  $P$ , secundum quod

19 abscindentem] scindentem  $B\alpha E\zeta$  circulum] partem circuli  $C\zeta$  circulum ... punctos] *om.*  $C\epsilon$  super] *om.*  $D\gamma$  super punctos] *om.*  $B\gamma C\eta E\delta E\zeta E\tau M\theta P\gamma P\theta R\alpha V\epsilon$ ; *interlin.*  $B\iota$ ; in  $X\alpha$  super ...  $\gamma\chi$ ]  $\gamma\chi$   $S\kappa$  punctos] puncta *and add. interlin.* al' punctos  $V\beta$   $\gamma$ ,  $\chi$ ]  $ISX M\eta$ ;  $IX P\nu$ ;  $PT M\theta$ ;  $VF V\kappa$ ;  $VX S\beta$ ;  $\gamma B\eta$  (*add. in marg.* super punctos  $\gamma$ ,  $\tau$ );  $\gamma\chi B\iota E\delta E\zeta E\tau L\beta L\zeta M\theta M\lambda P\theta P\nu Q\mu R\alpha V\beta$ ;  $\gamma n \chi D\gamma$ ;  $YNX V\pi$ ;  $YNX$  *corr.* to  $\gamma\chi V\chi$ ;  $YOX O\phi$  (*add. interlin.* al. 1);  $YT B\alpha C\delta C\zeta E\mu M\gamma M\nu O\alpha O\eta O\kappa O\sigma P\phi P\psi Q\alpha S\theta S\lambda V\alpha V\nu V\nu$ ;  $YTH E\nu$ ;  $YTX V\epsilon$ ;  $\gamma\chi$  *corr.* to  $VNX C B\theta$ ;  $YZ F\beta F\zeta Q\lambda W\beta$ ;  $YZ$  *corr.* to  $\gamma\chi W\alpha$  et ...  $\gamma\chi$ ] *om.*  $B\eta$  (*add. in marg.* sunt punctos  $\gamma\tau$  et est  $\gamma\tau$ )  $B\theta$  (*add. in marg.* ex pars  $YNX$ )  $C\eta L\beta O\eta O\phi R\delta V\pi$  (*add. et expones*)  $W\iota$  arcus  $\gamma\chi$ ] arcus  $\gamma\chi$   $P\theta$ ; arcus  $\gamma\tau$  et  $\chi P\lambda$ ; pars ill' as  $VSF V\kappa$ ; pars  $INT P\phi$ ; pars  $YCRX M\eta$ ; pars  $PNT M\theta O\kappa$ ; pars  $VIX N\alpha$ ; pars  $YAX Q\delta$ ; pars  $YEX S\beta$ ; pars  $YHT C\delta$ ; pars  $\gamma\chi B\iota B\kappa C\epsilon P\gamma Q\mu R\alpha V\beta$  (*add. interlin.* scilicet totius circuli); pars  $\gamma\chi C\beta C\theta$ ; pars  $YNT B\alpha B\zeta C\zeta E\mu M\gamma M\nu O\alpha P\psi S\theta S\lambda V\alpha V\nu$ ; pars  $YNX D\gamma E\theta$ ; pars  $YT V\nu$ ; pars  $YTLQ E\nu$ ; pars  $YTX P\theta V\epsilon$ ; pars  $YUT O\sigma$ ; pars  $\gamma\chi A\alpha C\iota E\delta E\nu M\nu M\phi N\epsilon P\delta P\theta S\iota V\iota V\psi X\alpha$ ; pars  $\gamma\chi V\chi$ ; pars  $YZ F\beta Q\lambda W\alpha$  (*corr.* to pars  $\gamma\chi$ ); pars  $YZT Q\alpha$ ;  $\gamma\chi V\sigma$  Similiter] *om.*  $F\beta N\epsilon Q\lambda W\alpha$ ; sic  $V\epsilon$ ; *add.* faciendo  $Q\alpha$ ; *add.* vero  $O\eta$ ; *add.*  $N$  fanen  $D$  perveni quod ipsem eo que arcus  $XL$  est quarta noctem est esse equalis sit  $M\eta$ (?) non] nec  $F\beta Q\lambda$

19-20 non cessabis facere] fac  $B\alpha$

20 cessabis] cesses  $Q\alpha$ ; *add.* hoc  $B\epsilon E\alpha E\beta F\alpha F\beta L\beta L\epsilon M\delta M\nu M\phi N\delta O\zeta O\xi O\nu P\alpha P\mu P\nu V\iota X\beta$  pervenias] perveniat  $F\zeta$ ; veniat  $B\alpha$ ; venies  $E\zeta$  ad punctum] a puncto  $V\kappa$  punctum] *om.*  $B\alpha$ ; *add.*  $F S\iota$ ; *add. illeg.*  $M\eta$ ; *ms*  $R\beta$  ends cenith] canich  $O\kappa$ ; cen<sup>t</sup>  $B\eta$ ; cenich  $A\alpha X\beta$ ; cenit  $B\alpha C\theta D\gamma E\nu E\theta L\zeta O\alpha O\sigma O\nu P\lambda P\tau V\nu S\lambda V\chi$ ; cenithe  $E\zeta$ ; cenitht  $P\theta$ ; chenith  $N\delta$ ; cinich  $C\iota M\kappa$ ; tenich  $V\sigma$ ; zenith  $B\epsilon P\theta V\alpha$  capitum] *om.*  $B\alpha$ ; capite  $T\delta$ ; capitis  $E\beta L\gamma L\eta M\delta M\phi O\zeta O\xi O\tau O\nu P\lambda P\mu P\theta Q\beta Q\gamma Q\delta S\delta W\alpha X\beta$  scilicet  $P$ ] *om.*  $C\beta C\delta C\zeta C\theta E\mu E\nu E\theta M\gamma M\theta M\kappa M\nu O\alpha O\sigma P\psi S\theta S\iota S\lambda V\alpha V\epsilon V\pi V\sigma V\nu V\chi$ ; *interlin.*  $O\phi$   $P$ ]  $FP A\alpha$ ;  $FP$  *corr.* to  $P B\theta$ ;  $\gamma E\eta$  secundum]  $\chi X\beta$ ;  $\gamma P\theta$  quod] *om.*  $C\zeta R\alpha$

20-21 scilicet ... figura<sub>1</sub>] *om.*  $B\alpha$  scilicet ... figura<sub>2</sub>] *om.*  $O\eta$  secundum ... figura<sub>1</sub>] ut patet in figura presente  $B\eta$

cutting the circle of Capricorn at points  $\gamma$ ,  $\chi$ , and it is arc  $\gamma\chi$ . Similarly you will not cease your activity until you reach the point of the zenith overhead, that is  $P$ , according to

processit in hac figura. Et scribes super almucanthatat numerum, sicut vides in figura.

21 processit] patet Dη Rε; processerit seu processit Xβ; se<sup>ur</sup> Bε hac] *om.* Bε Cε Dη Fα Pδ  
 Pρ figura<sub>1</sub>] linea Bθ Bι Dγ Eδ Eζ Lζ Mo Mη Mλ Nα Pγ Po Qμ Rα Sβ Vβ(*add. interlin.*  
 in al' figura) Vκ Wι Xα; lcīti(?) Aα; *add.* producta postea Cζ; *add.* que hic ponitur  
 Eμ(*interlin.*) Mθ(*interlin.*) Oκ; *add. in marg.* scilicet P Eo Et ... figura<sub>2</sub>] *om* Sκ; Hoc est  
 quemadmodum in magna figura sequenti Pψ(*other hand*) scribes] *om.* Eα; scribas Bζ;  
 scribe Bα super] *om.* Mγ; in Fβ; etiam super spatia inter Bε almucanthatat] *om.*  
 Bι; almicantarath Vχ; almicantarath Eδ Ev; almicantaraz Cδ; almicantha Dη;  
 almicanthatrach Bζ; almicanthatrat Cθ; almicanthatrach Pν; almicatarat Bκ; almicatarath Eα;  
 almichancarath Cε; almucan<sup>rat</sup> Et; almitantatach Mν; almi<sup>th</sup> Rδ; almucancharath Pα;  
 almucant~ Fα; almucantar~ Qα; almucantarā Vε; almucantarac Lζ; almucantarach Vκ;  
 almucantarath Vα; almucantarath Eη Eμ Mδ Mκ Nε Pθ Pλ Pυ Pφ Qμ Sθ Sλ Vβ Vν Vψ Wι;  
 almucantaraz Oα Oσ; almucanthatrath *corr. to* almucanthatrach Bγ; almucanthatrach Xβ;  
 almucanthatram Sβ; almucanthatrat Fζ Mo Oφ Pρ; almucanthatrach Nδ Rε; almucanthatrath  
 Po; almucanthatraz Mλ; almucanthatrus Bη; almucanthatraz Cβ; almucatarah T Oκ;  
 almucatarant Mθ; almucatharath Nα; almuchancarach Mγ; almuchantarach Bθ;  
 almuchantarath Fβ; almuchantarath Vπ; almuchanthatrach Wα; almuhantharath Bε; almui  
 cantarath Vσ; almuicatatharath Eζ; almuscantarat Bα; almutanth' Pγ; almutantarach S;  
 almutanthatrach Lβ; almutatat Vυ; almutanthanth Cη numerum] *om.* Cζ Pδ; *add.*  
 graduum Oυ; *add. interlin.* graduum id est almu<sup>raz</sup> Cδ sicut] quemadmodum Bα Bζ  
 Cβ Cδ Cζ Cθ Eμ Ev Eo Mγ Mθ Mκ Mν Oα Oκ Oσ Oφ Pφ Sθ Sι Sλ Vα Vβ(*add. interlin.* al'  
 sicut) Vε Vν Vπ Vυ Vχ; sic Qβ; sicut sicut Xα; *add.* et Mη sicut ... figura<sub>2</sub>] que egent  
 Qα vides] videre potes Dη in figura] *om.* Vι; *illeg.* Qα; hic Bα; in hac figura Bι  
 Bκ Cβ Cδ Cζ Cθ Eδ Eμ Ev Mθ Mκ Mν Oα Oσ Sβ Sι Sλ Vα Vβ Vε Vσ Vυ Vχ; in posita  
 figura Bζ; in anposita figura Vν; in antiposita figura Mγ; patet in figura Cε; poita figura  
 Eo figura<sub>2</sub>] *add.* etc. Rδ; *add.* et quemadmodum in magna figura sequenti Oα; *add.*  
 hoc est quemadmodum in maga figura sequenti Oσ; *add.* immediate sequenti Tδ; *add.* que  
 sequitur Cζ Eμ(*interlin.*); *add.* sequenti Vα; *add.* transacta Pν; *add. interlin.* scilicet in  
 mediatr(?) transacta Vβ; *add. in marg.* Mφ Wα

Signa	Gradus
Aries	15
Taurus	19
Gemini	27
Cancer	36
Leo	39
Virgo	[3]9
Libra	39
Scorpius	39
Sagittarius	36
Capricorn	[2]7
Aquarius	19
Pisces	15

Virgo 39] *mss* Virgo 29; Capricorn 27] *mss* Capricorn 37

the procedure in this diagram. And you will write the number on the almucantar, as you see in the diagram.<sup>9</sup>

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<sup>9</sup> The list (*apparatus criticus*, previous page) in mss M $\phi$  W $\alpha$  gives the rising times in oblique ascension of the zodiacal signs for a latitude of around 48°. The two corrections are necessary in order to preserve the symmetry of the table. These emendations were suggested to me by Julio Samsó, who also notes that there are systemic problems with the list since the oblique ascensions at the end of the signs are off, overall, by 10 degrees, i.e., the sum of the ascensions to the end of Virgo add up to only 175° rather than 180°, and to the end of Pisces to 350° rather than 360°. [Note: there is another such list, with minutes, in ms M $\phi$  at the end of the previous capitulum. See Cap. 12, line 15 *apparatus criticus*.]

For a further discussion of this list, see Samsó, *On Both Sides*, p. 426.

[ FIGURA 13 ]

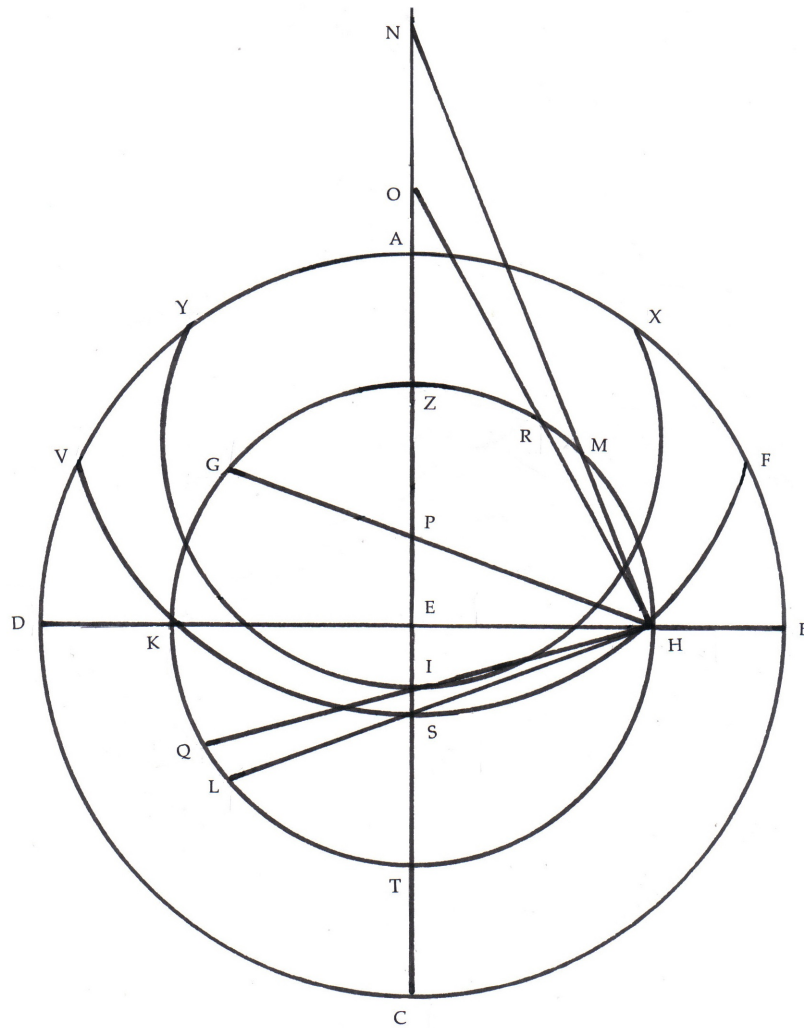


Figura inscriptionis almucanthatat super latitudinem regionis /  
 Figure of the inscription of the almucantars at the latitude of the region

[Complete diagram] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eν Eτ Eυ(upside down) Fα Fβ Fζ Lγ Lε Lζ Lη Mγ(sideways) Mδ Mη Mθ Mκ Mλ Mν Mο Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ<sup>10</sup> Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qμ Rα(upside down) Rδ Rε<sup>11</sup> Sβ(sideways)

<sup>10</sup> In ms Oφ, κ is on the right side and Η is on the left, and the construction lines and associated letters radiate from left to right.

<sup>11</sup> Figura 13 in ms Rε is found on f. 164<sup>va</sup>. There is another diagram, on f. 164<sup>tb</sup> ("Figura divisionis equinoctii per almucanthatrach") which repeats most of Figura 12 (found on f. 163<sup>va</sup>), with lettering from



Sδ Σκ Τδ Vα Vβ<sub>1</sub>(fol. 96<sup>v</sup>)<sup>12</sup> Vβ<sub>2</sub>(fol. 97<sup>v</sup>) Vε Vι(fol. 332<sup>v</sup>) Vκ Wβ Xβ

[Partial diagram] Eο Sι Vχ Wα Wι

[Outline or space only] Bζ Bθ Cε Dγ Dη Eδ<sup>13</sup> Eζ Lβ Mφ Oα Pν Pφ Qα Vν Vπ Vσ Vυ Vψ

[No space] Aα Cζ Nα Oη Qλ Sθ Sλ Xα

Pθ: "M"

[Caption]

Figura ... regionis] Bε Cη Cι Eβ Eη Ev Fα Fζ Lγ Lε Lη Mδ Mη Mν Oζ Oξ Oτ Ou Pα Pδ Pλ Po Pτ Qβ Qγ Qδ Qλ Sδ Tδ; om. Bα Bκ Cβ Cδ Cθ Eμ Ev Lζ Mγ Mθ Oσ Pυ Pψ Rδ Vα Vβ<sub>1</sub> Vε Xβ; Almucantharath Pq; Descriptio almucantharath ssuper latitudinem regionis Nδ; Figura almucantharath Bι Oφ; Figura circuli emisperii et almichantharath Rε; Figura descriptionis orizontis et almucancharath Wβ; Figura descriptionis orizontis per almucancharath Bη; Figura inscriptionis almucantharath Fβ Mλ; Figura inscriptionis almucantarath et horizontis Vκ; Figura inscriptionis almucantharath in tabula Eα; Figura inscriptionis almicatharat super totam latitudinem regionis et est 49 gradibus Vι; Figura inscriptionis ciculi orizontis et almucanth~ Pγ; Figura inscriptionis orizontis id est circuli hemisperii; et almucantarath super totam latitudinem regionis Vβ<sub>2</sub>; Hec figura pro complendo almucantarath Oκ(later hand); Tabula almucantharath ad latitudinem 48 g~ Rα Sβ; add. Figura capituli 13<sup>i</sup> Bε

almucantharat] Bι Eα Fα Lη Mκ Mλ Mν Oτ Pδ Po Pq Pτ; almicantharath Pλ; almicatharat Vι; almichantharath Rε; almiscantharath Bε; almucancarath Qβ; almucancharath Bη; almucantarath Fζ Oκ Qγ Qμ Sδ; almucantarath Cη Ev Lβ Lγ Mδ Oζ Oφ Pα Pμ Tδ Vβ<sub>2</sub> Vκ; almucantath Nε; almucanterath Sκ; almucanth~ Pγ; almucantharath Cι Eτ Oξ; almucantharam Sβ; almucantharat Eβ Eη Mν; almucantharath Rα; almucatharath Wβ; almuchancharath Mo; almucantarath Bγ; almucantat~ Fβ; almucantarath Mη; almutamtarat Qδ; almutantarath Bγ; illeg. Ou super] add. regionis Qδ; add. totam Bγ Eτ Mo Mν Pμ inscriptionis] add. orizontis et Bγ Mκ regionis] add. fatispone(?) est eius gradus equalis Mν

*Add. marginal note:* Ego Iohannes de Calomonte:<sup>14</sup> Multi non ponunt hanc figuram quia figura immediate sequens et ista est una et eadem res. Si rethe intelligis, tamen est utilis pro rudibus ut possint melius intelligere figuram sequentem. Vβ<sub>1</sub>(fol. 96<sup>v</sup>)

[Lettering on the diagram]

A] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Ou Oφ Pα Pγ Pδ Pλ Pμ Po Pq Pτ Pυ Pψ Qγ Qδ Qμ Rα Rδ Rε Sβ Sδ Σκ Τδ Vα Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; om. Mκ; illeg. Qβ B] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Ev Eτ Ev Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Ou Oφ Pα Pγ Pδ Pλ Pμ Po Pq Pτ Pυ Pψ Qγ Qδ Qμ Rα Rδ Rε Sβ Sδ Σκ Τδ Vα

Figura 12, and with some of the construction lines from Figura 13.

<sup>12</sup> In the first diagram in Vβ (fol. 96<sup>v</sup>), only the first arc is drawn.

<sup>13</sup> Ms Eδ contains other diagrams.

<sup>14</sup> See note to Cap. 7 line 9 (var.).

Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Mκ; *illeg.* Qβ C] Bα Bγ Bη Bε Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qγ Qδ Qμ Ra Rδ Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Mκ Pγ; *illeg.* Qβ D] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qγ Qδ Qμ Ra Rδ Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Mκ Pγ; *illeg.* Qβ E] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mλ Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sβ Sδ Tδ Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Wβ Xβ; *om.* Mθ Mν Pγ Pψ Ra Sk Va Qδ Vκ F] (*right*)<sup>15</sup> Bε Cη Ci Eβ Eη Fa Fβ Fζ Lγ Le Lη Mδ Mθ Nδ Ne Oζ Ok Oξ Oτ Ou Oφ Pa Pδ Pl Pτ Qγ Qδ Qμ Rδ Re Sδ Tδ Xβ; (*left*) Bα Bγ Bη Bi Bκ Cβ Cδ Cθ Eμ Et Eu Lζ Mγ Mη Mλ Mν Mo Oσ Pμ Po Pρ Pv Pψ Ra Sβ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ; *om.* Mκ Mu Pγ Sk; *illeg.* Qβ; VI Ev; Y' Ea G] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qβ Qγ Qμ Ra Rδ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vι Vκ Wβ Xβ; *om.* Mκ Mu Qδ Re; *illeg.* Sβ; E' Vε H] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu (*misplaced*) Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qμ Ra Rδ Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vκ Wβ Xβ; *om.* Mκ I] Bα Bγ Bε Bη Bi Bκ Cη Ea Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mν Mo Mu Nδ Oζ Ok Oξ Ot Ou Oφ Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Ra Re Sβ Sδ Sk Tδ Va Vβ<sub>2</sub> Vι Vκ Wβ Xβ; *om.* Ne Mκ Qδ Rδ Vβ<sub>1</sub>; G' Ev; N' Cδ Mγ Mθ Oσ Pψ Vε; Q' Ci; TI Cβ Cθ Ev K] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qμ Ra Rδ Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Mκ L] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pl Pμ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qμ Ra Rδ Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Mκ Pδ M] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pl Pμ Po Pτ Pv Qβ Qγ Qμ Ra Rδ Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vι Vκ Wβ Xβ; *om.* Mκ Ne Pγ Pδ Pψ Qδ Vε; N' Pρ N] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pδ Pl Pμ Po Pτ Pv Pψ Qβ Qγ Qδ Sδ Qμ Ra Rδ Re Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Ev Mκ Sk; *illeg.* Sβ; M' Pρ O] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qμ Ra Rδ Re Sβ Sδ Va Vβ<sub>2</sub> Vι Vκ Wβ Xβ; *om.* Mκ Pγ Sk Tδ Vβ<sub>1</sub>; E' Vε; R' Pρ P] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Ci Ea Eβ Eη Eμ Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pδ Pl Pμ Po Pρ Pτ Pv Qβ Qγ Qδ Qμ Ra Re Sβ Sδ Sk Tδ Va Vβ<sub>1</sub> Vβ<sub>2</sub> Vκ Wβ Xβ; *om.* Cθ Ev Mκ Mu Nδ Pψ Vε Vι; *illeg.* Rδ Q] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ea Eβ Eη Eμ Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pγ Pl Pμ Po Pρ Pτ Pv Pψ Qβ Qγ Qδ Qμ Ra Re Sβ Sδ Sk Tδ Va Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Ci Mκ Pδ Rδ Vβ<sub>1</sub>; G' Mo; L' Ev R] Bα Bγ Bε Bη Bi Bκ Cβ Cδ Cη Cθ Ci Ea Eβ Eη Eμ Ev Et Eu Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mθ Mλ Mν Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pl Pμ Po Pτ Qβ Qγ Qμ Ra Re Sβ Sδ Tδ Va Vβ<sub>2</sub> Wβ; *om.* Mκ Pγ Pδ Pψ Qδ Rδ Sk Vβ<sub>1</sub> Vε Vι Xβ; *illeg.* Pu; O' Pρ; X' S]

<sup>15</sup> Whether F should be on the right or left of the diagram is not specified in the text; the only relevant information is that it is opposite V.

Bα Βγ Βε Βη Βι Βκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μθ Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ργ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qμ Ρα Rδ Re Sβ Sδ Σκ Tδ Vα Vβ<sub>1</sub> Vβ<sub>2</sub> Vι Vκ Wβ Xβ; *om.* Μκ; F' Vε; IS Ev T] Bα Βγ Βε Βη Βι Βκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eν Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μθ Μλ Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qμ Ρα Rδ Re Sβ Sδ Σκ Tδ Vα Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Μκ Μν Ργ Qδ; D' Ρα v] (*left*)<sup>16</sup> Bε Βη Cη Cι Eβ Eη Fα Fβ Fζ Λγ Λε Λη Μδ Μθ Νδ Νε Οζ Οκ Οξ Οτ Ου Οφ Ρα Ργ Ρλ Ρτ Qγ Qδ Qμ Rδ Re Sδ Σκ Tδ Xβ; (*right*) Bα Βγ Βι Βκ Cβ Cδ Cθ Eμ Eτ Eυ Λζ Μγ Μη Μλ Μν Μο Οσ Ρμ Ρο Ρρ Ρυ Ρα Sβ Vα Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ; *om.* Eα Ev Μκ Μυ Pδ; *illeg.* Qβ; γ' Ρψ x] (*right*)<sup>17</sup> Bε Cη Cι Eβ Eη Eυ Fα Fβ Fζ Λγ Λε Λη Μδ Μη Μθ Νδ Νε Οζ Οκ Οξ Οτ Ου Οφ Ρα Ρδ Ρλ Ρρ Ρτ Qγ Qδ Qμ Rδ Re Sδ Tδ Xβ; (*left*) Bα Βγ Βη Βι Βκ Cβ Cδ Cθ Eα Eμ Eτ Λζ Μλ Μο Οσ Ρμ Ρο Ρυ Ρα Sβ Vα Vβ<sub>2</sub> Vε Vκ Wβ; *om.* Μγ Μκ Μυ Ργ Σκ Vβ<sub>1</sub> Vι; *illeg.* Qβ; vi Ev Μν; τ' Ρψ γ] (*left*)<sup>18</sup> Bε Cη Cι Eβ Eη Eυ Fα Fβ Fζ Λγ Λε Λη Μδ Μη Μθ Μν Νδ Νε Οζ Οκ Οξ Οτ Ου Οφ Ρα Ρλ Ρρ Ρτ Qγ Qδ Qμ Rδ Re Sδ Σκ Tδ Xβ; (*right*) Bα Βγ Βη Βι Βκ Cβ Cδ Cθ Eμ Eτ Λζ Μγ Μλ Μο Οσ Ρμ Ρο Ρψ Ρα Sβ Vα Vβ<sub>2</sub> Vε Vκ Wβ; *om.* Eα Ev Μκ Μυ Ργ Ρδ Ρυ Vβ<sub>1</sub> Vι; *illeg.* Qβ z] Bα Βγ Βε Βη Βι Βκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eν Eτ Eυ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μθ Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qμ Ρα Rδ<sup>19</sup> Re Sβ Sδ Σκ Tδ Vα Vβ<sub>1</sub> Vβ<sub>2</sub> Vε Vι Vκ Wβ Xβ; *om.* Μκ Ργ Ρψ Qδ

[Other information]

*add.* meridies Bι Βκ Eτ Eυ Λζ Ρο Ρρ Ρυ Vκ *add.* oriens Bκ Eτ Λζ Ρρ *add.* occidents Bκ Λζ Ρρ *add.* septentrio Bκ Λζ Ρρ

*add.* Cancri Bι Βκ Λζ Ρρ; Cancer Ρρ; circulus Cancri Ρα Sβ *add.* Arietis Bι Βκ Λζ; circulus Arietis Οσ(*later hand*); Arietis et Libre Ρρ Ρτ; Aries Ρρ *add.* Capricorni Bι Ρρ; circulus Capricorni Bκ Λζ 1q Οσ(*later hand*) *add.* orizon Λζ; circulus hemisperii Ρρ Ρτ

P] *add.* cenith Βγ Βι Cη Eβ Eυ Fα Fζ Λη Λγ Μκ Μλ Μν Μο Νε Οζ Ου Ρα Ρδ Ρο Qβ Ρα Sβ Sδ Tδ Vκ Wβ Xβ; cenit Bκ Fβ Λε Λζ Μη Ρμ Ρτ Ρυ Qδ Qμ; cinich Cι; zenit capitis Ρρ; zenith capitum Οκ(*later hand*); punctum cenit horizontis Οξ v] *add.* primum Bι Cθ Λζ Ρα Sβ Vε; primum occidents Eτ Μν Ρο Ρυ Vβ<sub>2</sub> γ] *add.* quartum Λζ Vε; *add.* x<sup>m</sup> [= decem] Cθ

*arc KL*] *add.* latitudo Μδ Νδ; *add.* latitudo regionalis Ρλ Ρρ; *add.* latitudo regionis Μκ Ρυ Qγ Rδ Vβ<sub>1</sub>; *add.* latitudo regionis 45 graduum Οκ(*later hand*) *arc HM*] *add.* equale latitudo Μκ Ρλ Qγ Ρυ; latitudo regionis Vβ<sub>1</sub>; *add.* 45 graduum latitudo regionis Οκ(*later hand*) *arc ZG*] *add.* equale latitudo Μκ; latitudo regionis Οκ(*later hand*) Ρτ Vβ<sub>1</sub>; et hic latitudini Ρυ *arc LT*] *add.* 48 Fζ; *add.* residuum Μδ Νδ Ρυ Qγ; *add.* residuum latitudinis Rδ *arc MZ*] *add.* equale residuo

<sup>16</sup> Whether v should be on the right or left of the diagram is not specified in the text; the only relevant information is that it is opposite f.

<sup>17</sup> Whether x should be on the right or left of the diagram is not specified in the text; the only relevant information is that it is opposite γ.

<sup>18</sup> Whether γ should be on the right or left of the diagram is not specified in the text; the only relevant information is that it is opposite x.

<sup>19</sup> In ms Rδ, z is usually replaced by R; however, in the diagram the appropriate point is labelled z.

Pυ Qγ *line LG and line GM] add. illeg.* Pυ *line HPG] om.* Rε

*Circles numbered:* 5, 10, 15 Oκ(*later hand*); 6, 12 ... 90 Vβ<sub>2</sub>; 10, 15, 20, 25 ... 40 Qδ 10, 20, 30 Bη  
Cη Eβ Fα Lγ Mδ Nδ Nε Oξ Oυ Pα Pτ Qβ Qγ Qμ Sδ Sκ(*add. 40*) Tδ Wβ Xβ 10, 20, 30, 40, 80,  
90 Eη 10, 20, 30, 40, 50, 80, 90 Bε

*Extra arcs or circles drawn:* 1: Bι Lζ Mθ Pγ Oκ Vκ; 2: Eν Mλ Vι Wβ; 3: Bη Cδ Eυ Fβ Fζ Mη Oφ Pο  
Rα Sβ; 4: Cι Eβ Eη Lγ Lη Mν Mο Nε Oξ Pτ Pυ; 5: Bε Fα Lε Mδ Mκ Oυ Pα Pδ Qβ Sδ Tδ Xβ; 6: Pμ  
Pρ Qγ; 7: Mκ Oζ Qδ Sκ; 8: Eτ; 9: Eα Rδ; 15: Vβ<sub>2</sub>; 16: Rε

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## [CAPITULUM 14.] DE DIVISIONE ORIZONTIS ET AZIMUTH PER ARCUS

- 1 De ... arcus] *ms* Gα *begins; om.* Aα Bα Bζ Bκ Cβ Cε Cθ Dγ Eα Eζ Ev Fβ Gα Lζ Nα Oα Oσ Pγ Pο Pφ Pψ Qα Qδ Rα Sβ Sθ Sι Sλ Vα Vε Vυ Vχ; Dcō de almu hic docet inscribere azimuth Wι; De azimuth primum Vκ; De azimuth Bγ Eδ Qμ; De compositione azimuth et primo de divisione emisperii Dη; De constitutione azimuth Mθ Oκ; De divisione circuli emisperii azimuth inscribendo Eτ; De divisione circuli emisperii per azimuth Bη Oφ; De divisione circuli (h)emisperii per azimuth inscribendis Lε Pα(*marg.*) Tδ Wβ; De divisione circuli emisperii per azimuth inscribendis vel de divisione orizontis per azimuth ab equinoctiali Mυ Vι; De divisione emisperii ad azimuth Mλ; De divisione orizontis ad azimuth Mη Sδ(*add. per alt<sup>us</sup>*) Vπ(*add. Rubrica*); De divisione orizontis ad constitutum azimuth in ipso Cζ(*marg.*) Eμ(*marg.*) Vσ(*om. in ipso*); De divisione orizontis et consticutione azimuth in ipso Oη; De divisione orizontis quod constitutionem azimuth Mκ; De fiburatione azimuth in orizonte Pτ; De formatione azimuth Rε; De inscriptione azimuth Mυ; De ordine azimuth et orizontis Cι; Divisio circuli emisperii ad constitutionem azimuth Cδ(*marg.*); *add. in marg.* Secundo d[ivisio] azimuth et primo dividit hemisperium super dimidia altitudine regionis secundo inscribit azimuth super cenith Bι; *add. in marg.* “Et Post”: In hoc secunda parte docet descriptionem azimuth et primo docet dividere circulum emisperii per arcus transeuntes per punctum diametri circuli Arietis opposita et per punctum altitudinis mediate que sit ex ductu linee BK in diametra super L. Secundo docet describere azimuth super duo puncto emisperii modo praedicto inventa et super punctum cenith ibi “Cum aut divisens” [Capitulum 15]. Lζ
- 1 *before De]* *add. Rubrica* Pλ et] in Lη Sκ et ... arcus] *om.* Eο Mγ Nε Pδ Pυ Vυ; ad azimuth Bθ Ev Pυ; per azimuth Vβ; per azimuth ab equinoctiali Mφ; pro azimuth Bι azimuth] Bγ Bε Bθ Bι Cζ Eδ Eη Eτ Ev Fζ Lβ Mθ Mκ Mλ Mυ Oζ Oκ Oξ Oτ Pα(*marg.*) Pδ Pθ Pλ Pμ Pτ Pρ Pυ Qβ Qγ Qλ Qμ Sδ Tδ Vβ Vσ Wα Wβ Wι Xβ; *illeg.* Pυ; arimuth Vπ; arimutht *corr. to* azimutht Cη; asimut Mυ; asimuth Mυ; asmut Vι; azim<sup>t</sup> Lη; azimuth Oη; azimuth Cι; azimuth Mη; azimuth Bη Eβ Eμ Fα Lγ Lε Mo Ou Pα Vκ; azimuth Cδ; azmt Vι; azymuth Oφ per] secundum Lβ per arcus] *om.* Pυ Pθ Rδ Sκ Vψ arcus] *add. Rubrica* Qβ; *add in marg.* Secundo de azimuth et primo dividere hemisperium super dimidiam altitudine regionis, secundo inscriberit azimuth super cenith Bι; *add. in marg.* Capitulum 14<sup>m</sup> Bε

[CHAPTER 14.] ON THE DIVISION OF THE HORIZON AND THE AZIMUTHS BY ARCS

Et post hoc oportet facere azimuth, quorum opus est ut figas tabulam in aliqua tabula lignea cum pice vel aliter et perficies in ea circulum hemispherii. Deinde divides

- 2 hoc] *add.* etiam Pq oportet] debes Fβ; oportebit Mγ Rε Vv; *add.* te Bι Eμ Ev Eo Mγ Mκ Oα Oσ Rε Sι Vv oportet facere] fac Bα; facies Cδ Sλ facere] componere Dη azimuth] *interlin.* Qμ; arimuth Vπ; asimut *corr.* to azimuth Mκ; asimuth *corr.* to azimuth Mv; atimuth Vυ; azimath Sι; azimith Mγ; azimuc Lζ Mλ Oη; azimuch Cι; azimut Bα Bζ Bη Bι Cβ Cθ Dγ Eμ Eo Mv Oσ Ov Pψ Qδ Sθ Sλ Vα Vκ Vv; azimuz Cδ Sβ; axmuch Nε; azmuth Vι; azsumut *corr.* to azumut Vχ; azsumuth Ev; azumut Vε; azumuth Nα; azymut Oα; mintus Vσ quorum ... est] sed oportet Bα figas] facias Sβ; fig<sup>a</sup> | sni Dγ; figat Bθ Vπ; figi<sup>s</sup> Mv; figuras Mη Sθ; figuras *corr.* to figas Bγ; figures Cη; fingas Gα Sι
- 2-3 aliquam tabula] *om.* Bα
- 3 tabula] *om.* Sκ; tabella Mv lignea] *om.* Bη Xα; *interlin.* Rε; ligno Bα; linea Bκ Nε Sι; *add.* levigata(?) Rε cum pice] compice Bα; conpice Mv pice] pisce Sβ Sι; pise Dγ vel ... et] tabul~ quod Gα aliter] cum aliqua alia re tenaci: cum aliqua alia] Cβ Cδ Cθ Eμ Mγ Mκ Mv Oα Oσ Pφ Pψ Rε Sι Sλ Vα Vv Vσ Vυ; alia Qα; aliqua Oφ; aliqua alia Ev; cum alia Mη Sθ; cum alio Bα; cum aliquo alio Eo; cum aliqua Cζ Mθ Oη Oκ Pτ Vε Vχ; in aliqua alia Bζ re tenaci] Cδ Ev Pφ Sλ Vα Vε Vσ; *om.* Mη; re tenabili Cζ Cθ Mγ Mθ Pψ Sι Vυ; re tenabili *corr.* to re tenaci Mκ; re tenabli Eo Qα; re tenab'li Cβ Eμ Oκ; re tenabl'i Sθ; re tenabuli Oα Oη; retenabili Oφ(*add.* *interlin.* al' tenati) Vv; retenablī Bζ; retenaci Pτ; retinabili et tenaci Rε; te deuati Mv; tenabili Oσ; tenabili *corr.* to tenaci Vχ; tenaci Bα aliter] cum alia Qμ; *add.* and marked "glossa" cum alia retenabili Vβ; *add.* in marg. Hoc melius faciet operator per sua industria Mκ et] *add.* tunc Bα perficies] facies Pq ea] eam Sι circulum] circulus Cη Deinde] Post hoc Bα divides] divide Bα
- 3-4 et ... circulum,] *om.* Eη Deinde ... hemispherii] *om.* Bκ Cη Dη Eα Mδ Nδ Pθ Pφ Vβ Vε Vψ



And after this it is necessary to make the azimuths;<sup>1</sup> to make these you should attach the plate to some other wooden surface with pitch or with something else, and you draw on it the horizon. Then you divide

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<sup>1</sup> The next step, after the almucantars (Cap. 13), is to draw the azimuths. But to do this one must first divide the horizon into segments equivalent to the spacing of the azimuths. This division is covered in Cap. 14, and the drawing of the azimuths themselves is the subject of Cap. 15.

- 5 circulum hemisperii sicut divisisti circulum signorum per ipsos tres modos; sed uteris in loco totius declinationis tota altitudine Arietis et Libre in eadem regione. Altitudo
- 4 circulum<sub>1</sub>] *om.* Bθ Vπ; eum Ev hemisperii] *om.* Bζ Ev; *add. in marg.* quem divides Be sicut] quia Lβ divisisti] *add. in Vψ* circulum<sub>2</sub>] circulum circulum Mη signorum] *om.* Gα; *add. circulum* Bθ Vπ per ... modos] *om.* Bα tres] 3 many modos] *add. scilicet* Mo; *add. p°/primo* per diametros Bε Bζ Cε Cι Dη Eα Eβ Eη Eο Fα Fβ Fζ Lβ Lγ Lε Lη Mγ Mδ Mo Mυ Mφ Nδ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qγ Qδ(diametro) Qλ Rδ Re Sδ Vι Vν Vψ Wα Xβ; *add. 2°/secundo* per gradus Bζ Eο Mγ Mδ Mo Nδ Re Vν; *add. 2°/secundo* per gradus assensionum Bε Cε Cι Dη Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mυ Mφ Nε Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qδ Qγ Qλ Rδ Sδ Vι Vψ Wα Xβ; *add. 3° computando* maximam solis declinationem Re; *add. 3°/tertio* per medium altitudinis computado sicut ibi patuit Fβ Fζ Nε Oξ Qλ Wα Xβ; *add. tertio* per medium declinationis Mo; *add. 3°/tertio* per medium declinationis (*add. altitudinis* Mυ Mφ Vι) computado sicut ibi patuit Bε Cι Dη Eα Eβ Eη Fα(ibi] prius) Lβ Lγ Lε Lη Mδ Mυ Mφ Nδ Oζ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qγ Qδ(sicut] ut) Rδ Sδ Vι Vψ; *add. tertio* computando maximam declinationis solis ut ibi patuit Cε; *add. t[erti]°* computado maximam solis declinationem ut ibi et postea constitutionem horarum et cum (*add. ut* Bζ) tibi patuit Bζ Vν; *add. tertio* computado maximam solis declinationem ut ibi. Et post constitutionem horarum et cum tibi patuit Mγ Pτ; *add. tertio* computando maximam solis declinationis ut ibi et punctus constitionem horem et t' tibi patuit Eο; *add. Tres* modos etc: unus modus fuit dividere equinoctialem. Alius modus sumitur medietatem declinationis solis. Tercius, per illam medietatem in diametro signata et predictas divisiones equinoctialis, arcus dividentes zodiacum. Eodem modo(*om.* Bη) facies hic. "Sed (uteris *inserted* Mκ) in loco et c[etera]" Bη(*marg.*; *om.* "Sed ... cetera"); Cζ(*after line 9*) Eμ(*marg.*) Mκ(*marg.*) *add. 16-line marginal comment* Qα sed] et Eη; si Qα uteris] numerus Vψ; *rep. va-* sicut signorum circulum dividisti per ipsos tres modos Sed uteris <sup>-cat</sup> Qδ
- 5 in<sub>1</sub>] *om.* Eη; hic Bζ Bη Cε Cι Dη Eα Fβ Lβ Lγ Lε Mγ Mδ Nδ Nε Oτ Oυ Pα Pδ Pλ Pμ Qβ Qλ Rδ Sδ Tδ Xβ hoc Eο Fα Fζ Pρ Pτ Qγ Qδ Vι Vψ; hoc in Xα; *add. hoc* Po(*interlin.*) Re loco] *om.* Eτ Sκ in<sub>1</sub> ... declinationis] per tota declinatione Bα totius] *add. regionis* Bζ tota] *om.* Ev Mγ tota ... Libre] altitudinem arcus tota Pφ altitudine] altitudo Bζ; altitudines altitudinis Vκ; *add. ipsius* Gα; *add. line 7* (regionis) – *line 8* (deus) Aα et Libre] *om.* Bα Bζ Cδ Cζ Cθ Ev Eο Mθ Mκ Oα Oη Oκ Oσ Pψ Qα Sθ Sι Sλ Vε Vν Vσ Vυ Vχ; *interlin.* Oφ; *suprascr.* Eμ; tanta Mγ in<sub>2</sub>] et Vν eadem] adem Sθ; eandem Eζ Pγ Po; eiusdem Mη; teodem *corr. to* eodem Vσ regione<sub>1</sub>] *add. expositio*(exponit Cζ) quid sit altitudo Arietis Cζ Oη; *add. in marg.* quid sit altitudo Arietis Bη; *add. est* ut minuas alti<sup>ua</sup> Aα; *add. Addendum 14* Qδ Altitudo] *add. interlin.* Expon<sup>t</sup> quod sit altitudo Arietis Eμ
- 5-6 Altitudo ... regione] *om.* Bζ Cη Mη Nε Pμ Pψ Sκ Vψ; Altitudo autem Arietis et Libre Bγ(*marg.*); Et Eτ
- 5-7 Altitudo ... est] *marg.* Eο

the horizon as you divided the circle of signs with those three methods;<sup>2</sup> but you use, in place of the whole declination, the whole altitude of Aries and Libra in the same region. Moreover, its altitude

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<sup>2</sup> See Cap. 9. Here in Cap. 14 the last method found in Cap. 9 is not mentioned. Ps.-Māshā'allāh does give the first method in detail, and mentions the second in the addendum, but does not describe the third (using a table of right ascensions). Samsó says that Maslama also gives these three methods (*On Both Sides*, pp. 426-428).

autem eius in eadem regione est ut minuas latitudinem regionis ex 90, et quod remanserit ipsam erit altitudo Arietis. Et iteremus narrationem in eo quod magis propalabitur, si deus vult.

10 Ponamus igitur circulum hemisperii ABCD, et circulum Arietis et Libre EBZD et eius diametra abscondant se super centrum H, et extrahemus diametrum ZE in directo

- 6 eius] *om.* B<sub>1</sub> E<sub>1</sub> V<sub>1</sub>χ; *marg.* Oφ; cuius Vα est ut] ut est ut Aα minuas] minues Fζ Pα; numeriat(?) *corr. in marg. to* minues Po; *add.* altitudinem(*explunged*) Bη latitudinem] altitudinem Cθ Gα Nα Vπ; *corr. from* altitudinem Cβ 90] 1x Cθ; 20 Vκ; 60 E<sub>1</sub>v; *add.* g[radibus] Dη Vα quod] *marg.* M<sub>1</sub>v; q<sup>t</sup> S<sub>1</sub>
- 7 remanserit] remansit Vα ipsam] *om.* Bα Bζ Cδ Cη Eα Eη Eτ Fβ Lε Lβ Lγ Mγ M<sub>1</sub>v Mφ Oζ Oυ Pλ Qβ Qλ Rε Sδ S<sub>1</sub>t Tδ V<sub>1</sub>v Vσ; ei Eo erit] est Aα Bγ Lζ Mο Pθ Qμ Rα Sκ Vψ W<sub>1</sub>ι; et M<sub>1</sub>v Nα altitudo] *om.* Pφ Arietis] *add.* et Libre Bγ(*interlin.*) Eα Gα; *add.* vere Mγ V<sub>1</sub>v Et<sub>2</sub>] Vero et Bζ; *add.* que Lγ iteremus] *om.* Gα; intremus Oφ(*add. interlin. al' iteremus*); reiteremus Vκ; *add.* huius Bε; *add.* magis M<sub>1</sub>v narrationem] rationem Cη in] *erased* Rε; inde Mθ Oκ quod] quare E<sub>1</sub>v magis] *add.* ut P<sub>1</sub>v
- 7-8 Et<sub>2</sub> ... vult] *om.* Bα
- 8 propalabitur] *illeg.* Eη; *corr. from* probabitur Wβ; vel propalabitur approbabitur Lβ; propabilitur Nα; propalabitur *corr. to* prolabitur Vχ; propallabitur Dγ; propolabitur E<sub>1</sub>v; approbatur Qλ; approbabitur Bε Eβ Fα Fβ Lγ Lη Mη M<sub>1</sub>v Mφ Oζ Oτ Oυ(*add. in marg. propolabitur*) Pα Pλ P<sub>1</sub>v Pφ Qβ Qγ Sδ V<sub>1</sub>ι; dabitur Pφ S<sub>1</sub>ι; proabitur Oα; probabitur Aα Bθ Cζ Eμ E<sub>1</sub>v Oη Oκ Pψ Qα Qδ Vα Vπ; probatur Mκ M<sub>1</sub>v V<sub>1</sub>v; probetur Cδ Mθ; probitur Cβ Oσ si deus vult] *om.* Bζ Cδ Eo Mγ Pφ Sλ V<sub>1</sub>v W<sub>1</sub>ι vult] voluerit *many*; *add.* 3-line comment as in Eμ and Mκ at line 4 Cζ
- 9 Ponamus] Ponas Rδ; Primo pone Bα igitur] ibi Pτ; super V<sub>1</sub>v; *add.* hic Vσ hemisperii] *om.* Eα Vκ; *add.* circulum Bζ Cβ Cζ Cθ Eμ E<sub>1</sub>v Eo Mγ Mθ Mκ Oη Oκ Oσ Pψ Qα Sθ Sλ Vα Vε Vσ V<sub>1</sub>v Vχ; *add.* iterum Oφ; *add.* scilicet S<sub>1</sub>ι; *add.* scilicet circulum Pφ ABCD] ABD Gα et circulum<sub>2</sub> ... EBZD] *om.* Fα Nε Vε Libre] *add.* circulum Bζ Eo Mγ V<sub>1</sub>v EBZD] ABZD Sκ; EBSD *corr. from* EBPD M<sub>1</sub>v; EB et D Nα; EBRD Rδ; EBTD V<sub>1</sub>v; EERD Pφ; EHZD Mφ; EHZQ Pφ
- 9-15 ABCD ... hemisperii] *marg.* W<sub>1</sub>ι
- 10 eius] *om.* Pφ; cuius Mγ; eorum Sβ diametra] *marg.* Wα abscondant] abscondantur Pψ; abscondat Pφ; scindant Bα se] *om.* Aα Bα Bθ B<sub>1</sub>ι Bκ Dγ Eδ Eζ E<sub>1</sub>v Fα Gα Lζ Mλ Mο Nα Po Pτ P<sub>1</sub>v Vκ W<sub>1</sub>ι Xα; C Cε; se se Xβ super] supra Eη centrum] *om.* Bα Bζ Cδ Cθ Eμ E<sub>1</sub>v Eo Mγ Mθ Mκ M<sub>1</sub>v Oα Oκ Oφ Pφ Pψ Qα Sθ Sλ Vε Vσ Vχ V<sub>1</sub>v Xβ; puncto Bε; punctum Eδ W<sub>1</sub>ι H] E Pφ; V Pφ; *add.* recto Bε; *add. in marg.* id est tota illa altitudo emisperii per divisionem circulum Arietis et Libre Qα extrahemus] prorende Bα diametrum] *om.* Pδ; diametra Mδ; *add.* abscondant se super centrum H et extrahemus Pμ ZE] E Mη; EZ Aα Bθ E<sub>1</sub>v Qα Qδ Vπ; RE Nα Rδ; S'E M<sub>1</sub>v; TE V<sub>1</sub>v; ZH Rε; ZQE *corr. to* ZE Pγ; *add.* et DB Pφ in directo] *om.* Bα Eδ
- 10-11 et ... A] *om.* Eα Gα

in the same region is such that you subtract the latitude of the region from 90, and what will remain this will be the altitude of Aries.<sup>3</sup> And we repeat the instruction about this because it has been shown [to be] better (God willing).

And therefore we take the circle of the horizon ABCD, and circle of [the beginnings] of Aries and Libra EBZD and its diameters intersect on centre H, and we extend diameter ZE straight

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<sup>3</sup> In other words, you use the co-latitude of the observer.

versus A. Postea ponemus arcum DT altitudinem Arietis in eadem regione. Deinde dividemus eum per 2 equalia super K et iungemus K cum B, et abscindemus diametrum AZ super L. Postea ponemus arcum EN 10 gradus aut quantum vis, et arcum ZM similem eius. Postea proice arcum qui est super punctum M et L et N, et abscindet ipse arcus

- 11 A] *om.* Nα Postea] *om.* Cη ponemus] pone Bα; pones Dγ arcum] *om.* Wι  
DT] CD Aα Eν Fζ Pγ; DC Vε Vσ; ED Eζ; OC Bη Wβ; TB Mδ; TD Bε Bθ Cε Cη Cι Dη Eα  
Eβ Eδ Eη Eο Eτ Fα Fβ Gα Lγ Lε Lη Mη Mo Mv Mφ Nδ Oζ Oξ Oτ Ov Pα Pδ Pθ Pλ Pμ Pν  
Po Pq Pτ Qβ Qγ Qδ Qλ Qμ Sδ Sκ Tδ Vι Vπ Vχ Wα Xβ; et D Lβ; *add.* id est Wβ  
altitudinem] latitudinem Oη Arietis] *add.* et Libre Dη; *add.* and *del.* et Libre Wι  
regione] rōne regione Bθ? Deinde] Quod Bα
- 11-13 Postea ... L] *marg.* Lε
- 12 eum] *om.* Bα Bζ eum per 2] et E et 3 Nα per] in Gα 2] 2°/duo *some; add.*  
*interlin.* scilicet equalia Cβ 2 ... super] duos u per Mv equalia] *om.* Cβ Cδ Cζ  
Mθ Mv Oα Oη Oσ Pψ Sθ Sλ Vα Vε Vv; *marg.* Mκ; *interlin.* Eμ Oφ super] in puncto  
Bα; scilicet Oφ (*add.* in *marg.* al' scilicet DK) K<sub>1</sub>] H Mγ; QK Cι; *add.* cum B Vσ; *add.*  
*interlin.* centrum Eμ K et iungemus] *om.* Cη Pδ; *marg.* Bγ iungemus] iunge Bα;  
*add.* eum per duo super R et iungemus Vα K<sub>2</sub>] *om.* Bζ Vv; KM Mv K<sub>2</sub> cum B] H  
cum K Vε; K super B Gα; K cum L Rε abscindemus] scinde Bα; *add.* eum per duo Vα  
diametrum] diamet. diametrum Nα
- 13 AZ ... L] *om.* Gα AZ] *om.* Rε Sι; *corr.* to AEZ Cδ; AR Nα; AS Mv; AT Vv L] A Pφ; S Sι  
Vε Postea] Post hac *some* ponemus] pone Bα; ponens Oξ EN] N Bζ; DN  
Nα; EL Rδ; *add.* ex Qα; *add.* ex O Bη EN ... ZM] AC ad gradus aut prout volueris AM et  
EM Vε EN ... arcum<sub>2</sub>] *om.* Pq 10] x Cθ Mθ Mκ Oκ Pψ Vσ Vχ; 2° Nα; ex 10 Qα  
gradus] graduum Aα Bθ Bι Eδ Eη Fα Lγ Pλ Pμ Rε Sδ aut] atque Vv aut  
... vis] vel plurius vel paucior Bα quantum] quanta Nε; quod Mv vis] volueris  
*many*; placit Rδ vis et arcum] *om.* Fα arcum<sub>2</sub>] *om.* Cε Vv ZM] *om.* Bζ; S'M  
Mv; M Nα; RM Pφ Rδ; TM Vv; Z Mγ; ZN Eν; secundum Vψ similem] visibl'e Mγ
- 14 eius] *om.* Nδ; ei Bα; eis Fα; *add.* 3 Fβ Postea] Post hoc *some* proice] proice *corr.*  
to prohice Po; aspicias Vε; pi et Xβ; prociplies Oη; prohice Aα Bι Eδ Eζ Eη Fα Fβ Lγ Lε Oξ  
Oτ Ov Pα Pμ Qγ Qλ Tδ; proficies Rε; pro<sup>h</sup>ice Po; prohicias Bα Eμ Mκ Oφ Pψ; prohicias  
*corr.* to proficias Cβ; prohicies Mγ Vv Vχ; prohyce Xα; proicias Cδ Cθ Mθ Mv Oα Oσ Oκ  
Qα Sθ Sλ Vα Vσ Vv; proicies Cζ Eο; proijce Pq; pronte Mδ; propicies Ev; propior Pγ;  
prospice Bγ; protrahas Pφ Sι; raproicies Bζ; *add.* *interlin.* id est figas duo locu orizontum  
tamen in oppositis partis Pα arcum] punctum Mv; *add.* x Eα Fζ Pv Qβ Sδ; *add.*  
*interlin.* qui scilicet transeat per tria puncta M, L, N Eμ qui] XQLN Lγ; est] eat Cβ  
Cδ; est est Pθ; est *corr.* to eat Sλ; *add.* AT Vε super] *om.* Ov punctum] puncta Eο  
Vv M] H Cδ M et L et N] L et M et N Eα; L, M, N Eο; M et L Oξ Pq; M, L, N Bα Bζ  
Mγ Pφ Sι Vv Vv; M et L, N Lβ; M et L et N *corr.* to MNL Bθ; M et L, N, R Nα; M et L et V Qδ; M  
et LM et N Vε; M, N Mv; M, N, L Vπ; M et N Mθ Oα Oκ Oσ Oφ Pψ Qα Vα; M et N *corr.* to M et  
N et L Eμ; M et N *corr.* to M et L et N Vχ; M et N et L Cδ Mκ Vσ; M, Z, L Xβ; N et M (*add.*  
*interlin.* et L) Sλ; *add.* id est figura 2 loca orizontum tamen in oppositis partibus ut patet in  
figura presenti Fβ; *add.* scilicet qui dicati sit punctos puncta M, L, N Cζ abscindet]  
abscindat Eα Eο; scindet Bε ipse] *om.* Sκ; ille Dη Eα Wβ

towards A. Afterwards we take arc DT as the altitude of Aries in the same region. Then we divide it into 2 equal [parts] at K and we join K with B, and we cut diameter AZ at L. Afterwards we take arc EN as 10 degrees, or however much we wish, and arc ZM similar to it. Next sketch out the arc which is through points M, L and N, and this arc cuts

- 15 circulum hemisperii super punctos S et O. Iterum fac similiter quousque divides reliquam ABCD. Postea divides quartam AD sicut quartam AB; et quartam CB secundum divisionem CD sicut fecimus in divisione circuli signorum, et similiter divides
- 15 hemisperii] *add. and del.* Ponamus igitur circulum emisperii Wι punctos] puncta Bα; *add. interlin.* puncta Vβ punctos ... reliqua] *illeg.* Eη s et O] *om.* Bα; S, O *many*; SO *corr. to* S et O Aα; et O Mη; FCDO Fβ; FO Eo; L,O Nα; N et O Dγ; S Gα; X, O Bε Cι Eα Eβ Fα Fζ Lβ Lγ Lε Lη Mδ Mυ Mφ Nδ Oζ Oξ Oτ Ou Pα Pλ Pμ Pν Pρ Qβ Qγ Tδ Vε Vι Wβ Xβ; x et O Qδ; ZO Nε Vψ; *add. in marg.* X Wα; *add. in marg.* X et O Qμ Iterum ... quousque] Similiter quoque Bε Eα Eβ Fα Fζ Lβ Lγ Lε Lη Mδ Nδ Oζ Oτ Ou Pα Pλ Pμ Pν Pρ Qβ Qγ Sδ Xβ Iterum fac] *om.* Oξ Tδ fac] facies Bα Cβ Cδ Cζ Cθ Eμ Ev Eo Mγ Mκ Mν Oα Oη Oκ Oσ Oφ Qα Sθ Si Sλ Vα Vε Vν Vσ Vυ Vχ quousque] *add. interlin.* similiter Cβ divides] dividens Qα *add.* quartam CB Bζ; *add.* quosque divides Lγ
- 16 reliquam] reliquam partem Cζ Mθ Oη Oκ Qα; reliquam partem circuli Pτ Rε; reliquam 4<sup>tam</sup> (*marg.* Vν) circuli Mγ Vν; reliquam quartam/4<sup>tam</sup> scilicet Bε Pφ; *add. interlin.* partem scilicet Eμ; *add. interlin.* [*illeg.*] Eα; *add.* circuli Bα; *add.* scilicet Bη Cι Eα Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mυ Mφ Nδ Oζ Oη Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pν Qα Qβ Qγ Qλ Qμ Sδ Si Tδ Vι Vψ Wα Wβ Xβ reliquam ... divides] *om.* Dη Nε; *interlin. and marg.* Rα ABCD] *om.* Vσ; AB et CD Cβ; cand' (?) AB Qα; AB Xα; quam aliud Rδ Postea] *twice* Eδ; Post hoc/hec *many*; *add. in marg.* Aliter postea divides AD sicut 4<sup>am</sup> AB; 4<sup>am</sup> CB secundum divisionem CD sicut fecimus in divisione circuli signorum Po; *add. 39-line note in marg.* Bθ divides] divideris Dη quartam<sub>1</sub>] 4<sup>am</sup>/4<sup>m</sup> *some* AD ... CB] AB Qμ Rα AD ... secundum] ab Wι; AB Sλ quartam<sub>2</sub>] 4<sup>am</sup>/4<sup>m</sup> *some* AB et quartam] *om.* Bη et ... CB] *om.* Gα quartam<sub>3</sub>] 4<sup>am</sup>/4<sup>m</sup> *some* CB] CD Sκ Vψ secundum] sicut Vβ (*add. interlin.* secundum)
- 16-17 quartam<sub>1</sub> AD ... CD] quartam AB secundum divisionem AD Oφ Vε Vχ; quartam AB secundum divisionem AD et quartam CD secundum divisionem BC Vυ; quartam AB secundum divisionem CB Aα Bι Bκ Cδ Cζ Cθ Dγ Eζ Eμ Ev Eo Ev Lζ Mη Mθ Mκ Mλ Mν Mo Nα Oα Oη Oκ Oσ Po Pψ Qα Rε Vα Vκ Wβ; quartam AB secundum divisionem CD Bθ Pτ Pυ Rα Sβ Vπ; quartam AD secundum divisionem CB Bα Eδ Pγ Pφ Si; quartam CB secundum divisionem CD Bζ Mγ Vν; quartas AB et CB (*interlin.*) secundum divisionem CD Cβ; quartam AB sicut quartam CD et postea quartam DA sicut quartam CB Dη
- 17 CD] CB Qμ Wι; ED Qδ; *add.* gradus Cζ sicut] quemadmodum Bζ Cβ Cδ Cθ Eη Eμ Ev Eo Mγ Mθ Mκ Mν Oα Oη Oκ Oσ Oφ Pφ Pψ Qα Sθ Si Sλ Vα Vε Vν Vσ Vυ Vχ; *add. interlin.* quemadmodum Vβ fecimus] *om.* Bα; facis Sλ divisione] *add.* per Vπ



the horizon at points S and O. Again do likewise so that you cut the rest [of circle] ABCD. Afterwards you divide quarter AD as quarter AB, and quarter CB just as the division of CD as we made in dividing the circle of signs, and likewise you

universum circulum hemisperii scilicet per 10 et 10 vel per 20 et 20, vel per gradus et

- 18 universum] *om.* Bγ Cη Σκ; *add.* sicut Rδ circulum] *add.* signorum Dγ scilicet] *om.* Γα Wι scilicet ... 20<sub>2</sub>] per 30 vel 30 Vε; scilicet per 10 vel 20 vel 30 Mv; scilicet per 10 vel per 20 vel per 30 Vι; scilicet vel per 10 vel per 20 vel 30 Mφ scilicet per 10 et 10] *om.* Cθ Ev; et per 10(*interlin.*) Cδ; per 10 Pδ(*add. in marg. et 10*) Σκ; per 10 et 10 Cε Eδ Pθ Pρ Vβ Vv; per 10 et per 10 Bγ Cη Eτ Wβ; per 10 et per 10 vel per 12 Dγ; per 10 vel per 10 Bη; scilicet per minuta 10 et 10 Mη Qμ; scilicet per 10 Ev Wα; scilicet per decem et decem Qδ; scilicet per 20 et 10 Fβ; vel per gradus 10 et 10 circuli equinoctialis Sι; vel per 10 et per 10 Po; vel per 10 et 10 Pτ; vel per x et x Mκ; vel per minuta Mv; vel per minuta 10 Bα Mγ; vel per minuta 10 et 10 Cζ Eμ Eo Oα Oη Oσ Pφ Vα Vv; vel per minuta x x Ok Pψ; vel per minuta et 10 Bζ; vel per 10 gradus Cβ vel per 20 et 20] *om.* Bα Bζ Cζ Dγ Eμ Ev Eo Mγ Mκ Oα Oη Ok Oσ Pφ Pψ Vv Vv; quantum gradus 20 et 20 Sι; xx Cθ(*add. in marg. vel per minuta*); aut g<sup>u</sup> 20 Mv; et per 20 Ev Pv; vel 20 Aα; vel 20 et 20 Pα; vel per 20 Bι Bκ Cε Eδ Eζ Lβ Lζ Mη Mλ Mo Nα Pγ Pδ(*add. in marg. et 20*) Po Qμ Rα Vκ Wι Xα; vel per 20 gradus Cβ Sβ; vel per 30 Bθ Vπ et<sub>3</sub>] *add.* per Fζ
- 18 *add. in marg.* al' vel per 10 gradus vel per 20 gradus vel per gradus et gradus aut per minutia et minutia aut secundum quod volueris ut in hac figura Oφ
- 18-19 scilicet ... minuta<sub>2</sub>] ut per minuta aut gradus Sλ; vel per g<sup>a</sup> xx aut gradus Mθ; vel per g<sup>a</sup> 20 aut 10 gradus Qα; vel per minuta xx aut gradus gradus Sθ; vel per x et x gradus Vσ; per 9 vel per 10 gradus Vχ; vel per gradus *corr. to* vel per 10 id est 20 gradus Cδ; vel per 20 gradus Oφ 20<sub>2</sub> ... hac] *illeg.* Γα vel per gradus et gradus] *om.* Cβ Mv Sβ Sι; aut gradus Ok; aut gradus aut gradus Vε; aut gradus gradus Cθ Eμ Mκ Oα Pψ; aut gradus et gradus Cζ Eo Mγ Oη Oσ Pφ Vα Vv Vv; aut gradus aut(*corr. to et*) gradus Bζ; aut per gradu et g<sup>u</sup> Bη; aut per g<sup>u</sup> et g<sup>u</sup> Lε; aut per gradum et gradum Σκ Wβ; aut per gradum et gradus Bγ Cη Eτ; aut per gradus et gradus Pδ Qδ; et per gradus et gradus Ev; per gradus Ev; per gradus et gradus Bθ Vπ; vel gradus et gradus Cε Dη Nα; vel per gradus Mη Rα Xα; vel per gradus et g<sup>u</sup> Po; vel per g<sup>u</sup> et g<sup>u</sup> Bε Dγ Eβ Lβ Lγ Lη Mφ Mv Oζ Oξ Oτ Ov Pλ Pμ Pv Qγ Qλ Sδ Tδ Vι Wα; vel per gra et gra Fα; vel per gradum et gradum Eα Fβ Pα Qβ

each horizon circle by 10 and 10 or by 20 and 20 or by degree and

gradus, aut per minuta et minuta aut secundum quod volueris ut patet in hac figura.

- 19 aut per minuta et minuta] *om.* Bα Bζ Cβ Cδ Cζ Cθ Eμ Eο Mγ Mκ Mν Oα Oη Oκ Oσ Pγ Pψ Sι Vα Vν Vυ Xβ; aut minuta Ev Pq; aut minuta et minuta Ea; aut per minuta Cε Nα; aut per minuta aut minuta Mη; aut per minuta et minuta Fα; aut per minuta minuta Bε; aut per minuta et per minuta Rα; aut per 4 gradus et 4 gradus aut per minuta et minuta Qδ; et cetera per minuta et minuta Vi; per minuta et minuta Dη; per minuta vel minuta Vε; vel per minuta et minuta Dγ Qβ aut<sub>2</sub>] *om.* Bη; ac/et *some* aut<sub>2</sub> ... volueris] alii quantum volueris Oκ; aut quantum volueris Bζ Cβ Cδ Cθ Eμ Ev Eο Mγ(*om.* aut) Mκ Mν Oα Oφ Pψ Qα Sθ Sι Sλ Vα Vε(*om.* aut) Vν Vσ Vχ; aut quem volueris Oη; aut quemadmodum volueris Oσ; aut quod volueris Dγ; autem quem volueris Cζ; et sic de aliis multas Bα; quod volueris Qδ; sicut placet Vυ ut] *om.* Qδ ut ... figura] *om.* Bα Mκ Oη Vσ Vυ; et hec est figura Cβ Cδ(*marg.*) Cζ Cθ Eμ Ev Eο Mγ Mθ Mν Oα Oκ Oσ Oφ Pφ Pψ Qα Sθ Sι Sλ Vα Vε Vν Vχ; in hac figura Eζ; sicut patet in figura inferiore Bζ; sicut patet in hac figura Fα Pq; ut in figura apparet Dη Nα; ut in hac figura Bι Bγ(*ut corr. from* aut) Bκ Cη Eδ Eτ Lζ Mη Mλ Mo Pγ Po Qμ Rα Sβ Tδ Vκ Wι Xα; ut in hac figura appareat Pυ Vβ; ut in presenti figura patet Sκ; ut in hac figura patet Cε; ut patet in figura Aα Bθ Ev Vi(*ut*3) Vπ; ut patet in figura sequenti Pτ; ut [pat]3 in sua figura Bε patet] [pat]3 Mυ Pλ; apparet Rε hac] *illeg.* Eη figura] *add. interlin.* que ibi ponetur Eμ; *add. interlin.* scilicet immediate antecedens Vβ; *add. 2-line gloss* Cζ; *add. in marg.* Capitulo nunc sequenti scilicet 15° Bε; *add.* Expositio. Cum arcus HM sit similis arcui que designat latitudinem regionis. Arcus vero ZMH cum sit quarta circumferencia est similis arcui circuli maioris qui est a cenith capitis per equinoxialem usque ad orizonta que similiter est quarta circuli. Erit arcus ZM similis elevatam capitis Arietis in regione tua erit. Patet quod dicta linea HM quousque concurrat cum linea EA protracta terminabitur semidiameter circuli equidistantis recto contingentis circulum emisperii residua patent ex planisperio. Oη<sup>4</sup>; *add. Addendum 14: most*

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<sup>4</sup> Gunther added this to his text although he did comment on it (p. 210): “This explanatory paragraph containing the words “circumferencia” and “semidiameter”, which do not occur in the rest of the text, is perhaps a thirteenth-century addition.” In fact, it only appears in the one manuscript.

degrees, or by minute and minute, or however much you wish, as is shown in this diagram.

## [ ADDENDUM 14 ]

After line 19: Aα Bγ Bε Bη Bθ Cη Cι Dη Eα Eβ Eδ Eη Eτ Eυ Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη  
Mo Mu Mφ Nδ Nε Oζ Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pρ Pτ Pφ Qβ Qγ Qλ Qμ Sδ Sκ Tδ Vβ Vι Vπ Vψ  
Wα Wβ Wι Xα Xβ

In marg.: Eμ Mκ

At line 5: Qδ

20 Dividitur etiam melius orizon per lineas rectas transeuntes per totam  
altitudinem Arietis id est per punctum cenith et gradus equinoctialis et hoc utimur.

20 etiam] et Wι per] *om.* Pφ melius] *om.* Dη

21 altitudinem] *add.* in marg. scilicet per latitudinem regionis factus est in almucantar et  
idem Qμ id est] *om.* Pν; et Bε Pθ Vβ; per Rδ punctum] totam Mη; *add.* per Sκ  
cenith] cenit Fβ Lβ Oξ Ou Wα Xα; cinich Xβ; zenith Bε Pρ; camitch Cε; *add.* capitum  
Qβ et] *add.* per Sκ gradus] gradu Vβ; per gradus Eμ Eτ equinoctialis]  
equinoctiales Sκ et hoc utimur] *om.* Bη; *add.* etc. Rδ; *add.* in marg. Ego Iohannes de  
Calomonte:<sup>5</sup> Hec lettera scilicet “Dividitur” usque ad litteram exclusive “Cum autem  
diviseris circulum” [*i.e.*, *Capitulum 15*] raret in multis exemplaribus. Tamen non est  
sperrenda. Et hoc presens figura est secundum ipsius doctrinam scilicet per lineas rectas  
transeuntes. Vβ

20-21 *add.* in marg., partly cut off [Dividitur etiam] melius orizon per [lineas recta]s transeuntes  
per totam altitudinem [Arietis id est] per punctum ce[nith et g]radus equinoctialis [et hoc  
ut]imur Vχ

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<sup>5</sup> See note to Cap. 7 line 9 (var.).

## [ ADDENDUM 14 ]

Actually, the horizon is better divided by straight lines passing through the whole altitude [of the circle] of Aries, that is, through the zenith point and the degree of the equator; and we use this [method].

.

[ FIGURA 14 ]

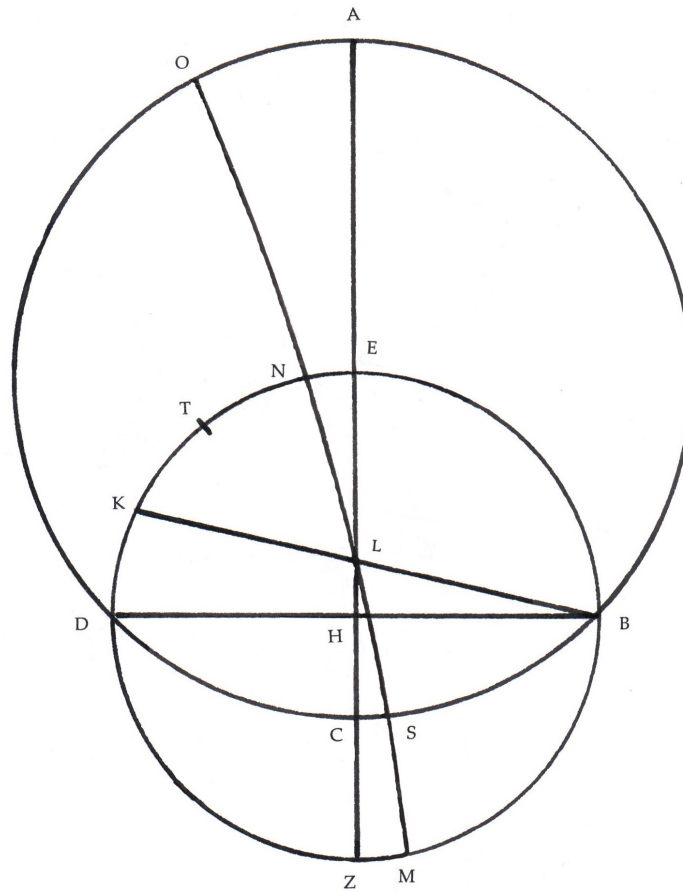


Figura divisionis orientis per arcus super medium altitudinis Arietis et Libre /  
 Figure of the division of the horizon using arcs through half the altitude  
 [of the circle through the beginnings] of Aries and Libra

[Complete diagram] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ  
 Lη Mγ(upside down) Mδ Mη Mλ Mν Mο Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο  
 Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ(sideways) Sδ Sκ Tδ Vα Vε Vi(fol. 333r) Vκ Wβ Xβ  
 [Partial diagram] Ev Eο Ev Mκ Mθ<sup>6</sup> Pq<sup>7</sup> Vβ Wι

<sup>6</sup> The diagram in Mθ has many errors; e.g., parts are upside down.

<sup>7</sup> The diagram in Pq is completely different from the others and seems unrelated to the text.



[*Outline or space only*] Aα Bζ Bθ Cε Dγ Dη Eδ<sup>8</sup> Eζ Lβ Mφ Oα Pν Pφ Qα Sι<sup>9</sup> Vν Vπ Vσ Vυ  
Vψ

[*No space*] Cζ Gα Nα Oη Sθ Sλ Vχ Wα Xα  
Pθ: "N"

[*Caption*]

Figura ... Libre] Fα(supra) Lγ Lε(supra) Nε Pτ Qβ Qγ Qλ Sδ(supra) Tδ Xβ; *om.* Bα Bη Bκ Cβ Cδ Cθ Eμ Lζ Mγ Oσ Pψ Rδ Vα Vε; Figura divisionis circuli orizontis Pγ; Figura divisionis emisperii ad azimuth Mλ; Figura divisionis hemisperii per azimuth Pμ; Figura divisionis emisperii per azimuth super medium altitudinis regionis Eτ; Figura divisionis emisperii per azimuth super mediam latitudinem regionis Mο Pο Pυ; Figura divisionis hemisperii prima per azimuth Rα Sβ; Figura divisionis hemisperii prima per azimuth super medium altitudinem Bι Oφ(*add.* regionis); Figura divisionis emisperii super medium altitudinis Arietis in regionis Bγ; Figura divisionis emisperii super medium altitudinem regionis Mη Mν; Figura divisionis orizontis per arcus super medium declinationis Cη Qδ; Figura divisionis orizontis per arcus super medium altitudinis Arietis et Libre Nδ; Figura divisionis orizontis per arcus super medium altitudinis Arietis et Libre vel super totam altitudinem eius Bε Eη; Figura divisionis orizontis per azimuth(asimuth Wβ) per arcus super polum medie altitudinis euntes vel(*om.* Sκ) per rectas lineas exeuntes super(a Sκ) cenith Wβ; Figura divisionis orizontis prime per azimuth super mediam altitudinem regionis Vκ; Figura inscriptionis almuchantarar super latitudinem regionis Fβ; Figura inscriptionis azimuth super primum azmut et Figura divisionis hemisperii de azimuth super mediam(*add.* longitudinis Mυ) latitudinis regionis Mυ Vι; Figura formandi azimuth Rε; Hec figura est pro divisione emisperii sed non pro pertractione arcuum, tamen arcus hic azimuth protracti sunt Oκ(*later hand*); Tabula divisionis orizonis per arcus super medium altitudinis arietis et libra Cι Eα Eβ Lη Mδ Oζ Oξ Oτ Oυ Pα Pδ Pλ; *add.* Figura capituli 14° Bε; *add.* Primus modus inscribendi azimuth Bε; *add.* Questio super tota altitudine Arietis Bε; *add.* Questio inscriptionis azimuth super medium altitudinem Arietis Bε

Arietis] *om.* Fζ      Libra] *add.* vel super totam altitudinem per lineas rectas Qμ

[*Lettering on the diagram*]

A] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mο Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pτ Pυ Pψ Qβ Qγ Qλ Qμ Rα Rδ Rε Sδ Tδ Vα Vε Vι Vκ Wβ Xβ; *om.* Qδ; C Sκ      B] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mο Mυ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Tδ Vα Vε Vι Vκ Wβ Xβ; *om.* Eα; *cut off* Nδ; D Sκ      C] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mο Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vα Vε Vκ Wβ Xβ; *om.* Eα Mυ Sβ; A Sκ; Z Vι      D] Bα Bγ Bε Bη Bι Bκ Cβ Cη Cθ Cι Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mο Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vα Vε Vι Vκ Wβ Xβ; *om.* Eα; *cut off* Cδ; B Sκ; C Sβ      E] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eα Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ

<sup>8</sup> The diagrams in this space are unrelated to this text.

<sup>9</sup> The diagram/outline in ms Sι seems to be for a different capitulum.

Mv Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pα Pγ Pδ Pλ  
 Pμ Po Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Tδ Vα  
 Vi Vκ Wβ Xβ; om Vε; A' Sk H] Bα Bγ Be Bη Bi Bκ Cβ  
 Cδ Cη Cθ Ci Ea Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ  
 Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ  
 Pα Pγ Pδ Pλ Pμ Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ  
 Sk Tδ Vα Vε Vi Wβ Xβ; om. Po Ra Vκ κ] Bα Bγ Be  
 Bη Bi Bκ Cβ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη  
 Mγ Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Oξ Oσ Ot Ou Oφ  
 Pα Pγ Pδ Pλ Pμ Po Pt Pv Pψ Qβ Qγ Qλ Qμ Rα Re Sβ Sδ  
 Sk Tδ Vα Vε Vi Vκ Wβ Xβ; om. Ea Ok Qδ; illeg. Rδ; cut off  
 Cδ λ] Bα Bγ Be Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eη Eμ  
 Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mλ Mv Mo Mu Nδ  
 Ne Oζ Oξ Oσ Ot Ou Oφ Pα Pγ Pδ Pλ Pμ Po Pt Pv Pψ Qβ  
 Qγ Qδ Qλ Qμ Rα Re Sβ Sδ Tδ Ve Vi Vκ Wβ Xβ; om. Ea  
 Ok Vα; illeg. Rδ; P Sk M] right of z: Bα Bγ Bi Bκ Cδ  
 Cθ Eμ Et Lζ Mγ Mη Mλ Mv Mo Ok Oσ Oφ Pγ Pμ Po Pv  
 Pψ Ra Sβ Va Ve Vκ M] left of z: Be Bη Cβ Cη Ci Ea Eβ Eη Fa Fβ Fζ Lγ Le Lη Mδ Mu Nδ Ne  
 Oζ Oξ Ot Ou Pα Pδ Pλ Pμ Pt Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Tδ Vi Wβ Xβ; om. Sk N] left of E:  
 Bα Bγ Bi Bκ Cδ Cθ Eμ Et Lζ Mγ Mη Mλ Mv Mo Ok Oσ Oφ Pγ Pμ Po Pv Pψ Sβ Ve Vκ; om. Ra Va  
 N] right of E: Be Bη Cβ Cη Ci Ea Eβ Eη Fa Fβ Fζ Lγ Le Lη Mδ Mu Nδ Ne Oζ Oξ Ot Ou Pα  
 Pδ Pλ Pμ Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Sk Tδ Vi Wβ Xβ; U Pt O] left of A: Bα Bγ Bi Bκ Cθ Eμ  
 Et Lζ Mγ Mη Mλ Mv Mo Oσ Oφ Pμ Po Pv Pψ Ra Rδ Sβ Va Ve Vi; om. Vκ; cut off Cδ; S Ok Pγ  
 O] right of A: Bη Cβ Ci Ea Pδ Pμ; S Pt Wβ; x Be Fζ Mδ Nδ Ne Oζ Oξ Ot Ou Pλ Qγ Qμ Xβ;  
 om. Cη Eβ Fa Fβ Lγ Le Lη Mu Pα Qβ Qδ Qλ Sδ Sk Tδ Vi; illeg. Eη; s Re S] right of c: Bα Bγ Bi  
 Bκ Cδ Cθ Eμ Et Lζ Mη Mλ Mv Mo Oσ Oφ Pμ Po Pv Pψ Ra Sβ Vκ; om. Va Ve ; E' Mγ; o Ok Pγ  
 S] left of c: Cβ Ea Rδ; om. Mu Vi; I Ci; o Be Bη Cη Eβ Eη Fa Fβ Fζ Lγ Le Lη Mδ Nδ Ne Oζ Oξ  
 Ot Ou Pα Pλ Pt Qβ Qγ Qδ Qλ Qμ Sδ Sk Tδ Wβ Xβ; o Re; x Pμ; z Pδ T Bα Bγ Be Bη Bi Bκ Cβ  
 Cδ Cη Cθ Ci Ea Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Oξ Oσ  
 Ot Ou Oφ Pα Pγ Pδ Pλ Pμ Po Pt Pv Pψ Qβ Qγ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Va Ve Vi Vκ Wβ  
 Xβ; om. Ok Qδ z Bα Bγ Be Bη Bi Bκ Cβ Cη Cθ Ci Ea Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ  
 Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pα Pγ Pδ Pλ Pμ Po Pt Pv Pψ Qβ Qγ Qλ  
 Qμ Rα Re Sδ Sk Tδ Va Ve Vκ Wβ Xβ; om. Sβ; cut off Cδ; c Qδ Vi; R Rδ

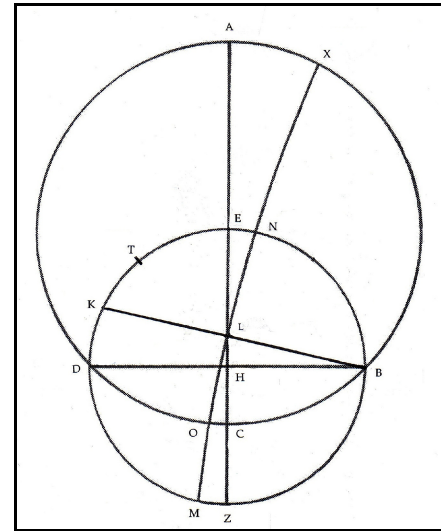


Figura 14A: Alternative Diagram

[Other information]

- L] *add. medium altitudinis Arietis* Bγ
- add. line BT*] Bγ Be Bη Ea Eη Fa Fβ Fζ Le Lη Mδ Mu Nδ Oζ Oξ Ot Pα Pδ Pλ Pμ Pt Qβ Qγ Qλ  
 Qμ Tδ Vi
- intersection of BT and ZE*] *add. cenit* Bγ; *add. zenith* Ok; *add. o* Mu Vi; *add. p* Bη Eβ Fa Fβ Fζ Le Lη  
 Mδ Nδ Ne Oζ Ot Pα Pλ Pt Qβ Qγ Qλ Qμ Tδ Vi Wβ
- add. arc OL(to horizon)* Rδ
- arc DT*] *add. tota altitudo Arietis* Qμ
- arc ZM*] *add. 30 graduum* Ok
- arc EM*] *add. 30 graduum* Ok
- arc ZB*] *add. 15 | 30 | 45 | 60 | 75 | 90* Rα Sβ

*arcs BA, BC, DA, DC] add. 10 | 20 | ... | 90 Rε*

*Circle of Capricorn] add. Rδ; add. C, D, T, K Eα; add. circulus Capricorni Bι Lζ Oσ(later hand) Rα Sβ;  
add. circulum emisperii Oφ*

*circle ABCD] add. circulus emisperii Bι Lζ Pτ Sβ*

*Circle of Cancer] add. Rδ; add. Cancri Bι Lζ Rα Sβ*

*Circle of Aries] add. Arietis Bι Lζ Rα(twice) Sβ(twice); add. latitudo regionis altitudo Arietis Pυ*

## [CAPITULUM 15.] DE INSCRIPTIONE CIRCULORUM AZIMUTH SUPER CENITH

Cum autem diviseris circulum emisperii, constitues in eo azimuth ut sequitur:

- 1 De ... cenith] *om.* Aα Bα Bζ Bκ Cβ Cδ Cε Cθ Dγ Eα Ev Ev Gα Lζ Nα Oα Oη Oσ Pγ Pτ Pψ Qα Rα Sβ Sθ Sι Sλ Vα Vβ Vε Vv; De azimuth secundo Vκ; De complemento azymuth Oφ; De constitutione azimuth Bθ Vπ(*add.* Rubrica); De constitutione azimuth in tabulis Cζ Eμ(*marg.*) Mκ Vσ; De descriptione circulorum azimuth super cenith Qγ; De divisione emisperii Mθ Oκ; De figuractione azimuth Eo; De figuracione azimuth in orizontem Mγ Vv; De protractione linearum vel arcuum azimuth super primum circulum cenith Bι(*add. in marg.* Inscriptione azimuth super cenith); Dividitur etiam melius orizon per lineas rectas transeuntes per totam altitudinem Arietis id est per punctum cenit et gradus equinocialis et hoc va[lere]tur(?) Xα; Secundus faciendi azimuth super medium altitudinem Arietis Rε; Sequitur de inscripcione azimuth Dη; [...]mentis orizontis per [...]s transeuntis per [...] totam altitudinem [...] per punctum ce[nith ...g]radus equinocialis [...]amur Vχ(*marg.*)
- 1 *before* De] *add.* Capitulum Qλ; *add.* Capuitulum *and add. interlin.* 15<sup>m</sup> Bε De inscriptione] Inscriptio Pλ Pρ Qβ Xβ; *add.* almucantarath Qδ circulorum] *om.* Eδ Et Fβ Mλ Mv Pv azimuth] *cut off* Bη; asimuth Mv; asmuth Vι; azim<sup>t</sup> Fζ Lγ Oζ Oξ Ou Wα; azimut Ev Mo Pμ Qβ Qγ Qλ Vψ Wι; azimuz Pα; azismuth Eμ; *add.* Alio modo et uenus(?) Mv; *add.* Capitulum Mλ super cenith] *om.* BηCη Eτ Mλ Mv Wβ Wι; *add. in marg.* Capitulum de inscriptione azimuth super cenith Fβ cenith] cēn Po; cen<sup>t</sup> Lη Oζ Sδ; cenich Fζ; cenit Ou Pλ; ceum Eζ; zenith Bε Pρ Qδ Rδ; planum Pα; *add.* Rubricam Qβ; *add.* Capitulum Mv; *add.* Caputum(!) etc. Rδ
- 2 autem] *om.* Cζ diviseris] dividimus Bε Bζ Fβ Lβ Lε Ou Qλ Tδ Vi Vv; diviserimus Fζ Mγ Qβ circulum] eius Aα emisperii] *interlin.* Cδ constitues] constituat Bε; constituemus Mγ Vv; constituemus constituemus Bζ; constituet Cβ eo] ea *some*; *add. interlin.* id est circulo altitudinis Oα; *add. interlin.* tabula scilicet Eμ azimuth] atimuth Pφ Vv; azim<sup>t</sup> Fζ Lβ Oζ Oξ Ou Pv Wα; azimich Mγ; azimuc Oη; azimuht Oκ; azimut Bα Bη Bι Bκ Cβ Cζ Cθ Cι Dγ Eδ Eμ Eo Lη Mκ Oσ Pα Pμ Pρ Pτ Pψ Qγ Qλ Sδ Sθ Sλ Vv Vσ; azimuz Cδ; azinmuth Ev; azmuth Vι; azsumut *corr. to* azumut Vχ; azum<sup>t</sup> Vε; azumuth Nα; azymut Oα ut] *om.* Fβ Lε Nα Ou Pα ut sequitur] sic quia Bα; sicut narrabo Bζ Eo Mγ Oη Qα Rε Vv; sicut narrabo tibi Cβ Cδ Cζ Cθ Eμ Ev Mθ Mκ Mv Oα Oκ Oσ Oφ Pφ Pψ Sθ Sι Sλ Vα Vε Vσ Vv Vχ; ut Vι; *add. interlin.* in alium sicut narrabo tibi Vβ

[CHAPTER 15.] ON THE INSCRIBING OF THE CIRCLES OF AZIMUTH ON THE ZENITH

After you have divided the circle of the hemisphere [i.e., horizon], you will locate the azimuths on it as follows:

Fac circulum Capricorni ABCD, circulum Arietis et Libre ZLYM, et circulum Cancri HTGS, et circulum emisperii perfectum ELVM.

- 5 Deinde dividemus eum per aliquem modum predictum. Et sint eius divisiones
- 3 Fac] facies Bα Pτ Sλ; facimus Bε Vπ; Nam facies Cβ Cζ Cθ Rε Vε; Nam faciemus Bζ Eμ Ev Eo Mγ Mθ Mκ Mν Oα Oη Oκ Oσ Oφ Pφ Pψ Qα Sθ Sι Vν Vσ Vυ Vχ; *add.* ergo Dη  
 Fac ... ABCD] *marg.* Bθ Capricorni] *add.* super quem erit Bα Bζ(erunt) Bθ(*marg.*) Cβ(erint) Cδ Cζ(erunt) Cθ Eμ(erunt) Ev Eo Mγ Mθ Mκ Mν Oα Oη(erunt) Oκ Oσ Oφ Pφ Pψ Qα Rε(erunt) Sθ Sι Sλ Vα Vν(erunt) Vπ Vσ Vυ(est) Vχ; *add.* sunt que ei Vε  
 ABCD] AB<sup>CD</sup> Bζ; *add.* fac Vπ circulum<sub>2</sub>] item Qδ; *add.* *interlin.* ZQZH Pq  
 circulum<sub>2</sub> ... ZLFM] *marg.* Fβ Libre] *add.* super quem erit Bα Cβ(erint) Cδ Cζ(erunt) Cθ Eμ(erunt) Ev Mγ(erunt) Mθ Mκ Mν Oα Oη(erunt) Oκ Oσ Oφ Pφ Pψ Qα Rε(erunt) Sθ Sι Sλ Vα Vβ Vε Vν(erunt) Vσ Vυ(est) Vχ ZLYM] *blank* Pq; LIM Cε; RLYM Rδ; SLKM Mν Oα Oη Oσ Pψ Qα Sλ; TLKM Vυ; YLZM Vβ; ZFYM Eτ; ZHON Vε; ZHYM Eζ; ZKML Mκ; ZLFM Fβ; ZLKM Bα Cδ Ev Oφ Vα; ZLVM Qβ; ZLXM Gα; ZMKL Cζ Eμ Mθ Oκ; ZMYL Eα; *add.* super erunt ZLKM Bζ et ... Cancri] *marg.* Sλ Cancri] *om.* Ev; *add.* super quem Bζ Eo; *add.* super quem erit Bα Cδ Cζ(erunt) Cθ Eμ(erunt) Ev Mγ Mθ Mκ Mν Oα Oη(erunt) Oκ Oσ Oφ Pφ Pψ Rε(erunt) Sθ Sι Sλ Vα Vε Vσ Vυ(est) Vχ HTGS] *illeg.* Oζ; GSHT Vβ; HCGHS Pτ; HCGS Aα Bι Cβ Cε Eη Lη; HDGS Qδ; HFGS Bα Bζ Cδ Eμ Eo Fα Mγ Mθ Mν Oα Oσ Pφ Pψ Oη Oκ Qα Sθ Sλ Vκ Vν Vσ Vυ Vχ; HFGY Oφ; HFOS Ev HFSG Cζ Lβ; HGTS Dγ; HSGP Sβ; HTGF Vψ; HZOC Vε; *add.* SLKM et circulum Cancri super quem erit Mν
- 3-4 et<sub>2</sub> ... ELVM] *om.* Mλ HTGS ... ELVM] *fcinet(?)* Nα
- 4 et<sub>2</sub>] *add.* *interlin.* fac Bθ emisperii] *add.* vero/non(?) Bη perfectum] *om.* Mφ; *add.* super quem erit Bα Bζ Cβ(erint) Cδ Cζ Cθ Eμ(erunt) Ev Eo Mγ Mθ Mκ Oα Oη(erunt) Oκ Oσ Oφ Pφ Pψ Qα Rε(erunt) Sθ Sι Sλ Vα Vε Vκ Vν Vσ Vυ Vχ; ELVM] *illeg.* Pq; EBOM Dγ; EHOM Bα; ELBM Ev Oσ Vυ; ELBM *corr.* to ELVM Oα; ELGM Vε; ELMM *corr.* to ELNM Tδ; ELMN Bζ Bη Qβ Sδ Vψ; ELMV Wβ; ELNM Eβ Fβ Lε Lη Mδ Oζ Pδ Pθ Pν Qγ Qδ Qλ Xβ; ELRM Aα Bθ Pψ; ELYM Xα; EMBL Mθ Oκ; EMVL Cζ Eμ Mκ Oη Vσ; ESVM Bε; LVM Cη Eτ Mo Mν Sκ; LVM *corr.* to ELVM Bγ; LVNR Eδ; *add.* et fac circulum signorum ALGM Bθ(*marg.*) Vπ
- 5 Deinde] *om.* Vπ dividemus] divides Aα Dη Vπ Vψ Wι eum] *om.* Xα; *add.* *interlin.* circulum emisperii Oα; *add.* id est orizontem Cζ; *add.* *interlin.* orizontem Eμ; *add.* *interlin.* scilicet orizontem Mκ per ... predictum/diximus] *om.* Bα aliquem] *om.* Nα modum predictum] modorum quos diximus Bζ Cβ Cδ Cζ Cθ Dγ Dη Eμ Ev Eo Mγ(*add.* in finem proximi capituli) Mθ Mκ Mν Mυ Oα Oκ Oσ Oφ Pθ Pν Pφ Pψ Qα Sθ Sι Sλ Vα Vε Vι Vν Vπ Vυ Vσ Vχ; modorum (unus modus est dividere equinoxialem; alius modus est sume[re] medietatem declinationis solis; tercius per illam medietatem in diametro signatum et predictus divisionis equinoxialis arcus dividentes zodiacum querere; et eodem modo facies hic) quos diximus Oη; *add.* dividendo circulum Arietis et Libre per divisionem ex 10 vel 20 etiam ut diximus Qα; *add.* in fine proximi capituli Bζ Eo Vν; *add.* in *marg.* hoc est sicut diximus in primo capitulo precedente Eμ; *add.* in *marg.* scilicet doctum in capitulo precedente Mκ; *add.* *interlin.* al' modorum quos diximus Vβ predictum] *om.* Wα Xβ Et] *add.* in *marg.* 15 line note concerning azimuths Eμ

Make the circle of Capricorn A, B, C, D, the circle of Aries and Libra Z, L, Y, M, and the circle of Cancer H, T, G, S, and the complete circle of the horizon E, L, V, M.

Next we will divide it [the horizon] by any aforementioned method. And let its divisions be

EN, NS', S'M, MH', H'T', T'V, VR, RC', C'L, LQ, QO, et OE. Et extrahemus punctum cenith capitum, sitque punctus K. Postea queremus arcum circuli qui vadit per punctum N et

- 6 EN ... OE] EN et NS' et S'M et ... *some*; EN, NG, GH, HS, SM, MP, PV, VR, RG, GT, TQ, QL, <sup>10</sup>et OE PQ; EN, NS, SL, LH, HO, OV, VR, RT, TM, MQ, QX, et XE Vψ; EN, NS, SL, LM, MO, OV, VY, YC, OM, MQ, QO, OE Vπ; ON, AN, SM, MH, HE, EV, EM, BOR, EPO Vε EN] CN Eτ; EV Dγ Oτ Wα; SN Cβ NS'] VE Dγ; VS Lβ Oτ Wα Wβ S'M] *om.* Mv Pγ; CM Nα; SL Bθ Cβ; STX *corr.* to SM PA MH'] *om.* Wι; HO Mv; LH Cβ; LM Bθ; MHO Eμ Mθ Oα Oη Ok Oσ Pψ Qα Vv; MK Aα; MLP Vα; MT Cζ; MX Pτ; MY Sβ; SMH Mv; TXH *corr.* to MH PA H'T'] *om.* Xα; CT Nα; HC Pφ Vv Vσ; HO Mθ; HOT/H'OT Cδ Eμ Mv Oα Oη Ok Oσ Pψ Qα Sθ Vα Vv; KHT Aα; MO Bθ; TH Vχ; TI Cζ; XT Pτ; YT Sβ T'V] *om.* Ok; CB Pφ; CV Vv; IV Cζ; OK Mθ; OR Bθ; TN Vσ; UV Nα VR] KR Mθ; NR Wι; RY Bθ; VI Fβ Vv; VK Ok; VT Cβ Si; VZ Tδ RC'] *om.* Eo Eu Pγ; ET Bζ; IC Fβ Vv; IP Fβ Vσ; IT Nα; PC Cζ; RC *corr.* to RP Mκ; RF Cβ; RP Eε Sβ Sκ; RT Aα Eδ Mη Mθ Mλ Ok Po Pv Pφ Rα Rδ Si Xα; RP Bγ Cη Eτ Mo Pτ Vβ Vκ Vχ Wι; YC Bθ; ZR Tδ C'L] CL *corr.* to PL Mκ; CM Bθ; FM Cβ; IL Mη; PL Bγ Cη Eτ Mo Pτ Rε Sβ Sκ Vβ Vκ Vσ Vχ; RL Eu Pγ Tδ; TB Bζ; TL Aα Eδ Mθ Mλ Ok Po Pv Pφ Rδ Si Wι LQ] BQ Bζ; LA Vσ; MQ Bθ Cβ QO] PO Cβ OE] OC Ok extrahemus] extrahes Cδ punctum] *om.* Cε cenith] cenich Fζ; cenih Tψ; cenit Bα Bη Cβ Cθ Dγ Eδ Ev Oα Oσ Pλ Vv Vχ; zenith Bε Nα Pq Vα
- 7 capitum] *om.* Bα Bε Eα Eη Fβ Fζ Lβ Lγ Lη Mδ Mv Pv Wα Mφ Oζ Oζ Oτ Ov Pα Pλ Pμ Pq Qβ Qγ Rδ Sδ Tδ; *add.* cenith Nε; *add.* nostrum(?) Bζ sitque] sit autem Bζ Eo Mγ Vv; eritque Dη Nα punctus] *om.* Bα K] F Nα; LC Vv; LZ *corr.* to K; Wβ *add.* cenit Bα; *add.* Nota quod divisiones orizontis primo debet fieri in lamina plumbea bene polita et postea ipse divisiones sumantur per circulum ex plumbo et in tua lamina erea. Opus azimuth per divisionem circuli emisperii similem divisioni zodiaci et per altitudinem Arietis in eadam regione et post per divisionem dimidie [*illeg.*] Cζ queremus] ponemus Dη; pones Cε, queres Cδ arcum] *om.* Pv punctum] *om.* Gα Sκ N] *om.* Bα; M Mv Sι Wι; R Cε Pφ; V Wα; R et punctum KN Pq et] *add.* per Bα; *add.* interlin. per Mκ
- 7-8 per ... nadair] *om.* Mv; *marg.* Rα



EN, NS', S'M, MH', HT', T'V, VR, RC', C'L, LQ, QO, and OE.<sup>1</sup> And we will draw the overhead zenith point, and it would be point K. Afterwards we will seek the arc of the circle which goes through point N and

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<sup>1</sup> Because of the large number of letters needed to define these divisions, some of the letters are repeated. Scribes often substituted other letters for the duplications, or added a second letter to the first to distinguish between them. I have added primes in my Latin text, the diagram, and the English translation.

eius nadir, punctum R, et punctum K, punctum cenith capitum. Et sit arcus NKR,  
et abscondet motum Arietis super punctum X, et motum Capricorni super punctum I,

- 8 eius] *om.* Cη Eτ Σκ; *interlin.* Bγ Mv nadir] Bα Bε Bζ Bη Cζ Cι Eα Eη Eμ Eο Gα Lη Mθ Mλ Nα Oη Oκ Oφ Pλ Pρ Pφ Qα Qγ Rδ Sι Vα Vι Vν Vσ Vυ Vχ Wβ Xβ; gnadair Cε; naadayr Vψ; nadair Aα Bθ Bι Cβ Dγ Dη Eβ Eδ Ev Eτ Fα Fβ Fζ Lβ Lγ Lε Lζ Mη Mν Mo Nε Oζ Oξ Oτ Ov Pα Pγ Pδ Pμ Po Pτ Pυ Pψ Qβ Rα Sβ Sδ Sθ Σκ Tδ Vβ Vε Vπ Xα; nadair Pθ; nadar Rε; nadayr Bγ Cθ Ev Oα Oσ Qδ Vκ; nadii Eζ; nadit Mφ; nadir *corr.* to nadair Wι; nadyr Cδ Mδ Nδ Sλ; vadair Qλ; vadayr Cη; vadir Wα; vadit Mγ; videtur Pν; *add.* id est oppositum Cζ Eμ(*interlin.*) Mκ(*interlin.*) Oη; *add.* in marg. nadair id est punctum oppositum Oα; *add.* per Nα punctum<sub>1</sub>] *om.* Bα; per punctum Qδ; qui est Bζ; qui est punctum Cβ Cδ Cε Cζ Cθ Dη Eμ Ev Eο Mγ Mθ Mκ Mν Oα Oη Oκ Oσ Oφ Pψ Qα Sθ Sι Sλ Vα Vε Vν Vσ Vυ Vχ; *add.* vadit Vι punctum<sub>1</sub> ... punctum<sub>3</sub>] qui est punctus Pφ R] H Nα; K Oκ Vα Vε; K *corr.* to R Oσ; K *corr.* to T Mθ; T Cη; Z Pρ punctum<sub>2</sub>] per Oη; punctus Vχ; per punctum Cβ Cδ Cε Cζ Cθ Dη Eμ Ev Eο Mγ Mθ Mκ Mν Oα Oκ Oσ Oφ Pψ Qα Sι Vα Vβ Vε Vν Vσ Vυ punctum K] *om.* Cη Gα K] D Vα; V Vε; LZ *corr.* to K Wβ; N Oκ; N *corr.* to K Mθ; K qui est Bγ(*marg.*) Sθ Sλ; *add.* et Aα Ev punctum<sub>3</sub>] *om.* Bγ Qμ Rε Vβ; per Bα; qui punctus Bζ; qui est punctus Cβ Cδ Cε Cζ Cθ Dη Eμ Ev Eο Mγ Mθ Mκ Mν Oα Oη Oκ Oσ Oφ Pλ(*interlin.*) Pψ Qα Sι Vα Vε Vν Vσ Vυ Vχ; *add.* prius Pλ; *add.* scilicet Bι Bκ Dγ Lζ Mλ Nα Pυ Rα Sβ Vβ(*interlin.*) cenith] cenit Bα Bη Cθ Dγ Ev Oα Oσ Ov Pλ Pφ Sδ Vβ Vυ Vχ Wα; enith Aα; zenith Bε Nα Pρ Qδ Vα capitum] *om.* Bα Eζ Eο Qα; *add.* id est(*om.* Cζ) qui transire per illa tria puncta Cζ Eμ(*interlin.*) nkr] KNR Oξ; KR Qλ Wα; KVT Ev; NKI Fα Vα; NKK Oκ; NKK *corr.* to NKR Mθ; NKTR Nα; NKV Bθ; NRK Bζ Vχ; UKR Dγ
- 9 motum<sub>1</sub>] capud/caput Fα Fζ Lγ Pμ Pν Ov Qλ Wα; capud/caput vel motum Fβ Qβ Sδ; motum vel caput Lε Pα Tδ; *add.* capud/caput Mv Mφ Po(*marg.*) Vι; *add.* *interlin.* id est circulum Oα Oτ; *add.* *interlin.* id est circulum equinoctialem Vχ; *add.* sive circulum capitis Xβ Arietis] *om.* Bζ punctum<sub>1</sub>] *add.* A et motum Cancri Pν x] *om.* Fζ Mη Nα Nε Pμ Rε; C Mν; et H Bζ; I *corr.* to Z Pγ; K Bε; R Pφ Rδ; T Vυ; Z Aα Bγ Bη Bθ Bι Bκ Cβ Cδ Cε Cζ Cη Cθ Cι Dγ Eδ Eζ Eη Ev Eο Eτ Ev Fα Fβ Gα Lζ Mγ Mθ(*add.* *interlin.* id est punctum x) Mκ Mλ Mo Oα Oη Oκ Oσ Oφ Pδ Pθ Po Pυ Qα Qλ Rα Sβ Sθ Sι Σκ Sλ Vα Vβ Vε Vκ Vν Vπ Vσ Vχ Vψ Wα Wβ Wι Xα; Z *corr.* to X Pτ; *add.* in marg. al' x Po x ... punctum<sub>2</sub>] *om.* Eη et<sub>2</sub>] *add.* per Vε motum<sub>2</sub>] *add.* *interlin.* id est circulum Vχ super<sub>2</sub> punctum<sub>2</sub>] marg. Rε punctum<sub>2</sub>] punctu Sι I] *om.* Mη Rε; A Bζ Bη Bθ Bι Bκ Cδ Cε Cζ Cθ Cι Dγ Eα Eμ Ev Fβ Fζ Lε Lζ Mγ Mθ Mλ Mν Nε Oα Oη Oκ Oσ Oφ Pα Pδ Pθ Pμ Pν Pφ Pψ Qα Qβ Qδ Qλ Sδ Sθ Sι Sλ Tδ Vα Vε Vκ Vν Vπ Vυ Vχ Vψ Wα Wβ Xα; DX Nα; IT Vσ; K Eτ Fα; R(?) Gα; S Sβ; Y Aα; v Rδ; *add.* et circulum Arietis super punctum F Nα; *add.* in marg. Z Po
- 9-10 et<sub>1</sub> ... F'] *om.* Bα motum<sub>2</sub> ... et<sub>2</sub>] marg. Bε

its nadir,<sup>2</sup> point R, and point K, the overhead zenith point. And let this be arc NKR, and it will divide the path of Aries on point X,<sup>3</sup> and the path of Capricorn on point I,<sup>4</sup>

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<sup>2</sup> This is not the normal meaning of “nadir”, i.e., the point of the celestial sphere vertically opposite the overhead zenith; here the “nadir” of a point or position means the opposite point 180° across (or around) the sphere.

<sup>3</sup> The lettering of the intersections of arc NKR with various circles as Z, A, and H reflects a conflation of two different uses of these letters in Figura 15. In line 3 Z, A, and H are part of the definition of the circles of Cancer, of the equator, and of Capricorn. As shown in the figure, these letters are normally found along the north/south (or vertical) diameter. But in many manuscripts (with or without Figura 15), these letters seem to have migrated over to arc NKR and are used to define both the three circles and their points of intersection with the arc. Other manuscripts use other letters (usually X, I, and F) to mark the intersection of the three circles with the arc, and retain the letters Z, A, and H to define just the three circles.

<sup>4</sup> See previous note.

10 et motum Cancrī super punctum F'. Et faciemus arcum similem predicto et erit arcus qui vadit per punctum O, et T' oppositum puncto O; et abscindet hic arcus circulum Capricorni super punctum D', et circulum Arietis super punctum F, et circulum Cancrī

- 10 et<sub>1</sub>] *add.* circulum Cancrī I et Nα; *add.* per Vε et<sub>1</sub> ... F'] *marg.* Bθ Cancrī] Tauri Cη F'] *om.* Pγ; B Eδ Mη; F *corr.* to H Sδ; H Aα Bγ Bη Bζ Bθ Bι Bκ Cβ Cδ Cε Cζ Cη Cθ Cι Dγ Eζ Eμ Ev Eo Eτ Ev Fβ Gα Lζ Mγ Mθ (*add. interlin.* F) Mκ Mλ Mν Mo Nα Nε Oα Oη Oκ Oσ Oφ Pδ Pθ Po (*add. interlin.* F) Pτ Pv Pφ Pψ Qα Qλ Rα Rδ Re Sβ Sθ Si Sκ Sλ Vα Vβ Vε Vκ Vν Vπ Vσ Vυ Vχ Vψ Wα Wβ Wι Xα faciemus] facies Bε Bκ Cδ Cι Eα Eζ Fa Fβ Fζ Lβ Le Lη Mδ Mη Mυ Mφ Oζ Oσ Oτ Ou Pα Pδ Pθ Pλ Pv Po Pρ Pτ Qβ Qγ Qλ Qμ Sδ Sλ Tδ Vι Vυ Wα Xα; *add.* A Nα similem] *om.* Xα; *add. in marg.* ex alio parte Oα predicto] predictum Cη Sκ; puncto Mγ Mθ Oκ Vσ; *add.* arcui NKR Cζ Oη; *add. interlin. illeg.* Eμ; *add. in marg.* qui est similem arcui NKR Cζ et<sub>3</sub> ... arcus] *om.* Bα et<sub>3</sub>] *add.* hic Bζ Eo; *add.* hic arcus Cβ Cδ Cζ Cθ Eμ Ev Mγ Mθ Mκ Mν Oα Oη Oκ Oσ Oφ Pφ Pψ Qα Sθ Si Sλ Vα Vε Vν Vσ Vυ Vχ; *add. interlin.* qui est arcus circuli NKR Eμ arcus] *om.* Eζ Mγ Mν Qα Vε; *add.* predictus Cε
- 11 qui vadit] *om.* Oη; vadens Aα Bγ Bε Bη Bθ Bι Bκ Cδ Cε Cη Cι Dγ Dη Eα Eβ Eδ Eζ Eη Eτ Ev Fα Fβ Fζ Lβ Lγ Lζ Le Lη Nα Mδ Mη Mθ Mλ Mo Mυ Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pθ Pλ Pμ Pv Po Pτ Qγ Qβ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sκ Tδ Vβ Vι Vκ Vπ Vψ Wα Wβ Wι Xα Xβ per] *om.* Pμ; super Xβ punctum] *om.* Bα O<sub>1</sub>] *om.* Bθ Mυ Mφ Sκ Vι Vπ; *add. interlin.* et punctum K Sλ; *add.* et TO Xα; *add. in marg.* et per punctum K Mκ O<sub>1</sub> et] *marg.* O et per punctum K et per punctum Cβ et<sub>1</sub>] *add.* per Bα; *add.* per punctum Bζ Cζ Cθ Eμ Ev Eo Mθ Mκ Mν Oα Oη Oκ Oσ Oφ Pφ Pψ Qα Sθ Si Vα Vε Vν Vυ Vχ; *add.* per punctum K et per punctum Vσ; *add.* punctum Sλ; *add.* punctum K et punctum Cδ et<sub>1</sub> ... O<sub>2</sub>] *om.* Bγ Cη Ev Mγ Re; *add. in marg.* et T oppositum Bγ T'] C Mν Pμ Si; I Vν; P Pρ; X Cθ Oφ (*add. interlin.* al' T); T *corr.* to K Mθ oppositum] opposito Cε; ei oppositum Qα; qui est oppositus Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mθ Mκ Mν Oα Oη Oκ Oφ Si Sλ Vα Vε Vν Vσ Vυ Vχ; qui est punctus oppositus Sθ puncto] *om.* Bα Gα O<sub>2</sub>] *om.* Eζ Qα; OR Nα; *add.* D fit Vχ; *add.* et erit arcus ORX Oφ; *add.* qui similiter transire per K qui est cenith Cζ Eμ (*interlin.*) hic arcus<sub>2</sub>] *om.* Qα
- 11-12 circulum ... et<sub>1</sub>] *om.* Bθ Vπ
- 11-13 et<sub>2</sub> ... I'] *om.* Bα; *marg.* Oφ (al' et abscindat ...) abscindet ... I'] *marg.* Vχ
- 12 Capricorni] *add.* supricorni Aα Capricorni ... circulum<sub>1</sub>] *om.* Nε punctum<sub>1</sub>] *om.* Mθ Oκ et<sub>1</sub> ... F] *om.* Vε Arietis] *om.* Bκ F] *om.* Xα; A Aα Bθ Eδ Ev Mη Po (*add. interlin.* F) Vπ; FE Cδ Cζ Cθ Eμ Mθ Mν Oα Oη Oκ Oσ Pψ Qα Sθ Vυ Wι; FE *corr.* to F Mκ; FM Bζ; FT Cβ; M Mγ Vν circulum<sub>2</sub>] *om.* Bε
- 12-13 D' ... I'] *om.* Eη F ... punctum] *om.* Mo Nα Pγ Po et<sub>2</sub> ... I'] *om.* Eδ Pρ Wι
- 12-14 super<sub>2</sub> ... similiter] *marg.* Bε

and the path of Cancer at point  $F'$ .<sup>5</sup> And we will construct an arc similar to the aforesaid [arc NKR] and it will be the arc which passes through point O, and  $T'$  opposite point O; and this arc will cut the circle of Capricorn at point  $D'$ , and the circle of Aries at point F, and the circle of Cancer

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<sup>5</sup> See above, notes to Cap. 15, line 9.

super punctum I'.

Similiter facies in arcu S'KC' et QKH' et MKL. Perficies quoque positionem horum

- 13 I'] A Bγ Cη Eζ Mo Nα Pα Pγ Po Pτ Pv Sκ Vβ Wα; A *corr.* to S Mθ; C Si; EI Mv Pφ; N Bθ Bi Cβ Cδ Cε Cθ Mκ Qλ Sλ Vε Vi Vπ Vυ; S Mγ Vv; Si Bζ; T Sθ Vα; TI Cζ Eμ Mη Oη Oσ Pψ Qα Vσ; TN Oα; TS Ev; V Oκ; *add.* *Addendum 15* Aα Bε Bθ Cε Ci Dη Eα Eβ Eη Ev Fa Fβ Fζ Lβ Lγ Lε Lζ(*marg.*) Lη Mδ Mv Mφ Nε Oζ Oξ Oτ Ov Pa Pδ Pθ Pλ Pμ Pv Pρ Qβ Qγ Qδ Qλ Qμ(*marg.*) Rδ Sδ Tδ Vi Vπ Vψ Wα Xβ
- 14 Similiter] *om.* Si; Super Aα; *add.* etiam Vσ facies] fac Aα Bε Bκ Ci Eα Eβ Eζ Lβ Lε Lη Mλ Mφ Nε Oζ Ov Pγ Pδ Pθ Pλ Pv Pτ Qλ Rδ Rε Sβ Tδ Vi Vπ Vψ Wi; *add.* etiam Cβ Cζ Cθ Eμ Ev Eo Mθ Mκ Mv Oα Oσ Pψ Sθ Si Vv in<sub>1</sub>] *om.* Mκ Xβ in arcu] *om.* Cθ Vε; arcum Oφ Vχ; *add.* scilicet Pγ in ... S'KC'] *om.* Bα arcu] *interlin.* Cβ S'KC'] et OKP Bζ; KP Pγ; OCH Mγ; OKT Pφ Si; OLK Vv; PFK Eo; PKS Vχ; SCK Vi; SKCP Qδ; SKE Cθ Xα; SKEC *corr.* to SKP Mκ; SKF Cβ Lγ; SKO Fβ Vε; SKP Aα Bγ Bθ Bi Bκ Cε Cη Dγ Eδ Eτ Ev Gα Lζ Mη Mλ Mo Nα Po Pτ Pv Rα Rε Sβ Sκ Vβ Vκ Vπ Vσ Wi; SK.PA Eζ; SKT Cδ Ev Fζ Lβ Mθ Oκ Pρ Vυ; TKS Oφ et<sub>1</sub>] R Nα; *add.* arcum Oφ Vχ; *add.* in arcu Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mγ Mθ Mκ Mv Oα Oκ Oσ Pφ Pψ Qα Sθ Si Sλ Vα Vε Vv Vσ Vυ et<sub>1</sub> ... MKL] *marg.* Rα et<sub>1</sub> QKH] *om.* Vκ QKH'] AKHO] Vυ; HKQ Oφ Vχ; QBH Vε; QHK Bζ Nα; QHO Qα; QK Mη; QKHO Cδ Mθ Mv Oα Oκ Oσ Pψ Si Vα; QKL Cβ Pγ; QKO *corr.* to QKHO Eμ; QKP Aα Pτ; QKQ Bθ Ev Vπ; QKT Cζ; QLHO Sθ et<sub>2</sub>] *om.* Nα; *add.* in arcu Bα Bζ Cβ Cδ Cζ Cθ Eμ Ev Eo Mγ Mθ Mκ Mv Oα Oη(*om.* in) Oκ Oσ Pφ Pψ Qα Sθ Si Sλ Vα Vε Vv Vσ Vυ; *add.* item quoque arcum Vχ; *add.* *interlin.* similiter Vβ et MKL] et de MKL et XHZ *marked* "va | cat" Vβ; itemque arcus MKL Oφ MKL] MKH Qλ; MKLN Sθ; MKS Bε Ev; MKTR Cθ Perficies quoque] Perficies Bη Eζ Pδ Qλ Wβ; Perficiesque Aα Bγ Bκ Cη Ci Dγ Dη Ev Lζ Mη Mλ Mo Nα Ne Pγ Pθ Po Pτ Pv Qδ Qμ Rα Vβ Vκ Vπ Vψ Wi Xα Xβ; Et perficies Bα; Erisque perficiens Bζ Cβ Cδ Cζ Cθ Eμ Eo Mθ Mκ Oα Oη Oκ Oσ Oφ Pφ Qα Sλ Vα Vv Vσ Vυ Vχ; Eritque perficiens Ev Mγ Mv Pψ Sθ Si Vε quoque] *om.* Sκ horum] eorum Cε; istorum Eα

at point  $I'$ .

You will do similarly in arc  $S'KC'$  and  $QKH'$  and  $MKL$ . And you will complete the position of these

15 azimuth per hanc divisionem sub 30 et 30 gradibus. Similiter divides gradum gradui aut cui volueris. Et scribes in eis numerum secundum quod est in figura, si deus voluerit.

15 azimuth] acimuth Vπ; armut Vσ; asimuc Oη; asimut Oκ; asumut *corr. to* azumut Vχ; atimuth Vυ; azimich Mγ; azim<sup>t</sup> Eβ Lζ Rα; azimuht Mη; azimut Bα Bζ Bη Cβ Cθ Dγ Eδ Eο Lβ Lε Mθ(*interlin.*) Mκ Oα Oσ Pυ Pψ Sθ Sλ Vκ; azimuz Cδ; azismuth Vα; azsumuth Ev; azum<sup>t</sup> Vε; azumuth Nα Xα azimuth ... gradui] *om.* Bκ hanc] *om.* Eο Sβ divisionem] *corr. from* dictionem Pο sub] *om.* Eτ Vσ; et gratia exempli sint Bα; et sint Bζ Cβ Cδ Cζ Cθ Eμ Ev Eο Mγ Mθ Oα Oη Oκ Oσ Oφ(*add. interlin. al' sub*) Pψ Qα Sθ Vα Vυ Vυ Vχ(*add. interlin. sub*); et sunt Pφ; per Oζ Pλ Pρ; que sint sub Mκ; sint Mν; sunt Vε; super Bη sub ... gradibus] et sunt(sint Sλ) 30 gradus Sι Sλ; 30 gradibus Sκ 30 et 30] triginta et triginta Qδ; 30 Cδ Gα Nα Oη Pφ Rε; 20 et 30 Nε; 30.30 Eμ Ev Mθ Oα Oκ Qα Sθ Vα Vε Vχ; 30 et 30 et 30 Bη 30<sub>2</sub>] *interlin.* Pρ gradibus] gradus Bα Eο Mγ Mν; *add. super* Aα; *add. vel ad tuum placitum de 10 in 10 et c[etera]* Bε divides] *add. per* Bε gradum] *om.* Eη Ev Pγ Sθ Vα Vε Vσ Vυ Vχ; *interlin.* Oφ; gradi Oκ; gradui Oη; gradus Bζ Eο Mθ Vυ; *add. interlin. id est secundum quod [illeg.] Oα gradui] om.* Mν; in graduum Bε; gradubus Bζ Eο Vυ; gradus Pρ; scilicet gradibus Mγ; *add. id est per quot gradus volueris divide[re] equinoxialem et per equinoxialem orientem et describes azimuth(azimuc Oη) transeuntes per cenith capitis Cζ Oη*

15-16 Similiter ... volueris] vel sicut vis Bα

16 aut cui] si Dη cui] quamlibet Bε; cuius Mθ(*add. interlin. quamlibet*) Et scribes] Scribesque *some* in<sub>1</sub>] *om.* Vυ numerum] *om.* Cη; *add.* 30.30 Qα secundum] *om.* Sι secundum quod] sicut Cδ Sλ quod] *om.* Cη; quot Lβ est] apparet Cε Dη; patet Bε; ponitur Cη Oη; tibi apperebit Bκ in<sub>2</sub>] *add. hac* Bι Cβ Cδ Cθ Dγ Eμ Ev Lζ Mθ Mκ Mλ Mν Oα Oη Oκ Oσ Oφ Pυ Pφ Pψ Qα Qδ Rα Rε Sβ Sθ Vα Vβ Vε Vκ Vσ Vυ Vχ Wβ; *add. presenti* Lε Tδ figura] *add.* 30.30 Cζ Cθ Eμ Mθ Mκ Oα Oκ Oσ Pψ Sθ Vα Vε Vυ Vχ; *add.* 30 et 30 Dγ Gα Lζ Mλ Oφ(xxx et xxx) Pφ Rα(*marg.*) Rε Sβ; *add. [illeg.] 30 et 30 Eο; add. est 30 et 30 Vκ; add. presenti* Pρ; *add. sequenti* Tδ; *add. subscripta* 30 et 30 Vυ; *add. scripti est* Bκ; *add. subscripta* 20 et 30 Mγ; *add. subscripta* 30 et 40 Bζ; *add. interlin. que ponitur* Eμ

16-17 si deus voluerit] *om.* Bγ Bζ Bη Bθ Bι Bκ Cδ Cη Dη Ev Eο Eτ Mγ Mθ Mν Oκ Pρ Qα Sι Sκ Sλ Tδ Vε Vυ Vπ Vυ Wβ Xα; etc. Rδ; si deus Lζ; *ms* Gα ends



azimuths through this division of 30 and 30 degrees. Similarly you will divide degree by degree, or what you wish. And you write in them [i.e., the divisions] the number in accordance with what is in the figure (God willing).

## [ ADDENDUM 15 ]

Line 13: γ] *add.* Aα Bε Bθ Cε Cι Dη Eα Eβ Eη Ev Fα Fβ Fζ Lβ Lγ Lε Lζ(*marg.*) Lη Mδ Mu Mφ Nε Oζ Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qγ Qδ Qλ Qμ(*marg.*) Rδ Sδ Tδ Vι Vπ Vψ Wα Xβ

Et nota quod invenies circulum transeuntem per cenith et principium Arietis et Libre et erit primum azimuth, et secundum quod deprimitur vel elevatur cenith.  
 20 Secundum hoc oportet querere centrum illius in diversis locis in dyametro ita quod primum azimuth semper transeat per cenith et principium Arietis et Libre.

18 Et [no]ta] *om.* Eη; *marg.* Bε nota] notando Fβ circulum] *add. interlin.* scilicet alium apdeīs(?) Pα per cenith et] *om.* Eβ Lη Pμ cenith] cenich Xβ; cenit Fβ Pθ Qμ; chenith Cε; zenith Bε Ev Pρ Qδ cenith et principium] *om.* Pμ et<sub>2</sub>] *om.* Oξ; *add.* per Aα Bε Bθ Dη Eβ Eη Ev Fβ Lη Mδ Qμ Vπ Wα

19 erit] *superscr.* Bε primum] *add. and expunged* vel elevatur Aα azimuth] acimuth Vπ; azim<sup>t</sup> Dη Eβ Qμ secundum] *om.* Ev quod] *om.* Aα elevatur] *add.* a Lγ cenith] cenich Xβ; cenit Qμ Sδ; cen<sup>t</sup> Cι Lβ Lη Oξ Ou Qλ; zenith Bε Pρ Qδ: centrum Pν

20 Secundum hoc] *om.* Qμ hoc] *interlin* Cε; *om.* Vπ in<sub>1</sub>] *om.* Fζ in<sub>2</sub>] *om.* Qδ

21 azimuth] acimuth Vπ; azim<sup>t</sup> Eβ Lβ; azimut Fβ Pα ; *add.* <sup>va</sup> et secundum quod deprimitur vel elevatur cenith. Secundum hoc oportet querere <sup>cat</sup> Nε(= lines 20-21) semper] *om.* Vφ; super Bθ Vπ Xβ cenith] cenich Xβ; cenit Fβ Qμ Vι; cen<sup>t</sup> Qγ; chenith Cε; zenith Bε Pρ Qδ et<sub>1</sub>] *add.* per Fβ

## [ ADDENDUM 15 ]

And note that you will find the circle passing through the zenith and the beginnings of Aries and Libra and it will be the first azimuth, and the second [azimuth], because the zenith is depressed or raised. In pursuing this, it is proper to seek the centre of that in various places on the diameter so that the first azimuth always passes through the zenith and the beginnings of Aries and Libra.

[ FIGURA 15 ]

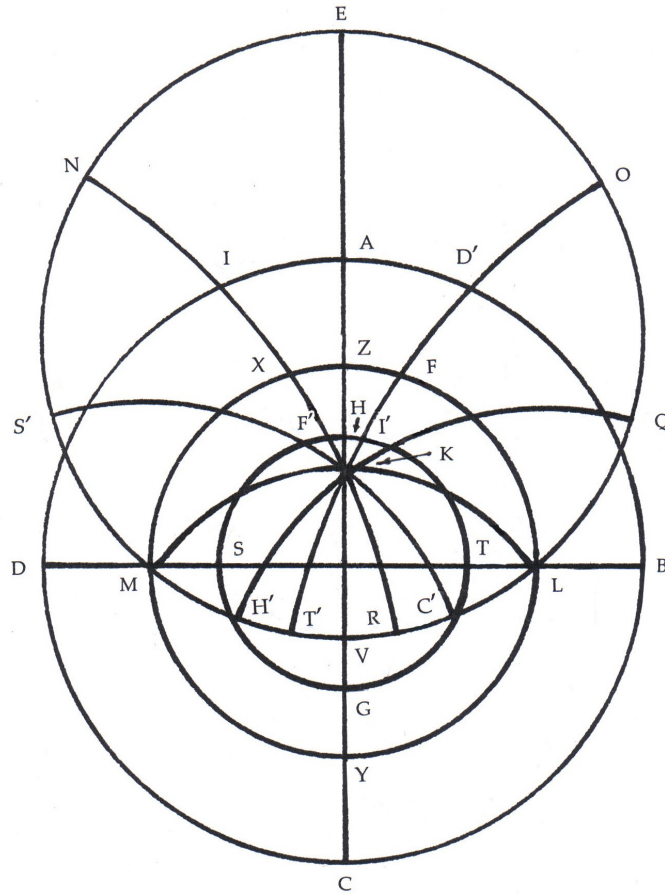


Figura inscriptionis azimuth super cenith /  
Figure of the inscription of the azimuths through the zenith

Complete: Bα(*upside down*) Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Eτ Fα(*upside down*)  
Fβ Fζ Lγ Lε Lζ Lη Mγ(*upside down*) Mδ<sup>6</sup> Mη Mλ Mν Mo Mυ Nδ<sup>7</sup> Nε Oζ Ok Oξ Oσ Ot Ou Oφ Pa  
Pγ<sup>8</sup> Pδ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ(*sideways*) Sδ Sκ Tδ Vα Vβ Vι Vκ Wβ Xβ

<sup>6</sup> In ms Mδ, Figura 15 is combined with Figura 16. Only the lettering in mss Mδ, Nδ and Pγ relevant to Figura 15 is recorded here.

<sup>7</sup> In ms Nδ, Figura 15 is combined with Figura 16.

<sup>8</sup> In ms Pγ, Figura 15 is combined with Figura 16.

*Incomplete:* Mθ<sup>9</sup> Mκ Pλ Vε Wι

*Outline or Space Only:* Αα Βθ Cε Dγ Dη Eδ Eζ Eο Eυ Lβ Mφ Oα Pν Pφ Qα Sθ Vπ Vσ Vν Vυ Vψ Wα

*No Space:* Bζ Cζ Eα Ev Gα Nα Oη Si Sλ Vχ Xα

Pθ: “O”

*Note: the letters are reversed left/right in these manuscripts:*<sup>10</sup> Bκ Cβ Cδ Eμ Eτ Lζ Mη Mλ Mν Mo Oσ Pμ Po Pυ Pψ Rα Sβ Vα Vκ

[Caption]

Figura ... cenith] Bε Cη Cι Eβ Eη Fα Fζ Lγ Lε Lη Mδ Mη Nε Oζ Oτ Oυ Pα Pδ Pμ Pρ Pτ Qδ Qλ Qμ Sδ Tδ Xβ; *om.* Bα Bι Bκ Cβ Cδ Cθ Eμ Lζ Mγ Nδ Oκ Oσ Pψ Vα; Figura descriptionis ipsorum azimuth Bγ; Figura dispositionis azimuth Bη (azimut) Wβ; Figura divisionis azimuth per [*illeg.*] Rα Sβ; Figura divisionis orizontis per azimuth per arcus super polum medie altitudinis euntes vel per rectas lineas exeuntes a cenith Fβ;<sup>11</sup> Figura inscriptionis azymuth secunda super totam altitudinem regionis sive cenith quod idem est Oφ; Secunda figura azimuth super medium altitudinem Arietis Rε; *add.* Figura capituli 15 Bε

azimuth] admuch Cι Mν; azim<sup>t</sup> Lγ Oξ Qγ; azimut Oυ Pρ Qμ Vι; azymuth Eη Mλ Mν Sδ; *add.* secunda Vβ Vκ super] *add.* ipsum Eτ Mν Mo Mυ Po Vι super cenith] *om.* Mλ Pγ; primo modo Sκ cenith] cen<sup>t</sup> Oξ; cenich Cι Xβ; cenit Mη; zenit Eη; zenith Bε Mυ Pρ Vι; *add.* caputum Rδ; *add.* regionalis Vκ; *add.* cum figura 12 horarum naturalium Mδ; *add.* in tabule Mυ; *add.* nostram. Et est doctrina bona Pυ Vβ; *add.* secundis inscribendi azimuth Bε

[Lettering on the diagram]

A] Bα Bγ Bε Bη Cβ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mγ Mδ Mν Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pμ Po Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sβ Sδ Sκ Tδ Vα Vβ Vι Wβ Xβ; *om.* Bι Bκ Cδ Cθ Eμ Fζ Lζ Mη Mλ Mν Mo Pυ Pψ Rα Vκ B] Bα Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mo Mυ Nδ Nε Oζ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pμ Po Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sκ Tδ Vα Vβ Vι Vκ Wβ Xβ; D Oκ C] Bγ Bε Bη Bι Bκ Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mo Mυ Nδ Nε Oζ Oκ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pμ Po Pρ Pυ Pψ Qβ Qγ Qλ Qμ Rα Rδ Rε Sβ Sδ Sκ Tδ Vα Vβ Vι Wβ Xβ; *om.* Bα Qδ; *cut off* Oξ Pτ Vκ C'] Bα Bε Cδ Cη Cθ Cι Eβ Eη Eμ Fα Fβ Fζ Lγ Lε Lη Mγ Nδ Nε Oζ Oξ Oσ Oτ Oυ Pα Pδ Pψ Qδ Xβ; *om.* Bη Qβ Vα; F Bκ Lζ; G Pρ; *illeg.* Rδ; H Oφ; P Bγ Bι Eτ Mη Mλ Mν Mo Pμ Po Pτ Pυ Qγ Qλ Qμ Rα Rε Sβ Sδ Sκ Tδ Vβ Vι Vκ Wβ; R Mδ; T Mυ Oκ Pγ; X Cβ D] Bα Bγ Bε Bη Bι Bκ Cη Cθ Cι Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mη Mλ Mν Mo Mυ Nδ Nε Oζ Oξ Oσ Oτ Oυ Oφ Pα Pγ Pδ Pμ Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sκ Tδ Vα Vβ Vι Wβ Xβ; *om.* Po Vκ; *cut off* Cβ Cδ; B Oκ D'] Bγ Bε Bι Cβ Cδ Cη Cθ Cι Eβ Eη Eμ Fα Fβ Fζ Lγ Lε Lζ Lη Mυ Nδ Nε Oζ Oξ Oσ Oτ Oφ Pα Pγ Pδ Pρ Pτ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rε Sβ Sδ Sκ

<sup>9</sup> The diagram in ms Mθ is very confused.

<sup>10</sup> Letters B and D, however, remain in their normal positions.

<sup>11</sup> This is actually the caption for Figure 14.

Tδ Vβ Vι Vκ Wβ Xβ; *om.* Βα Βη Βκ Ετ Μγ Μδ Μη Μλ Μν Μο Οκ Ου Ρμ Ρο Ρυ Vα; T Rδ E] Ba Bγ Be Bη Bκ Cβ Cδ Cη Cθ Ci Eβ Eμ Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μν Μο Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ργ Ρδ Ρμ Ρο Ρρ Ρτ Ρψ Qβ Qγ Qλ Qμ Rδ Re Sβ Sδ Sk Va Vβ Vι Wβ Xβ; *om.* Eη Ετ Μυ Qδ Tδ; A Bi Μη Μλ Ρυ Rα; *add.* A Vκ F] Bγ Be Bi Cβ Cη Eβ Eη Eμ Fa Fζ Λγ Λε Λζ Λη Μδ Μη Μλ Μο Μυ Νδ Νε Οζ Οξ Οτ Ου Ρα Ρδ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Vβ Vι Vκ Wβ Xβ; *om.* Ba Bη Bκ Ετ Fβ Μγ Μν Οκ Ργ Vα; FA Cθ; FE Cδ Oσ Pψ; S Ci; Z Oφ F'] Be Cη Eβ Eη Fa Fβ Fζ Λγ Λε Λη Μδ Νε Οζ Οξ Οτ Ου Ρα Qβ Qγ Qλ Qμ Tδ Xβ; *om.* Ba Bκ Ετ Μγ Μν Μυ Οκ Οφ Ρρ Qδ Re Vα Vι; *illeg.* Rδ; H Bγ Bi Cβ Cδ Cθ Ci Eμ Λζ Μλ Μο Οσ Ργ Ρδ Ρμ Ρο Ρτ Ρυ Ρψ Rα Sβ Sδ Sk Vβ Vκ Wβ; Z Bη Μη G] Ba Bγ Be Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ρδ Ρμ Ρο Ρρ Ρτ Ρψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sδ Sk Tδ Vα Vι Vκ Wβ Xβ; *om.* Pu; H Pγ Vβ; s(?) Sβ H] Ba Bγ Be Bη Cη Ci Eη Et Fa Fβ Fζ Λγ Λε Λη Μγ Μδ Νδ Οζ Οκ Οξ Οτ Ου Ρα Ρδ Ρρ Qβ Qγ Qδ Qλ Qμ Tδ Vα Xβ; *om.* Bi Bκ Cβ Cδ Cθ Eβ Eμ Λζ Μη Μλ Μν Μο Μυ Νε Οσ Οφ Ρμ Ρο Ρτ Ρυ Ρψ Rα Re Sβ Sδ Sk Vι Vκ Wβ; *illeg.* Rδ; G Vβ; Z Pγ H'] Ba Bγ Be Cβ Cη Cθ Ci Eβ Eη Fa Fβ Fζ Λγ Λε Λη Μγ Μδ Μν Μο Νδ Νε Οζ Οκ Οξ Οτ Ου Ρα Ργ Ρδ Ρτ Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Sk Tδ Vβ Vκ Wβ Xβ; *om.* Bη Pψ Vα; H° Cδ Eμ Oσ; M Pρ; T Μη Oφ; X Bi Bκ Et Λζ Μλ Μυ Ρμ Ρο Ρυ Rα Vι; Y Sβ I] Bγ Be Cη Fa Fβ Fζ Λγ Λη Μδ Νε Οζ Οξ Οτ Ρα Ρτ Qγ Qδ Rδ Sδ Vβ Wβ Xβ; *illeg.* Eβ Eη; *om.* Ba Bη Bκ Et Μγ Μη Μλ Μν Μο Νδ Οκ Ου Οφ Ρμ Ρο Ρυ Qβ Qμ Re Sk Va Vι Vκ; A Cβ Cδ Cθ Ci Eμ Λζ Pδ Qλ; D Oσ Pψ; G Ra; L Pγ; N Λε Tδ; S Bi Mu Sβ; X Pρ I'] Be Bi Cη Ci Et Fa Fβ Fζ Λγ Λε Λη Μδ Μη Μο Νε Οζ Οξ Οτ Ου Ρα Ρδ Ρμ Ρο Ρυ Qβ Qγ Qλ Qμ Rα Re Sβ Tδ Vκ Xβ; *illeg.* Eβ; *om.* Ba Bη Bκ Eη Μγ Μλ Μν Μυ Νδ Οκ Οφ Ργ Ρρ Qδ Vα Vι; *illeg.* Rδ; A Bγ Pτ Sk Vβ Wβ; A, X Sδ; N Cβ Cδ Oσ Pψ; T Eμ; Π Cθ; Z Λζ K] Ba Bγ Be Bi Bκ Cβ Cδ Cη Ci Eμ Et Fa Fζ Λγ Λζ Λη Μγ Μδ Μη Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Ρδ Ρμ Ρο Ρρ Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Rα Re Sδ Sk Va Vβ Vι Vκ; *illeg.* Eβ Pψ Rδ; *om.* Bη Cθ Eη Fβ Λε Μλ Μν Οφ Ρα Ργ Sβ Tδ Wβ Xβ L] Ba Bγ Be Bη Bi Bκ Cδ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ργ Ρδ Ρο Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Va Vβ Vι Wβ Xβ; M Cβ; Q Ρμ Ρρ; X Vκ M] Ba Bγ Be Bη Bi Bκ Cδ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ργ Ρδ Ρμ Ρο Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Vα Vβ Vι Vκ Wβ Xβ; H Pρ; L Cβ N] Ba Bγ Be Bη Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eμ Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οτ Ου Ρα Ργ Ρδ Ρο Ρρ Ρτ Ρυ Ρψ Qγ Qδ Qλ Qμ Rδ Re Sβ Sδ Sk Tδ Vβ Vι Vκ Wβ Xβ; *om.* Eη Et Oσ Ρμ Qβ Rα Vα; X Oφ O] Ba Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eμ Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οτ Ου Ρα Ργ Ρδ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Vβ Vι Vκ Wβ Xβ; *cut off* Bη; *om.* Eη Et Oσ Ρμ Vα; N Oφ Q] Ba Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Ρα Ργ Ρδ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Vα Vβ Vι Vκ Wβ Xβ; *cut off* Bη; L Ρμ Ρρ; S Oφ R] Ba Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οξ Οτ Ου Ρα Ργ Ρδ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Qγ Qδ Qλ Qμ Rα Rδ Re Sβ Sδ Sk Tδ Vβ Vι Vκ Wβ; *om.* Bη Οκ Qβ Vα Xβ; O Oφ; T Oσ S] Bγ Be Bη Cη Ci Eη Et Fa Fζ Λγ Λε Λη Μγ Μδ Μο Νδ Νε Οζ Οξ Οτ Ου Ρα Ρδ Ρρ Ρτ Qβ Qγ Qδ Qλ Qμ Sk Tδ Wβ; *om.* Bi Bκ Cβ Eβ Fβ Λζ Μη Μλ Μν Μυ Ργ Ρμ Ρο Ρυ Rα Rδ Re Sβ Sδ Vι Vκ Xβ; C Ba; F Cδ Cθ Eμ Οκ Oσ Pψ Vβ; T φ Vα; Y Oφ S'] Ba Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Eβ Eη Eμ Et Fa Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Ρα Ργ Ρδ Ρο Ρρ Ρτ Ρυ Ρψ Qγ Qδ Qλ Qμ Rα Re Sβ Sδ Sk Tδ Vα Vβ Vι Vκ Wβ Xβ; *om.* Bη Ρμ; *illeg.* Rδ; F Qβ; Q Oφ T] Bγ Be Bη Cη Ci Eη Et Fa Fβ Fζ Λγ Λε Μδ Μο Νδ Νε Οζ Οξ Οτ Ου Ρα Ρδ Ρρ Ρτ Qβ Qγ Qλ Qμ Re Sk Tδ Wβ; *om.* Bi Bκ Cβ Eβ Λζ Λη Μη Μλ Μν Μυ Ργ Ρμ Ρο Ρυ Qδ Rα Sβ Sδ Vι Vκ Xβ; *illeg.* Rδ; F

Βα Μγ Οφ; s Cδ Εμ Οκ Οσ Ρψ Vα Vβ; SE Cθ T'] Βα Βγ Βε Βι Βκ Cβ Cδ Cη Cθ Cι Εβ Εη Εμ  
 Ετ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μλ Μν Μο Μυ Νδ Νε Οζ Οξ Οσ Οτ Ου Ρα Ργ Ρδ Ρμ Ρο Ρτ Ρυ  
 Qβ Qγ Qδ Qλ Qμ Ρα Sβ Sδ Sκ Tδ Vβ Vι Vκ Wβ Xβ; *om.* Βη Οκ Ρψ Vα; *illeg.* Rδ; H Μη; P Ρο; R Οφ;  
 x Ρε v] Βα Βγ Βε Βι Βκ Cβ Cδ Cη Cθ Εβ Εη Εμ Ετ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν  
 Μο Νδ Οζ Νε Οξ Οσ Οτ Ου Οφ Ρα Ργ Ρμ Ρο Ρο Ρτ Ρυ Ρψ Qβ Qγ Qδ Qλ Qμ Ρα Rδ Re Sβ Sδ Sκ  
 Tδ Vα Vβ Vκ Wβ Xβ; *om.* Μυ Vι; B Οκ; M Βη; N Cι Pδ x] Cη Εβ Εη Fα Fβ Fζ Λγ Λε Λζ Λη Μδ  
 Μλ Νδ Νε Οζ Οτ Ου Ρα Ρτ Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Wβ Xβ; *om.* Βα Βη Βκ Μγ Μυ Οκ Οφ Ρψ  
 Re Vα Vι; F Ρο; I Cβ; K Βε; KZ Cθ; P Sκ; T Εμ; Z Βγ Βι Cδ Cι Ετ Μη Μν Μο Οξ Οσ Ργ Ρδ Ρμ Ρο Ρυ  
 Ρα Sβ Vβ Vκ γ] Βα Βγ Βε Βη Βι Βκ Cβ Cη Cθ Cι Εβ Εη Ετ Fα Fβ Fζ Λγ Λε Λζ Λη Μδ Μλ Μν  
 Μο Νδ Νε Οζ Οξ Οσ Οτ Ου Οφ Ρα Ργ Ρδ Ρμ Ρο Ρτ Ρυ Qβ Qγ Qλ Qμ Ρα Re Sβ Sδ Sκ Tδ Vκ Wβ  
 Xβ; *om.* Μυ Vι; κ Cδ Εμ Μγ Οκ Ρψ Qδ Vα; *illeg.* Rδ g. Rδ; x Μη Ρο; z Vβ z] Βα Βγ Βε Βη Cι Εβ  
 Εη Ετ Fα Λγ Λη Μγ Μδ Μν Μυ Οζ Οκ Οξ Οτ Ου Οφ Ρα Ργ Ρδ Ρο Ρτ Ρψ Qβ Qγ Qλ Qμ Re Sδ;  
*om.* Βι Βκ Cβ Cδ Cη Cθ Εμ Fβ Fζ Λε Λζ Μη Μλ Μο Νδ Νε Οσ Ρμ Ρο Qδ Ρυ Ρα Sβ Sκ Tδ Vι Vα Vκ  
 Wβ Xβ; R Rδ; v Vβ

[Other information]

T' and R] transferred to the circle of Cancer Οκ(O and R)

H', O, R, T repeated on circle of Aries Οκ

arc KX [= KN] add. 80, 60, 40, 20 Οφ

arc KNEKO add. 80, 60, 40, 20 Οφ

add. at centre E Cη Εβ Εη Fα Fζ Λγ Λε Λη Μδ Νδ Οζ Ρα Ρμ Qβ Qλ Re Sδ Tδ

add. circuli Capricorni Ρτ; add. Capricorni Ρο(thrice)

add. Cancri Ρο(twice)

add. Arietis et Libre Ρο(twice)

add. circuli emisperii Ρτ

add. cenith Cι Pδ; add. zenith capitis Ρο

add. divisio 30 graduum Οκ(later hand)

add numbers: 30, 60, 90 | 90, 60, 30 | 30, 60, 90 | 90, 60, 30 Cβ Εμ Μν Μο Μυ Ρο Ρτ Vι Vκ; 10, 20 ...

80, 90 | 90 ... 10 | 10 ... 90 | 90 ... 10 Μλ Οφ Vβ; 15, 30 ... 75, 90 | 90 ... 15 | 15 ... 90 | 90 ...

15 Βι Μη Ρυ Qγ Sβ; 30, 30, ... 30 Cθ; 30, 60, 75, 90 | 90 ... 30 | 30 ... 90 | 90, 75, 60, 30 Eτ;

arc MZL add 10, 20, 30 ... 90 | 90 ... 10 Βη

add arcs every 15° with each marked "15" and each pair marked "30" Βκ

## [CAPITULUM 16.] DE HORIS PONENDIS

Et post positionem azimuth oportet ponere horas ut sequitur: Pones circulum

- 1 De ... ponendis] *om.* Aα Bα Bζ Bκ Cβ Cδ Cε Cθ Dγ<sup>1</sup> Eα Ev Ev Lζ Nα Oα Pγ Pφ Pψ Qα Rα Sβ Sθ Sι Sλ Vα Vε Vv Vχ Xα; *illeg.* Oσ; Capitulum 16<sup>m</sup> Bε(*marg.*); Capitulum de horis ponendis Rδ; Capitulum de inscriptione horarium Fβ(*marg.*); Capitulum de ponende horarum Qβ; De constitutione horarum Cζ Eμ(*marg.*) Mθ Mκ Oη Oκ Vσ; De constitutione horarum allilacaz Cδ(*marg.*); De horis inscribendis Mo; De horis ponendis in astrolabio Bθ Mη; De impositione linearum (*add.* et Mγ) horarum Mγ Pτ Vv; De inscriptione horarum Bγ Eζ Eτ Oφ Pμ Po Qμ Wι; De inscriptione horarum artificialium Dη; De inscriptione horarum naturalium Mv Vβ; De inscriptione horarum 12<sup>am</sup> naturalium diei et noctis Mv Vι(*add.* Capitulū); De inscriptione linearum horarum Mλ<sup>2</sup>; Descriptio horarum 12 naturalium Bη Rε(*om.* 12); Descriptio horarum 12<sup>am</sup> naturalium diei et noctis Wβ; [*illeg.*] horarum Eo; De lineis horarum Vκ; Modus inscribendi lineas horarias Bι; Modus inscribendi lineas horarum Eδ(*faint*); Sequitur de modo ponendi horas Rubrica Cη; *add. in marg.* In hac 3<sup>a</sup> et ultima particula docet situare horas Lζ [horis] horarum Pv [ponendis] *add.* Capitulum Mδ Nδ; *add.* in astrolabio. Rubrica Vπ
- 2 et ... azimuth] *om.* Bα [positionem] divisionem Vκ; punctum Lε Tδ [azimuth] acimuth Vπ; atimuth Pφ; azim<sup>t</sup> Fα; azimich Mγ; azimuc Oη; azimuth Bζ Bη Cβ Cδ Eμ Eo Fβ Mκ Mo Mv Oκ Oσ Pv Sθ Sλ Vv Xα Xβ; azimutt Vχ; azismut Vα; azsimut Pψ; azsumt Cθ; azsumuth Ev; azum<sup>t</sup> Vε; azumuth Nα; azymut Oα [oportet] *add.* igitur Bα; *add.* te Bζ Cβ Cθ Eμ Ev Eo Mγ Mθ Mκ Mv Oα Oη Oκ Oσ Oφ Pδ Pφ Pψ Qα Sι Sλ Vv Vσ Vv Vχ [oportet ... horas] *marg.* Ou [ponere] pones Nα [horas] hortis Mγ; hortum Vv; *add.* et earum positionem Cε Qα; *add.* et earum positionem est Bζ Cβ Ev Mγ Vv Vσ; *add.* et eius positionem est Cζ Cθ Eμ Mκ (*eius deleted*) Mv Oα Oη Oκ Oσ Oφ Pφ Pψ Sθ Sι Vε Vχ; *add.* et hic potest esse Mθ; *add.* et positionem est Vv; *add.* eius positio Vα; *add.* [*illeg.*] opus est Eo [ut sequitur] *om.* Bα; secundum quod narrabo tibi Bζ Cβ Cε Cζ Cθ Dη Eμ Ev Eo Mγ(*om.* quod) Mθ Mκ Mv Oα Oη Oκ Oσ Oφ Pφ Pψ Sθ Sι Vα Vε Vv Vσ Vv Vχ; sic Qα; sicut Vκ; sicut narrabo tibi Cδ Sλ; *add. interlin.* al' secundum quod tibi narrabimus Vβ [Pones] Ponamus Eα Fα Fβ; Ponas *some*; Pone *some*; Positio sit Mζ; Positione Wι

<sup>1</sup> In ms Dγ, Capitulum 21 intervenes (fols. 155<sup>v</sup>-156<sup>r</sup>).

<sup>2</sup> In ms Mλ, several capitula intervene (fols. 84<sup>r</sup>-90<sup>r</sup>).



[CHAPTER 16.] ON PLACING THE HOURS<sup>3</sup>

And after placing the azimuths, you must situate the hours as follows: You will mark the circle of

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<sup>3</sup> The hours referred to here are the “natural” hours, also known as the “unequal” hours, i.e., the night and the day each divided into 12 equal parts. Since the length of night and day varies through the year, so do the length of these hours. They are “unequal” in the sense that a daytime hour is different from a nighttime hour (except at the equinoxes), and an hour of one day (or night) is not the same as an hour of the next (or previous) day (or night).

5 Capricorni ABC, et circulum Arietis et Libre DEZ, et circulum Cancri HTQ, et quod  
 ceciderit in eo ex circulo emisperii habeat sub se A, D, H, L, Q, Z, C; et linea LTEB ipsa vadit  
 per allidadath et per punctum tabule, id est centrum, et ipsa est linea recessionis.

- 3 Capricorni] *add.* circulum Cε Cζ Eμ Ev Eo Mθ Oα Oη Ok Oσ Pψ SA Vv Vv Vχ ABC] ABCD Aα Bγ Bε Bζ Bθ Cε Cζ Eδ Eζ Eμ Eo Ev Mλ Mo Oη Pγ Pθ Po Pτ Pv Pφ Qδ Rα Sβ St Vε Vκ Vv Vπ Wι Xα Xβ; ABCD *corr.* to ABC Bη Mκ Vψ; ABCDIS Ou circulum<sub>1</sub>] *om.* Bι Bκ Lζ Qα Vκ et<sub>2</sub>] *add.* circulum Cθ Oφ Vχ Libre] *add.* circulum Ev DEZ] DEC *corr.* to DEZ Oσ; DEI Mν; DER Nα Pφ; DEX Bη; DEZ *corr.* to DEX Wβ; diei Dγ; DOZ Vε; DTE Bζ; DZ Eδ Pv Wι; DZ *corr.* to DEZ Po; MKL Qα circulum<sub>2</sub>] *om.* Aα Bγ Bη Bθ Bι Bκ Cη Eδ Eζ Eτ Ev Lζ Mo Pγ Pτ Nα Pv Rα Re Vκ Sκ Vπ Wι; *interlin.* Po Vβ Cancri] *add.* circulum Cθ Eμ Ev Eo Mγ Mθ Mv Oα Ok Oσ Oφ Pψ Sθ St Vv Vv Vχ HTQ] FGD Qα; HCQ Qγ Vv; HCQR Nα; HTA Pφ; HTK Rδ; *add.* circulum Ev et<sub>4</sub>] circulum Bθ Vπ; circulum etiam Aα
- 4 ceciderit] asiderit Xβ; cederit Mγ; deciderit Bζ Lε Tδ; ocaderit Sκ; reciderit Wβ; *corr.* from occiderit Rα in] ex Mv ex] *om.* Bη Vπ Wβ; *add.* g Eα ex eo] *om.* Nε sub] super Bζ Cβ Cδ Cζ Cθ Ev Mγ Mκ Oα Oη Ok Oφ Pψ Qα SA Vα Vβ Vv Vσ Vχ; super *corr.* to sub Eμ; supra Mv Pφ St; *add.* *interlin.* al' sub Oφ; *add.* *interlin.* al' super Vβ ADHLQZC] *illeg.* Et Qα; ... H,V,Q ... Wα; ... Q,X,C Wβ; ... Q,Z,O Pφ; ... Q,Z,T Vα; ADH Sκ; ADHKRC Nα; ADHLEZC *corr.* to ADHLQZC SA; ADHLQ et C Bζ; ADHQ C Dη; ADHQEC Vκ; ADHQTC Fζ; ADHQZC Bκ Re; ADQZC Dγ; ADHQ et C Bθ Vπ; ADHQTC Pα Vv; ADHQZC Aα Bγ Bε Cε Cη Ci Eδ Eζ Eη Ev Fα Fβ Lβ Lγ Lε Lζ Lη Mλ Mo Mv Mφ Nε Oα Oζ Oξ Oτ Ou Oφ Pγ Pδ Pθ Pλ Pμ Pv Po Pq Pv Qβ Qγ Qδ Qλ Rα Rδ Sδ Tδ Vβ Vι Wι Xα Xβ; ADHQZD Mδ Nδ; ADHQZT Sβ Vψ; ADLQZC Oσ; ADVLQZCY Sθ; BLZE Vε; *add.* id est armilla Vψ et] *add.* sint Bα; *add.* sit Bζ Mγ St linea] L,M,E,A Pθ linea LTEB] sit EB Cε LTEB] BCEB Nα; BCEL Sθ; BETL Cζ Eμ Mθ Mκ Oη Ok Vσ; BTEB Mv; BTEB *corr.* from BXEB Pψ; BTEB *corr.* to LTEB Oα; EAKC Qα; EB Eα Eζ; LBTEB *corr.* to LTEB Eδ; LCB Dη; LCEB Mγ Pφ Vε; LEB Lη; LETB Bζ Bε Bη Eo; LT et EB Eη; LTEB *corr.* to LTEV SA; LTEV *corr.* to LTEB Cδ; TEB Oξ Ou Qγ; *add.* *interlin.* BETL Bη ipsa] *om.* Rε; hac Bη; ipsos Sθ; per ea Vε; *add.* quoque Bα Bζ Eo; *add.* que Mγ Pφ Vv
- 4-5 ipsa ... per] *om.* Nα
- 5 per] super Qα allidadath] *blank* Wι; aldadit Bα; alidadā Eα; alidadach Rε; alidadath Lγ; alihathaht Cε; alilacath Eμ Ev Oα Oσ Pψ; alilachat Vv; alilarath Vv; alilatath Cθ Mθ Mv Oη Vα; alilatath Sθ; alilath Oφ; alilathat Cβ Ok; allelacach Wβ; allidada Mδ; allidadach Eτ Lη Oζ Vβ; allidadam Dη; allidadat Fζ Vκ; allidadth Qδ; allilacath Mκ Nε Pθ Pφ St Vσ; allilachrath Pγ; alliladat Dγ Qα; alliladath Bη Mλ Nα; allilarach Mγ; allilarath Rδ; allilatach Cζ Eζ Mη Pτ Pv; allilatath Cδ Lζ Pδ Po Sβ Vχ Vψ Xα; allilathah Cι; allilathat Rα SA; allidarath Bζ; alzarath Vε; [*illeg.*]larach Eo; *add.* in marg. al' per allilathaha Oφ; *add.* id est per armillam reflexam Oα; *add.* id est lineam meridiei Oτ; *add.* que est armilla reflexa Eμ(*interlin.*) Mκ(*marg.*) Oη; *add.* in marg. armilla [re]flexa Bη et<sub>1</sub> ... centrum] *om.* Sθ punctum] *om.* Sι per<sub>2</sub>] *om.* Eζ id est centrum] *om.* Bα Cδ Cζ Cθ Eμ Ev Eo Mγ Mθ Mκ Mv Oα Oη Ok Oσ Pψ Qα St SA Vα Vε Vv Vv Vχ; *interlin.* Cβ Oφ; id est per punctum Eδ; recte Mδ; scilicet centrum Wα; *add.* mundi Lβ Xβ est<sub>2</sub>] *om.* Eζ; erit Vε recessionis] *add.* in marg. id est meridiei Bγ; *add.* in marg. id est septentrionalis Cβ; *add.* in qua sol recedit a meridiei Pδ

Capricorn ABC, and the circle of Aries and Libra DEZ, and the circle of Cancer HTQ, and what in it falls from the circle of the hemisphere should have under it A, D, H, L, Q, Z, C; and this very line LTEB passes through the ring [i.e., alidadath<sup>4</sup>] and through the point of the plate, that is, the centre, and this is the line of recession.<sup>5</sup>

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<sup>4</sup> See note to Cap. 4 line 27 (English).

<sup>5</sup> See note to Cap. 12 line 8.

Eritque linea LB finis 6<sup>te</sup> hore, et initium 7<sup>me</sup>. Et postea divides arcum HT per 6 divisiones equales, et sint divisiones HM, MN, NS, SO, OF et FT; et divides etiam arcum DE per 6 divisiones equales, sintque partes DK, KR, RX, XY, YP, et PE. Divides etiam arcum AB per 6

- 6 Eritque] Erit etiam Bη LB] LB *corr.* to LV Sλ; LV *corr.* to LB Cδ; AB Mv Pψ Sθ; FE Vε  
6<sup>te</sup>] sexte / 6 / 6<sup>e</sup> many; *interlin.* Cθ; tertie Vε 7<sup>me</sup>] septime / 7 / 7<sup>e</sup> many; A *corr.* to  
7 Bγ; n<sup>e</sup> or 12<sup>e</sup> Sβ; *add.* hore Nα Et postea] Post hec Sι; Prius(?) Rδ divides]  
divide Bε Wι HT] *illeg.* Pτ; *corr.* from HDT Qδ; BC Qα; HC Bα Nα Vv; HE Vε; TH Vκ  
6] sex some; *interlin.* Qλ divisiones] partes Bα Bζ Cβ Cδ Cε Cζ Cθ Dη Eμ Ev Eo  
Mγ Mθ Mκ Mv Oα Oη Ok Oσ Pφ Pψ Rε Sθ Sι Sλ Vα Vv Vv Vχ
- 7 equales ... divisiones] *om.* Sβ equales] *om.* Bα et sint divisiones] *om.* Bγ Cη Eδ  
Eζ Eτ Mη Pq Pv Qμ; et Ev et<sub>1</sub> ... FT] HMNSOFT *corr.* in *margin.* to sint divisiones HM ... FT  
Po; huius OFT Wι sint] sunt some divisiones] *om.* Bη; partes Oη; *add.* equales Pλ  
HM, MN, NS, SO, OF, FT] HM et MN et NS ... many; H, M, N, S, O, F, T Aα Bγ Bκ Cη Eδ Eζ  
Eτ Ev Lζ Mη Mλ Mo Pγ Pτ Pv Qμ Sκ Vκ Xα; HM, NS, OFT Rα Sβ; HM, VS, SO, AF, FC Vε; H',  
O, F, T Dγ; HN, NM, MS, SO, OF, FT Sι; L, M, N, S, O, F, T Bθ Vπ; LM, MN, NS, SO, OF, FT Bε; HM,  
NN, SS, OO, FT, FT Bζ MN *om.* Mv NS] S Fζ; VS Mγ Wβ FT] *interlin.* Rε; F et T  
Rδ divides] divisiones Qδ etiam] *om.* Bγ Bη Bθ Bι Cβ Cη Eα Eδ Eη Eτ Fζ Lγ Lε  
Mδ Mλ Mφ Pα Pγ Pδ Pθ Pμ Qβ Qμ Rα Rε Sβ Sθ Sκ Vβ Vε Vπ Wα Wι Xβ; in Sι DE]  
CD Qα; DC Nε Vε; D Pθ 6] sex some
- 7-8 et<sub>1</sub> ... equales] *om.* Nα
- 8 divisiones] *om.* Mγ Pα Pφ; partes Bα Cδ Cε Cζ Dη Eμ Mθ Mκ Mv Oη Ok Pψ Qα Sβ Sλ  
Vα Vv equales] *om.* Bα; *add.* <sup>va</sup> et sint AHC et HE <sup>cat</sup> Vπ sintque] suntque / et sunt  
some; sicut et Pα partes] divisiones Bα Mγ Sι Xβ; divisiones eius Bζ DK ... PE]  
DK et KR et RX ... some; AB, KR, RX, XY, YP, AX Vε; H, M, M, N, S, SO, OF et FT Bζ; DC, NC, RX, NY,  
YP, PE Ev; DH, KR, RX, XY, YP, PE Vα; D, K, T, X, Y, P, E, Vκ; D, K, R, RX, XY, YP, PE Sκ; DK, KA, VX,  
XN, NP, PE Pφ; DK, KR, RR, RV, YP, PE Nα; DK, RT, XY, YP, PC Mv; DLK, KR, IR, XY, YP, Wβ; DQ,  
QR, RC, CT, OP, PE Cδ; DQ, Q,R RX, XY, YP, PE Cε; DR, KR, KX, XY, ZY, PZ, PE Sι; *corr.* to DQ et QR et  
RC et CT et TP et PE Sλ; *add.* Et postea Cζ KR] KV) Eη RX] *interlin.* Cβ; KX Mθ Ok;  
TX Bα XY, YP] XV, VP Vπ YP] *om.* Eζ et ... arcum] *om.* Nε PE] P Pγ; P et  
E Rδ Divides] *om.* Sκ etiam] *om.* Bα Ev AB] PAB Nα 6] sex some

And line LB will be the end of the 6<sup>th</sup> hour, and the beginning of the 7<sup>th</sup>. And afterwards you will divide arc HT into 6 equal divisions, and let the divisions be HM, MN, NS, SO, OF, and FT; and you will also divide arc DE into 6 equal divisions, and let the parts be DK, KR, RX, XY, YP, and PE. You will also divide arc AB into 6

- divisiones equales, et sint divisiones AH<sup>E</sup>, H<sup>E</sup>D<sup>E</sup>, D<sup>E</sup>T<sup>E</sup>, T<sup>E</sup>T<sup>O</sup>, T<sup>O</sup>H<sup>O</sup> et H<sup>O</sup>B.
- 10 Postea queres arcum qui vadit per puncta H<sup>E</sup>, K, M, et queres etiam arcum qui
- 9 divisiones<sub>1</sub>... H<sup>O</sup>B] f. Bα; partes Dη et<sub>1</sub>] ut Nα divisiones<sub>2</sub>] *om.* Aα Bε Bη Bθ Bι Cη Dγ Eα Eδ Eτ Fα Lε Lζ Lη Mδ Mη Mυ Mφ Nα Nδ Oξ Oτ Oυ Pα Pρ Pγ Pδ Pφ Rα Rε Vβ Vπ Vψ Wι Xα; *add.* eius Eο Mγ Vν; *add.* equales Vε AH<sup>E</sup> ... H<sup>O</sup>B] AH<sup>E</sup> et H<sup>E</sup>D<sup>E</sup> et D<sup>E</sup>T<sup>E</sup>... *some*; A et H<sup>E</sup> et H<sup>E</sup> et D<sup>E</sup> et D<sup>E</sup> et T<sup>E</sup> ... *some*; A.H.E.H.E et T.E.T.E et T.O.T.O et H.O.H.O et E.P Sκ; A, H<sup>E</sup>, D<sup>E</sup>, T<sup>E</sup>, T<sup>O</sup>, H<sup>O</sup>, EP Mo Vκ; AE, ED, DT, TO, OC, CB Cδ; AH et HE et DE et TE et TO et HO et OF Sβ; AH HE ED DT TE [blank] Vψ; AHE.DTE et TE.TO et TH.HO et HO.EP Wι; ALH<sup>E</sup>, D<sup>E</sup>, T<sup>E</sup> et T<sup>O</sup> Ev; *blank*, EH, HL, LT, TQ, IB Sι; *corr.* to AE et ED et DT et TO et OC et CB Sλ AH<sup>E</sup>] A Bε Eη; AH Eα Nα Oρ Qα Vβ; DK(*expunged*)<sup>AH<sup>E</sup></sup> Bζ; HAE Vχ; H<sup>E</sup> Dγ H<sup>E</sup>D<sup>E</sup>] *om.* Eδ Eζ Mη Pγ Pο Qμ Rα Vσ; DE Xα; D<sup>E</sup> Pφ Vε; HD<sup>E</sup> Nα Qα; H<sup>E</sup> Cι Vπ; HD Pρ; HE Vβ; H<sup>E</sup>T<sup>E</sup> Bγ Cη Eτ D<sup>E</sup>T<sup>E</sup>] *om.* Bγ Bη Cη Eτ Vα Xα; D<sup>E</sup> Pφ; D<sup>E</sup>D<sup>E</sup> Oυ; D<sup>E</sup>N<sup>ME</sup> Vε; D<sup>E</sup>R<sup>E</sup> Mθ; D<sup>E</sup>T Mφ Vι; D<sup>E</sup> T<sup>E</sup> Mδ; DT Nα; DT<sup>E</sup> Eδ Eζ Pγ Pο; ED Vβ; et T<sup>E</sup> Rδ; T<sup>E</sup> Bθ Qλ T<sup>E</sup>T<sup>O</sup>] *om.* Nα Vε Vσ; D<sup>E</sup>T<sup>O</sup> Mγ; T<sup>E</sup>C<sup>D</sup> Bε Oη; DT Vβ; P<sup>E</sup>T<sup>O</sup> Oφ; T<sup>E</sup>C<sup>O</sup> Qα; TD<sup>E</sup>T<sup>O</sup> Vι; T<sup>E</sup> Vα; T<sup>E</sup>D<sup>O</sup> Bθ Vπ; T<sup>E</sup>H<sup>O</sup> Pλ; T<sup>E</sup>O Pρ; T<sup>E</sup>T<sup>C</sup> Mδ; T<sup>E</sup>T<sup>D</sup> Oα Oσ; T<sup>E</sup>T<sup>E</sup> Oυ; T<sup>O</sup>(*expunged*)<sup>R<sup>E</sup></sup> T<sup>O</sup> Mθ T<sup>O</sup>H<sup>O</sup>] C<sup>O</sup>H<sup>O</sup> Qα; D<sup>O</sup>H<sup>O</sup> Bθ Vπ; H<sup>O</sup> Fβ Fζ Xα; H<sup>O</sup>T<sup>O</sup> Pλ; MH<sup>O</sup> Vε; T<sup>C</sup>H<sup>O</sup> Mδ; TO Nα Vβ; T<sup>O</sup>H<sup>A</sup> Oφ H<sup>O</sup>B] B Eα Pρ; H<sup>O</sup>BEF Bζ; H<sup>O</sup>BL Tδ; H<sup>O</sup>BP Cε Mλ Pτ; H<sup>O</sup>EP Bγ Bι Bκ Cη Eδ Eζ Eτ Lζ Mη Pγ Pο Pυ Rα Xα; H<sup>O</sup>EP *corr.* to H<sup>O</sup>B Qμ; H<sup>O</sup>EP et EP Dγ; H<sup>O</sup> et B Rδ; H<sup>O</sup>PE Aα Bθ Bη Eυ Vπ; OB Nα; TB Vβ; T<sup>O</sup>B Pλ; *add.* qui sint 6 arcus divisionis predictae Nα Rε
- 10 Postea ... H<sup>E</sup>, K, M] *marg.* Sλ; *follows line 11* queres ... D<sup>E</sup>, R, N Mv queres] queras queras Tδ; pones Mυ arcum<sub>1</sub>] *add.* circuli Sδ queres ... M] *om.* Cε Mv qui<sub>1</sub> vadit] *om.* Mυ Vε; eundem Bη Cη Eη Eτ Fα Oξ Wβ; euntem Bε Bγ Cι Eα Eβ Eζ Fβ Fζ Lγ Lε Lη Mδ Mη Mφ Nδ Nε Oζ Oτ Oυ Pα Pδ Pθ Pλ Pν Pρ Qβ Qγ Qλ Qμ Rδ Sδ Vι Vψ Wα Xβ qui<sub>1</sub> vadit per] eundem Sκ; per emitoni Lβ H<sup>E</sup>, K, M] *marg.* Pο; C, R, N, Z Sι; E, Q, M Cδ Sλ; EI, K, M Ev; H, K, M Qα Pρ; H<sup>E</sup>, C, V Vε; H<sup>E</sup>, L, M Eο; H<sup>E</sup>, L, Z Pφ; H<sup>E</sup>, R, M Vχ; H<sup>E</sup>, T, M Sθ; H<sup>O</sup>, K, M Vσ; M, H Nα; M, K, H Vβ; M, K, H<sup>E</sup> Aα Bγ Bθ Bι Bκ Cη Dγ Eτ Eυ Lζ Mλ Pυ Qδ Rα Sβ Sκ; Vκ Vπ Xα; *add.* et NR Qδ et] *add.* post hoc Cδ Sλ et queres] *repeated* Qλ Wα; et queras Qδ Tδ et ... arcum<sub>2</sub>] et alium Qα etiam] *om.* Bε Bη Cδ Cε Dη Eβ Eη Fβ Lβ Lε Lη Mδ Mυ Nδ Oζ Oτ Pδ Pθ Pλ Pν Pρ Qβ Qδ Qμ Rδ Sδ Sι Sλ Vι Wα Wβ Xβ
- 10-11 et ... D<sup>E</sup>RN<sub>1</sub>] *om.* Eο Mυ Pο Pφ Qγ Vε; et arcum M, C quere Nα; et arcum N, R, D<sup>E</sup> Aα Bι Bθ Bκ Dγ Eυ Lζ Mλ Pυ Rα Sβ Vπ; et arcum N, R, E Vβ; et arcum N, T, D<sup>E</sup> Vκ; et arcum V, R, D<sup>E</sup> Xα qui<sub>2</sub> vadit] *rep. and expunged* Oυ qui<sub>2</sub> ... puncta] *om.* Pρ
- 10-12 H<sup>E</sup>, K, M ... puncta] *om.* Eζ Mη Mo Pγ Pτ H<sup>E</sup>, K, M ... T<sup>O</sup>, Y, O] *marg.* Qμ
- 10-13 Postea ... H<sup>O</sup>, P, F] Postea queres arcum euntem per punctum M, X et arcum FPH<sup>O</sup> Eδ(*marg.*) et ... H<sup>O</sup>, P, F] *om.* Bγ Cη Eτ Sκ H<sup>E</sup>, K, M ... H<sup>O</sup>, P, F] *faded and illeg.* Rε
- 10-17 Postea ... ibidem] Et fac arcus per illas divisiones Bα

equal divisions, and let the divisions be  $AH^E$ ,  $H^E D^E$ ,  $D^E T^E$ ,  $T^E T^O$ ,  $T^O H^O$  and  $H^O B$ .

Afterwards you will find the arc which passes through the points  $H^E$ ,  $K$ ,  $M$ ; and you will also seek the arc which

vadit per puncta  $D^E$ , R, N, et est arcus  $D^E R N$ ; et queres quoque arcum qui vadit per puncta  $T^E$ , X, S; et queres arcum qui vadit per puncta  $T^O$ , Y, O; et queres arcum qui vadit per puncta  $H^O$ , P, F.

- 11  $D^E R N_1$ ] D, R, N Cδ;  $D^E R$  Ev;  $D^E$ , R, U Fβ Lβ Mφ;  $D^E$ , K, N Oκ;  $D^E$ , T, N Vv; *blank*, K, M Sι et<sub>1</sub> ...  $D^E R N_2$ ] *om.* Aα Bζ Bθ Bι Bκ Cβ Cζ Eβ Eο Ev Lζ Mγ Mu Nα Po Pq Pv Pφ Qμ Sβ Si Vβ Vκ Vv Vπ Vυ Vχ Xα est] erit Cδ Sλ  $D^E R N_2$ ]  $D^E K N$  Oκ;  $D^E N R$ .RN Cε; DRN Cδ;  $D^E R U$  Fβ Mφ Vε queres] querens Lβ; *om.* Pq quoque] *om.* Bε Bη Cε Dη Eβ Eο Fα Fβ Fζ Lε Lγ Mu Mφ Nδ Nε Oζ Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pν Po Pφ Qα Qβ Qγ Qλ Qμ Rδ Sδ Vψ Wβ Xβ; etiam Cβ Ev Rα Sβ Si arcum] alium Qα qui vadit] euntem Rα Sβ puncta<sub>2</sub>] punctum Cθ Rα
- 11-12  $D^E$ , R, N<sub>1</sub> ...  $T^O$ , Y, O] ET.EX.G est arcus .TES.Y.G. Oφ; ET.EX.G et arcus .RES.X.G. Vχ
- 11-12 et<sub>2</sub> ...  $T^E$ , X, S] *om.* Aα Cι Mλ Mv Tδ Vε Vι; *marg.* Po; et arcum euntem per puncta S, C, D Nα; et queres etiam arcum eundem S, X,  $T^E$  Bθ; et quere etiam arcum euntem per puncta S, X,  $T^E$  Bι Bκ Dγ Lζ Pv Qδ Vβ(S, X, D) Vκ (S, X,  $D^E$ ) Vπ Xα
- 11-13 qui ...  $H^O$ , P, F] euntem per punctum OY TO et arcum SP HO Wι
- 12  $T^E$ , X, S]  $E$ , X, S PQ; L, X, S Sι; S, T Ev; S, X,  $T^E$  Bκ Qδ Rα Sβ;  $T^E$ , S, X Cδ Sλ;  $T^E$ , X, C Cζ;  $T^O$ , Y, O Mu; *add.* et est arcus  $T^E X S$  Bη(*interlin.*) Cδ( $T^E S X$ ) Ev Mθ Mκ Oα Oη( $T^O Y O$ ) Oκ Oσ Pψ Sθ Si(L, X, S) Sλ( $T^E S X$ ) Vα Vσ  $T^E$ , X, S ... puncta] *om.* Nε  $T^E$ , X, S ...  $T^O$ ]  $T^E$ , X, S et arcus qui vadet per *marg.* Eα et<sub>1</sub>] postea Qμ et<sub>1</sub> ...  $T^O$ , Y, O] *om.* Bζ Mγ Oζ Oκ Pλ Vψ; *marg.* Po Sλ; et arcum euntem per punctum O, Y,  $T^O$  Bθ(O, Y,  $D^O$ ) Bκ Bι Dγ Eο Ev Lζ Nα(M, T) Pv Qδ Vβ(O, Y, T) Vκ(O, Y,  $D^O$ ) Xα; queresque arcum eundem per punctum O, Y,  $T^O$  Aα Vπ(O, V,  $D^O$ ) queres<sub>1</sub>] *om.* Rα Sβ; queras Tδ; *add.* etiam Mλ; *add.* quoque Vε queres arcum<sub>1</sub>] alium Qα arcum<sub>1</sub>] *interlin.* Cθ; *om.* Pμ qui<sub>1</sub>] *om.* Qγ qui vadit<sub>1</sub>] euntem Mo Qμ Rα Sβ vadit<sub>1</sub>] *interlin.* Cζ puncta] punctos Cβ; punctum Cθ Vε  $T^O$ , Y, O] C $^O$ , Y, O Qα;  $H^O$  Y, O Mu; M, X, O Vε; O, Y,  $T^O$  Eζ Mo Pγ Rα Sβ;  $T^O$ , I, O Ev;  $T^O$ , X, S Cθ; T, Y, O PQ;  $T^O$ , Y, S Vv; *add.* et est arcus  $T^O Y O$  Mκ Mv(*om.* est) Oα Oσ Pψ Qα(C $^O$  Y O) Sθ Vσ queres<sub>2</sub>] *om.* Sβ; queras Tδ; *add.* etiam Cδ Qα Sλ
- 12-13 et<sub>2</sub> ...  $H^O$ , P, F] *marg.* Po; et O, P, F PQ; et arcum  $H^O$  Mo; et arcum euntem per F, P,  $H^O$  Pv Qδ Vβ(F, P, O); et arcum euntem per punctum F, P, O Nα; et arcum F, P,  $H^O$  Bι Bκ Dγ Lζ Mλ Qμ Rα Vκ Vπ; et arcum F, T,  $H^O$  Xα; et arcum H, P, F Mη; et arcum S, P,  $H^O$  Aα Bθ Eζ Ev Pγ Pτ Sβ per puncta] *om.* Bζ
- 13 puncta] *om.* Si  $H^O$ , P, F]  $H^O$ , P, R Vα;  $H^O$ , P, S Oφ;  $H^O$ , T, F Ev; H, Q, P, F Sι;  $T^E$ , P, F Eα; *add.* perficiens Bθ



passes through points  $D^E$ , R, N, and it is arc  $D^E RN$ ; and you will also seek the arc which passes through points  $T^E$ , X, S; and you will search for the arc which passes through points  $T^O$ , Y, O; and you will try to find the arc which passes through points  $H^O$ , P, F.

- 15 Perficiesque horam primam, scribesque super eam “primam”; deinde  
 “secundam,” “terciam,” “quartam,” “quintam,” et “sextam,” ut est in hac figura. Postea  
 divides reliquas horas secundum primam divisionem, et scribes super eas “7,” “8,” “9,”
- 14 Perficiesque] Erisque perficiens Bζ Bθ Cβ Cδ Cε Cζ Cθ Eδ Eμ Ev Eo Mγ Mθ Mκ Mν Oα  
 Oη Oκ Oσ Oφ Pφ Pψ Qα Sθ St Sl Vα Vν Vv Vχ; Perficies Vσ; Usque perficiens Vε; *add.*  
 eam Wβ Perficies ... primum] *repeat in marg.* Po horam] eorum Nα  
 horam primam] horas sex Vv primam<sub>1</sub>] i<sup>am</sup> *some; corr. to xii Cδ; add.* id est  
 primas horas qui scilicet transiunt ante meridiem Cζ; *add.* secundam et ceteram Mγ; *add.*  
 secundam et ceteram usque ad initium septime hore Qα; *add.* secundam et terciam Eo Bζ  
 Vv; *add. in marg.* id est primas horas qui scilicet sunt ante meridiem Eμ scribesque  
 ... deinde] *om.* Mv Vε super] sub Qα eam] eas Mγ Vv Vv; eis Qα; *illeg.* Pτ  
 deinde] *om.* Bζ Cζ Eo Oη Sθ Vv Vv; et Cβ Ev Mθ Mκ Oα Oσ Oκ Oφ Pψ Qα Sθ St Sl  
 Vχ
- 15 secundam] 2 / 2<sup>am</sup> *some*; 3<sup>am</sup> Lβ Pv terciam] 3 / 3<sup>am</sup> / iii<sup>am</sup> *some* terciam ... sextam]  
 et ceteras Qα quartam] 4 / 4<sup>am</sup> / iii<sup>am</sup> *some* quartam ... sextam] et ceteras Tδ  
 quintam] 5 / 5<sup>am</sup> / v<sup>am</sup> *some; om.* Bη sextam] 6 / 6<sup>am</sup> / vi<sup>am</sup> *some; om.* Cι Vε  
 ut ... figura] *om.* Oη Vv; ut vides in alia parte Qα ut est] et est Vκ; sicut patet  
 Dη; sicut vides Cβ Cδ Cε C ζ Cθ Eμ Ev Mθ Mκ Mν Oα Oκ Oσ Oφ Pφ Pψ Sθ St Sl Vα Vε  
 Vσ Vv Vχ; ut Eδ; ut patet Eα Eβ Eη Fζ Mv Nδ Oξ Oτ Oυ Pα Pl Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ  
 Vι Wα Xβ; ut patet est Qδ ut ... hac] *om.* Eζ ut ... figura] *om.* Bζ Eo Mγ in  
 hac] *om.* Ev hac] *om.* Aα Bε Eζ Lη Mφ Oζ Pυ Mv Nα Pl Pτ Rδ Vι Vπ Wα; *illeg.* Rε;  
 precedenti Fβ; presenti Lε Tδ; sequenti Dη; *add.* secunda Bκ figura] *add.* Explicit Bι<sup>6</sup>;  
*add.* immediate(?) Fβ; *add. interlin.* id est prefigurata Cζ; *add.* prescripta Pυ
- 15-17 Postea ... ibidem] *om.* Mv Postea ... primam] *om.* Oφ
- 16 divides] *om.* Vψ; *add.* per Vκ horas] *om.* Vε; *add.* primam Dγ secundum] per  
 Sθ primam] *add. interlin.* id est prior est Eμ divisionem] *om.* Eo scribes]  
 scribas Bγ eas] *om.* Eα; ea Pφ; eam Cδ Cζ Cθ Eμ Ev Mθ Oα Oη Oκ Oσ Oφ Pψ Sθ Sl  
 Vα Vε Vχ; eam *corr. to* eas Mκ 7] *om.* Aα Bγ Bθ Cη Dγ Eδ Eζ Ev Lζ Mλ Mo Pγ Pυ  
 Rα Sκ Vε Vπ Wβ Wι Xα; 7<sup>am</sup> / septimam *some; interlin.* Po 8] 8<sup>am</sup> / octavam *some*  
 9] 9<sup>am</sup> / nonam *some* super] sub Qα
- 16-17 9 ... 12] et cetera Qα Tδ

<sup>6</sup> In fact the text in ms Bι continues on the next folio.

And you will complete the first hour, and you will write “first” on it; then “second,” “third,” “fourth,” “fifth,” and “sixth,” as it is in this diagram. After that you will divide the remaining hours in conformity with the first dividing, and you will write on them “7,” “8,” “9,”

“10,” “11” et “12,” ut est ibidem. Et scribas apud horam primam “occidens”, et apud horam 12<sup>am</sup> “oriens”. Deinde scribes in ea latitudinem regionis in loco descripto. Postea cum feceris horas, perficietur ipsa facies illius tabule; et hoc modo facies ceteras

- 17 10] 10<sup>am</sup> / decimam *some* 11] 11<sup>am</sup> / undecimam *some* 12] 12<sup>am</sup> / duodecimam *some*; 21 Lγ ut ... ibidem] *om.* Oη; et est ibidem Bη; sicut vides in hac figura Cβ Cδ Cζ(*om.* hac) Cθ Eμ Ev Mθ(*om.* figura) Mκ Oα Oκ(*om.* figura) Oσ Oφ Pφ Pψ Sθ Si Sλ(*om.* hac) Vα Vε Wσ Vυ Vχ; sicut vides in subscripta(sub Eo; scripta Bζ) figura Bζ Eo Mγ; sicut vides in scripta figura Bζ; sicut vides in prescripta(*expunged*) figura subscripta Vυ; ut vides in figura Qα ibidem] *add.* in figura Bε; *add.* et apud 12<sup>a</sup> occidens Pτ Et<sub>2</sub>] Deinde Pτ Et<sub>2</sub> scribas] *om.* Vσ scribas] scribe Bα; scribes Bζ Cδ Eα Eη Ev Fβ Lγ Lε Lζ Lη Mδ Qβ primum] *marg.* Pτ occidens] occidentis Qδ; oriens Qμ occidens et apud] *om.* Mo
- 18 horam] *om.* Bε Bη Bι Bκ Cδ Cε Cη Dγ Dη Eα Eδ Eη Et Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mυ Mφ Nα Nε Oζ Oξ Oτ Pθ Pα Pλ Pμ Pν Pρ Pυ Qβ Qγ Qμ Rα Re Sβ Sδ Sλ Vβ Vι Vκ Vψ Wι Xα Xβ; regulam Wα horam 12<sup>am</sup>] abam Wβ 12<sup>am</sup>] 12 / duodecimam / xii *some*; *om.* Cε; 2 Eζ; 2<sup>am</sup>/secundam Mv Po; a<sup>am</sup> Bη; terciam Dγ scribes] *twice* Bκ; scribe Fα Lε Lη Mυ Qγ; scribas Cη in ea] *om.* Bζ Cβ Cδ Vσ; eadem Pρ ea] eadem Bε Eα Eβ Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mυ Mφ Oζ Pα Pλ Pμ Pν Qγ Vι Wα Xβ; eandem Nδ; esse Vα latitudinem] altitudinem Oφ descripto] *illeg.* Nε; in scripto Bζ; predicto Nα; scripto Qδ; non (= vero?) scripto Aα Bθ Eo Ev Mγ Oτ Pγ Vυ Vτ; *add. interlin.* scilicet inter per communi(?) circuli Capricorni et per communi(?) circuli emisperii Cβ Postea] et Oφ; *add.* ares Oξ
- 18-19 Postea cum] Et Bζ; Et cum Cβ Cδ Cε Cζ Cθ Eμ Ev Eo Mγ Mθ Mκ Mν Oα Oη Oκ Oσ Pψ Sθ Si Sλ Vα Vυ Dη Pφ Vσ Vυ Vχ; Et eum Vε Postea ... horas] Et sic Qα
- 18-20 latitudinem ... voluerit] *om.* Dγ
- 19 feceris] perfeceris Bζ Cε Dη Eμ Mv Oη Rδ Tδ Vε; ceteris *corr. to* faceteris Po; fecit Sκ perficietur] per[*cut off*] Eo; perficies Mv Pφ ipsa] *om.* Dη Eδ; illa Eη facies<sub>1</sub>] *om.* Eη Oζ Pρ; *interlin.* Bε illius] *om.* Eα; eius Ev; ipsius Cβ Cε Mo; istius Cδ Sλ; regionis Mv hoc] *om.* Bε hoc modo facies] hoc facies et(*expunged*) hoc facies Pλ facies<sub>2</sub>] *om.* Qδ; *add.* ipsas Mδ hoc modo] sit Vψ ceteras] *om.* Nα; *add.* regionis Xα
- 19-20 ceteras latitudines] ipsas latitudines ceteras Nδ

“10,” “11” and “12,” as it is in the place already mentioned. And you should write “west” near the first hour and “east” near the 12<sup>th</sup> hour. Then you will write on it [i.e., the plate] the latitude of the region in the place described. Afterwards when you have drawn the hours, this face of that plate will be completed; and in this way you will make other

## 20 latitudines alterius regionis in alia tabula, si deus voluerit.

20 latitudines alterius] altitudines Oφ; latitudines Cβ Cδ Cζ Cθ Cι Eμ Ev Mη Mθ Mκ Mν Mυ Nε Oα Oη Oκ Oσ Pδ Pθ Pφ Pψ Qα Sθ Sι Sκ Sλ Vα Vβ Vε Vσ Vυ Vψ Vχ; latitudines aliarum Eα; latitudines eiusdem Fβ Mφ Vι Wα; latitudines vel longitudes Cε Dη Qλ; longitudes Bγ Bη Bι Bκ Cη Eδ Eζ Eτ Lζ Mλ Mo Nα Pγ Pτ Pυ Qδ Rα Sβ Vκ Wβ(marg.) Wι Xα; longitudes *corr. to* latitudines Pο; longitudes eiusdem Aα Bζ Bθ Eο Ev Mγ Vν Vπ latitudines ... tabula] gradum eundem tbule regionis latitudines Qμ alterius ... tabula] *om.* Rδ regionis] *om.* Cε Dη Mo Nε Pδ Pθ Vψ in alia tabula] eiusdem Vε; eiusdem tabule Aα Bγ Bζ Bη Bθ Bι Bκ Cβ Cδ Cζ Cη Cι Cθ Eδ Eζ Eμ Ev Eο Eτ Ev Lζ Mγ Mη Mθ Mκ Mλ Mν Mo Nα Oα Oη Oκ Oσ Oφ Pγ Pδ Pο(*corr. in marg. to aliam tabulam*) Pτ Pυ Pφ Pψ Qα Rα Rε Sβ Sθ Sι Sκ Sλ Vα Vβ Vκ Vν Vπ Vσ Vχ Wβ Wι Xα; in alia tabula tabule Qδ; in aliis tabulis] Eα; in ceteris tabula Vυ; in eadem tabula Cε Dη Fβ Mφ Nε Qλ Vι Vψ Wα; in eadem tabulla Pθ; in illa tabula Oζ Oτ Pλ Pρ; in nulla tabula Eη; q̄ eadem tabula Mυ; ut in eadem tabule si[ve] ex alio latere vel in alia tabula vel in dorso illius Xβ; *add. interlin.* id est in eadem tabula Mκ si deus voluerit] *marg.* Pο; *om.* Bα Bγ Bη Bι Bκ Cη Eδ Eζ Eτ Fβ Lζ Mλ Mo Nα Pγ Pρ Pτ Pυ Rα Rε Sβ Sκ Tδ Vα Vβ Vι Vκ Vυ Wβ Wι Xα voluerit] *add.* Explicit Bκ Cδ Lζ Rα Sβ; *add.* Explicit astrolabium Eδ Eζ Mη Mλ Nε Pδ Sκ Vψ Xα; *add.* Explicit astrolabium et figura sequens convenit ei Cι; *add.* Explicit astrolabium et sequitur(*om.* Qμ) ymaginatio projectionis spere in planum per visum Pθ Qμ; *add.* Explicit compositio Mγ; *add.* Explicit compositio astrolabii Bι Oφ Vν; *add.* Explicit opus astrolabii Sι; *add.* Explicit opus astrolabii secundum Messahalath. Rubrica Mθ Oκ(Messeallath); *add.* Explicit practica astrolabii in qua ostenditur qua sr(?) debeat fieri astrolabium; sequitur lectura Sθ; *add.* Explicit tractatus de compositione astrolabii Bα; *add.* Finit opus astrolabii secundum Macellama(Marcellania Cζ Oη), benedictus Deus Eμ Mκ(*add.* Amen) Oη(*add.* Amen); *add.* in eadem [*illeg.*] Rδ; *mss* Bα Bζ Bη Bι Cβ Cδ Cζ Cθ Eμ Ev Eο Mθ Mκ Oα Oη Oκ Oσ Pφ Pψ Qα Vα Vε Vκ Vν Vσ Vυ *end*; *mss* Dy Lζ *end, continue with Cap. 18*; *mss* Rα *ends, continues with Cap. 19*; *mss* Oφ Vχ *end, continue with Cap. 20*

latitudes of a different region on another plate (God willing).

[ FIGURA 16 ]

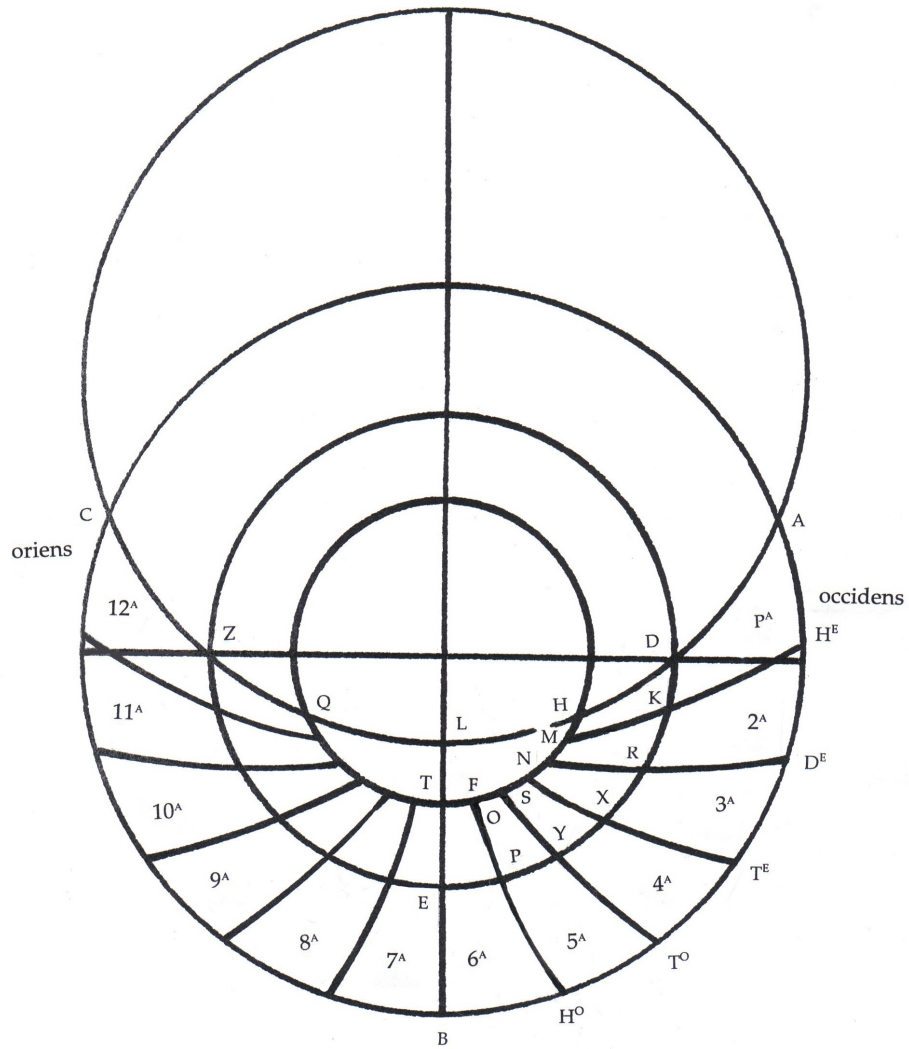


Figura inscriptionis 12 horarum naturalium /  
Figure of the inscription of the 12 natural hours

Complete: Bγ Bε Bι Cβ Cδ(upside down) Cη Cθ Cι Eα<sub>1</sub>(fol. 7<sup>r</sup> left)<sup>7</sup> Eα<sub>2</sub>(fol. 7<sup>r</sup> right) Eβ Eη Eμ Eτ Fα Fβ

<sup>7</sup> In ms Eα there are two diagrams, side by side.



Fζ Λγ Λε Λζ Λη Μγ(*upside down*) Μδ<sup>8</sup> Μη Μλ Μν Μο Μυ Νδ<sup>9</sup> Νε Οζ Οκ<sup>10</sup> Οξ Οσ Οτ Ου  
 Οφ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Ρβ Ργ Ρδ Ρλ Ρμ Ρα Ρδ Ρε Ρβ Ρδ Ρκ Τδ Vα Vβ Vι(*fol.*  
 333<sup>v</sup>) Vκ Wβ Wι Xβ

*Incomplete*: Bκ Mθ<sup>11</sup> Mκ Pγ<sup>12</sup> Vε

*Outline or space only*: Aα Bα Bθ Cε Dγ Dη Eδ Eζ Eο Eυ Lβ Mφ Oα Pν Pφ Qα Sθ Sι Vν Vπ Vσ Vυ  
 Wα

*No space*: Bη Bζ Cζ Eν Nα Oη Sλ Vχ Xα

Pθ: "P"

[Caption]

Figura ... naturalium] Cι Eα<sub>1</sub> Rδ; *om.* Bκ Cβ Cδ Cθ Eα<sub>2</sub> Eμ Λζ Μγ Νδ Οκ Οσ Ρψ Sβ Vα; Figura  
 descriptionis horarum Μλ Μο Ρο Ρυ(*add.* naturalium) Wι; Figura 12 horarum naturalium Sκ;  
 Figura duodecim horarum inequalium Ρρ; Figura horarum ultima Ρα; Figura inscriptionis  
 azimuth super cenith cum figura 12 horarum naturalium Μδ; Tabula horarum Bι Οφ

inscriptionis] *om.* Cη Eβ Eη Eτ Fα Fβ Fζ Λγ Λε Λη Μη Μν Μυ Νε Οζ Οξ Οσ Οτ Ου Ρα Ργ Ρλ  
 Ρρ Ρτ Ρβ Ργ Ρδ Ρλ Ρμ Ρε Sδ Tδ Vι Wβ Xβ 12] *om.* Eβ Mν Mυ Oξ Pμ Qλ Vβ Vι Vκ;  
 duodecim Ρρ naturalium] *om.* Bγ Fβ Pδ Ρμ Sδ Vκ; inequalium Ρρ; *add.* sive inequalium Bε;  
*add.* Figura capituli 16 Bε; *add.* Figura inscriptionis azimuth super cenith<sup>13</sup> Fβ

[Lettering]

A] Bγ Bε Bι Bκ Cβ Cδ Cη Cθ Cι Eα<sub>1</sub> Eα<sub>2</sub> Eβ Eη Eμ Eτ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μο  
 Μν Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Ρβ Ργ Ρδ Ρλ Ρμ Ρα Ρδ Ρε Ρβ  
 Ρδ Ρκ Τδ Vα Vβ Vι Vκ Wβ Wι Xβ; *om.* Sκ; Q Mν B] Bγ Bε Bι Bκ Cβ Cδ Cη Cθ Cι Eα<sub>1</sub> Eα<sub>2</sub> Eβ Eη  
 Eμ Eτ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ρδ  
 Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Ρβ Ργ Ρδ Ρλ Ρμ Ρα Ρε Sβ Sδ Tδ Vα Vβ Vι Vκ Wβ Xβ; *om.* Sκ Wι; *add.* C  
 Mν; *add.* EP Bι Bκ Λζ Μλ Μο Ρμ Ρο Ρυ Ρα Vκ; *add.* OP Oφ C] Bγ Bε Bι Bκ Cβ Cδ Cη Cθ Cι  
 Eα<sub>1</sub> Eα<sub>2</sub> Eβ Eη Eμ Eτ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ Μδ Μη Μλ Μο Μυ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ  
 Ρα Ρδ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Ρβ Ργ Ρδ Ρλ Ρμ Ρα Ρε Sβ Sδ Tδ Vα Vβ Vι Vκ Wβ Wι; *om.* Mν Ρλ Sκ  
 Xβ; G Rδ; S Nδ D] Bγ Bε Bι Bκ Cβ Cδ Cη Cθ Cι Eα<sub>1</sub> Eα<sub>2</sub> Eβ Eμ Eτ Fα Fβ Fζ Λγ Λε Λζ Λη Μγ  
 Μδ Μη Μλ Μν Μο Μυ Νδ Νε Οζ Οκ Οξ Οσ Οτ Ου Οφ Ρα Ρδ Ρλ Ρμ Ρο Ρρ Ρτ Ρυ Ρψ Ρβ Ργ Ρδ  
 Ρλ Ρμ Ρα Ρδ Ρε Sβ Sδ Sκ Τδ Vα Vβ Vι Vκ Wβ Wι Xβ; *om.* Eη D<sup>ε</sup>] Bε Bι Bκ Cβ Cη Cθ Cι Eα<sub>1</sub>

<sup>8</sup> In ms Mδ Figura 16 is combined with Figura 15. Only the lettering in mss Mδ, Νδ and Ργ relevant to Figura 16 is recorded here.

<sup>9</sup> In ms Νδ, Figura 16 is combined with Figura 15.

<sup>10</sup> In ms Ok the figure is reversed left/right.

<sup>11</sup> The diagram in ms Mθ is confused.

<sup>12</sup> In ms Ργ Figura 16 is combined with Figura 15 but omits all the lettering associated with Figura 16.

<sup>13</sup> Actually the caption for Figura 15.

Ea<sub>2</sub> Eβ Eη Eμ Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mo Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po  
 Pq Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Tδ Va Vκ Xβ; *om.* Sk Wi; *cut off* Mλ; CT Rδ; D Cδ; E Vβ; T<sup>E</sup>  
 Bγ Et Mη Mv Pt Wβ; T<sup>O</sup> Mu Vi E] Bγ Be Bκ Bi Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ  
 Lγ Le Lζ Lη Mγ Mη Mλ Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ  
 Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Tδ Vβ Vi Vκ Wβ Wi Xβ; *om.* Eη Mv Sk; *illeg.* Rδ; T Va; Y<sup>E</sup> Mδ F ]  
 Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mu  
 Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Sβ Sδ Sk Tδ  
 Va Vβ Vi Vκ Wβ Wi; *om.* Mγ Xβ; *illeg.* Rδ Re H] Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη  
 Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mv Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ  
 Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Tδ Va Vβ Vi Vκ Wβ Wi Xβ; *om.* Mλ Sk; *illeg.* Rδ  
 H<sup>E]</sup> Bγ Be Bi Bκ Cβ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mv Mo  
 Nδ Ne Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pv Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Tδ Va Vκ Wβ;  
*om.* Sk Wi Xβ; *cut off* Mλ; AH<sup>E</sup> Oζ; E Cδ; H Pψ Vβ H<sup>T</sup> Rδ; H<sup>O</sup> Pt; T<sup>E</sup> Mu Vi H<sup>O]</sup> Be Bi Bκ Cβ Cη  
 Cθ Ci Eβ Eη Eμ Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mλ Mo Nδ Ne Oζ Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ  
 Po Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Tδ Va Vκ; *om.* Mu Sk Wi Xβ; *illeg.* Rδ; C Cδ; EP Bγ Et Mη  
 Mv Pt Vi Wβ; H<sup>OP</sup> Sδ; O Pq Vβ; T<sup>O</sup> Ea<sub>1</sub> Ea<sub>2</sub> Ok K] Bγ Be Bi Bκ Cβ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eμ Et  
 Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mδ Mη Mλ Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq  
 Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Tδ Va Vβ Vi Wβ Wi Xβ; *om.* Eη Mv Sk; *illeg.* Eβ; Q Cδ;  
*add.* R Vκ L] Bγ Bi Cβ Cδ Cθ Ea<sub>1</sub> Ea<sub>2</sub> Eμ Lζ Mγ Mo Oσ Oφ Pμ Po Pt Pv Pψ Ra Sβ Vβ Vκ;  
*om.* Be Bκ Cη Ci Eβ Eη Et Fa Fβ Fζ Lγ Le Lη Mδ Mη Mλ Mv Mu Nδ Oζ Ok Oξ Ot Ou Pa Pδ Pl  
 Pq Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Sk Tδ Va Vi Wβ Wi Xβ; Q Ne M] Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci  
 Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou  
 Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Sβ Sδ Sk Tδ Va Vβ Vi Vκ Wβ Wi; *om.* Mγ  
 Xβ; *illeg.* Rδ Re N] Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη  
 Mδ Mη Mλ Mv Mo Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ  
 Qμ Ra Sβ Sδ Sk Tδ Va Vβ Vi Vκ Wβ Wi; *om.* Mγ Xβ; *illeg.* Rδ Re; v Mu O] Bγ Be Bi Bκ Cβ  
 Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Ok Oξ  
 Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Sβ Sδ Sk Tδ Va Vβ Vi Vκ Wβ  
 Wi; *om.* Mγ Xβ; *illeg.* Rδ Re P] Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eμ Et Fa Fβ Fζ Lγ Le  
 Lζ Lη Mγ Mδ Mη Mλ Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ  
 Qγ Qδ Qλ Qμ Ra Sβ Sδ Tδ Va Vβ Vi Vκ Wβ Wi; *om.* Eη Mv Sk Xβ; *illeg.* Rδ Q] Bγ Be Bi Bκ  
 Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mγ Mη Mo Mu Ne Ok Oξ Oσ Ot Ou  
 Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Tδ Va Vβ Vi Vκ Wβ Wi Xβ; *om.*  
 Mδ Mλ Mv Nδ Oζ Sk; *illeg.* Rδ R] Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eμ Et Fa Fβ Fζ Lγ Le  
 Lζ Lη Mγ Mδ Mη Mλ Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ  
 Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Sδ Tδ Vβ Vκ Wβ Wi Xβ; *om.* Eη Mv Sk; *illeg.* Eβ; E Va; X Vi S] Bγ  
 Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ Et Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mu Nδ  
 Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Sβ Sδ Sk Tδ Va  
 Vβ Vi Vκ Wβ Wi; *om.* Mγ Xβ; *illeg.* Rδ Re T] Bγ Be Bi Bκ Cβ Cδ Cη Cθ Ci Ea<sub>1</sub> Ea<sub>2</sub> Eβ Eη Eμ  
 Et Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mu Nδ Ne Oζ Ok Oξ Oσ Ot Ou Oφ Pa Pδ Pl Pμ Po  
 Pq Pt Pv Pψ Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Sk Tδ Va Vβ Vi Vκ Wβ Wi Xβ; *om.* Mγ Wi; *illeg.* Rδ  
 T<sup>E]</sup> Be Bi Bκ Cβ Cη Ci Eβ Eη Eμ Fa Fζ Lγ Le Lζ Lη Mγ Mδ Mλ Mo Nδ Ne Oζ Oξ Oσ Ot Ou  
 Oφ Pa Pδ Pμ Po Pv Qβ Qγ Qδ Qλ Qμ Ra Re Sβ Sδ Tδ Va Vκ Xβ; *om.* Sk Vi Wi; C<sup>E</sup> Cθ; D Vβ; D<sup>E</sup> Fβ  
 Ok Pl Pψ; D<sup>O</sup> Ea<sub>1</sub> Ea<sub>2</sub>; D<sup>T</sup> Rδ; E Pq; H<sup>O</sup> Mu; T Cδ; T<sup>O</sup> Bγ Et Mη Mv Pt Wβ T<sup>O]</sup> Be Bi Bκ Cβ Cη  
 Cθ Ci Eβ Eη Eμ Fa Fζ Lγ Le Lζ Lη Mγ Mδ Mλ Mo Nδ Ne Oζ Oξ Oσ Ot Ou Oφ Pa Pδ Pμ Po Pv  
 Qβ Qγ Qδ Qλ Qμ Ra Rδ Re Sβ Tδ Va Vκ; *om.* Fβ Sk Wi; D<sup>E</sup> Pl; D<sup>O</sup> Pψ Xβ; EP Mu; H<sup>O</sup> Bγ Et Mη Mv

Pτ Vι Wβ ; ο Cδ; τ Pρ Vβ; τ<sup>e</sup> Eα<sub>1</sub> Eα<sub>2</sub> Oκ; TH<sup>o</sup> Sδ x] Bγ Bε Bι Bκ Cβ Cθ Cι Eα<sub>1</sub> Eα<sub>2</sub> Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mλ Mο Mυ Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pδ Pλ Pμ Pο Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Tδ Vα Vβ Vκ Wβ Wι Xβ; *om.* Eη Mν Sκ; *illeg.* Eβ; C Cδ; H Cη; ν Mη Vι γ] Bγ Bε Bι Bκ Cβ Cη Cι Eα<sub>1</sub> Eα<sub>2</sub> Eβ Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mδ Mλ Mο Nδ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pδ Pλ Pμ Pο Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Tδ Vα Vβ Vκ Wβ Wι; *om.* Eη Mν Sκ Xβ; N Cθ; P Cδ Vι; ν Mυ; X Mη z] Bγ Bε Bι Bκ Cβ Cδ Cη Cθ Cι Eα<sub>1</sub> Eα<sub>2</sub> Eβ Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mγ Mλ Mο Mυ Nε Oζ Oκ Oξ Oσ Oτ Oυ Oφ Pα Pδ Pλ Pμ Pο Pρ Pτ Pυ Pψ Qβ Qγ Qδ Qλ Qμ Rα Rε Sβ Sδ Tδ Vα Vβ Vι Vκ Wι; *om.* Eη Mδ Mη Mν Nδ Sκ Xβ Rδ; X Wβ

## [Numbers]

1, 2 ... 12 Eα<sub>1</sub> Eα<sub>2</sub> Eμ Mγ Vα 1<sup>a</sup>, 2<sup>a</sup> ... 12<sup>a</sup> Cβ Bι Cδ Fζ Lε Lζ Mη Mλ Mν Nε Oξ Oσ Oτ Oφ Pμ Pο Pτ Pυ Pψ Qδ Qλ Qμ Rα Rδ Rε Sβ Sκ Tδ Vκ Wβ Wι Xβ; *om.* Bκ p<sup>a</sup>, 2<sup>a</sup> ... 12<sup>a</sup> Bε Cθ Eβ Eη Fα Fβ Mδ Nδ Oζ Oκ Pα Pλ Qγ Sδ p<sup>a</sup> hora, 2<sup>a</sup> ... 12<sup>a</sup> Cη Cι Lγ Lη Oυ Pδ Qβ Vβ prima, secunda ... undecima, duodecima Bγ Eτ 12 | prima hora, 11 | secunda hora, 10 | 3, 9 | 4, 8 | 5, 7 | 6, 6 | 7, 5 | 8, 4 | 9, 3 | 10, 2 | 11, 1 | 12 Pρ

## [Other information]

occidens Bε Bι Cβ Cδ Cη Cθ Cι Eα<sub>1</sub> Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mν Mο Mυ Nδ Nε Oζ Oξ Oσ Oτ Oυ Oφ Pα Pδ Pλ Pο Pρ Pτ Pυ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sκ Tδ Vβ Vι Vκ Wβ Wι Xβ; *om.* Bγ Bκ Eα<sub>2</sub> Mλ Oκ Pμ Pψ Qβ Vα oriens Bε Bι Cβ Cδ Cη Cθ Cι Eα<sub>1</sub> Eβ Eη Eμ Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mλ Mν Mο Mυ Nδ Nε Oζ Oξ Oσ Oτ Oυ Oφ Pα Pδ Pλ Pο Pρ Pτ Pυ Qγ Qδ Qλ Qμ Rα Rδ Rε Sβ Sδ Sκ Tδ Vβ Vι Vκ Wβ Wι Xβ; *om.* Bγ Bκ Eα<sub>2</sub> Oκ Pμ Pψ Qβ Vα *add.* melior quam alia Eα<sub>2</sub>

*at top of circle of Capricorn]* *add.* A Sβ; *add.* D Bγ Mγ Pτ; *add.* L Eβ Eη Fβ Fζ Lγ Lε Lη Pλ Nε Oζ Oτ Oυ Pα Pρ Qβ Qγ Qλ Qμ Sδ Tδ Xβ BL] *add.* linea recessionis Oφ *at centre]* *add.* I Sβ; *add.* L Cι Oκ Pδ Rδ *add.* circulum Capricorni Pτ; Capricorni Pρ *add.* Arietis et Libre Pρ *add.* Cancri Pρ *add.* septentrio Fβ Pρ Qγ *add.* meridiens Pρ Qγ *add.* latitudo regionis Bε; *add.* latitudo regionis 36 gradus Cβ Cθ; *add.* 42 gradus Oξ; *add.* 48 Cδ; *add.* 48 lati Vα; *add.* latitudo 48 Oσ; *add.* latitudo 50 graduum Eτ Mν Nε Pτ Sκ Wβ; *add.* latitudo 50 graduum | 48 Qλ *add.* [illeg.] horarum Lζ *add.* [illeg.] sunt lineae horarum Lζ

*horizontal diameter]* *add.* Q, L, H Mλ; *add.* Q, H Oκ(repeated); *add.* (left) C Sβ; *add.* (right) A Sβ *arc* TQ] *add.* F, O, S, N, M Oκ *arc* EZ] *add.* P, Y, X, R, K Oκ *arc* BC] *add.* O, T, D, E, H

## [ Construction, Section III ]

## [CAPITULUM 17.] PROIECTIO SPERE IN PLANUM

Concussio sive extensio immo verius proiectio spere in planum per visum fit hoc modo. Sit planum linea MBN, axis spere linea AB stans orthogonaliter super planum MBN

- 1 Proiectio ... planum] *om.* Aα Cε Eα Ev Mχ Nα Pγ Qμ; Capitulum Messahalath de proiectione spere in planum Wε<sub>2</sub>; Concussio sive extensio immo verius proiectio spere in planum per visum Mλ<sup>1</sup>; De proiectione spere in planum per visum vel per lineas erectas Rε; De ymaginatione proiectionis spere in planum per visum Pδ Pθ; Incipit inmaginatione(!) proiectionis spere im(!) planum per visum etc. Rδ; Incipit ymaginatione proiectionis spere in planum Nε; Ymaginatione proiectionis spere in planum per visum Cι Eδ Eζ Mη Po Vψ Xα; Ymag[inati]o spere in planum per visum Sκ; *add. in marg.* Capitulum 17<sup>m</sup> Bε; *add. in marg.* Capitulum de scientia proiectionis spere in planum Fβ  
*before* Proiectio] *add.* Capitulum Bε Fβ Proiectio] De proiectione Bε Bθ Cη Dη Fβ Mv Mo Mο Mψ Vβ Vπ; *mss* Mο Mσ Mχ Mψ Vθ Wε<sub>12</sub> *start* planum] *add.* Capitulum Cη; *add.* per visum Wι; *add.* per visum vel per lineas rectas Bθ Pv Vπ; *add.* per visum vel per lineas erectas ex polo australi super septentrionalem Vβ; *add.* ex polo australi super septentrionale Pτ; *add.* Rubrica Vπ
- 2 Concussio] *add.* spere Cε Dη; *ms* Mχ *starts* sive] seu *some* verius] potius Mχ Mψ Vθ Wε<sub>1</sub> Wε<sub>2</sub> proiectio] *add.* per Aα Mψ spere] vere Pγ planum] plano Cε per] pro Sκ fit] sit Bθ Eζ Mη Mv Mφ Nε Po Vι Vβ Wα Wε<sub>1</sub> Xα Xβ; *add.* 9<sup>a</sup>(?) Pv
- 2-3 fit ... planum] *om.* Pδ
- 3 Sit] Si Eτ; *add.* hic Pγ planum<sub>1</sub>] *om.* Mσ Vθ planum<sub>1</sub> linea MBN] *om.* Bε linea<sub>1</sub>] linee a β Eζ; lineas Pδ MBN<sub>1</sub>] in BA Nα; MVN Tδ; ROBN Mδ; *add.* presentans(?) planum et circulus ACBD presentans(?) spere, cumque Mσ Wε<sub>1</sub>; *add.* representans planum et circulus ACBD representans spere cuius Vθ MBN<sub>1</sub> ... linea<sub>2</sub>] *om.* Nε MBN<sub>1</sub> ... planum<sub>2</sub>] *om.* Eδ Eη spere] *om.* Mφ Qλ Vι Wα; sit Mσ Wε<sub>1</sub>; *add.* sit Pγ linea<sub>2</sub>] *om.* Aα Lγ Vψ; *add.* *interlin* Wε<sub>2</sub> stans] status Qδ orthogonaliter] *add.* id est Pδ planum<sub>2</sub>] lineam Xβ MBN<sub>2</sub>] MB Cε; *add.* quod est planum Xβ

<sup>1</sup> Mλ repeats the first line of the text as the rubric.

<sup>2</sup> There are two versions of this capitulum in *ms* Wε, beginning on fol. 110<sup>v</sup> (Wε<sub>1</sub>) and 115<sup>v</sup> (Wε<sub>2</sub>); Wε<sub>2</sub> is closer to the standard version.

[ *Construction, Section III* ]

## [CHAPTER 17.] THE PROJECTION OF A SPHERE ONTO A PLANE

The flattening or extension, or more correctly the projection by sight,<sup>3</sup> of a sphere onto a plane is effected in this manner. Let the plane be line MBN, the axis of the sphere, line AB, standing perpendicular on the plane MBN

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<sup>3</sup> This specific projection is known as “stereographic projection.” See Ron B. Thomson, *Jordanus de Nemore and the Mathematics of Astrolabes: De plana spere* (Toronto: PIMS, 1978).

- 5 ita quod polus septentrionalis contingat planum MBN in puncto B. Alter vero scilicet meridionalis maxime distet a plano in puncto A qui est oculus videntis. Sit<sup>4</sup> colurus transiens per maximas solis declinationes; sit ACBD. Linea quoque CD equidistans plano est equator diei, EH tropicus Cancrici, GF tropicus Capricorni et hii duo etiam equidistant
- 4 ita] *om.* Wε<sub>2</sub> ita ... MBN] *om.* Bε Eη Ev Mψ quod] *om.* Fβ septentrionalis] axis Eα planum] *interlin.* Pτ MBN] MB Pα in] super Qδ in puncto B] *om.* Qβ; mipō or inipō(?) Sκ B] *om.* Cη Eτ; P Mη; *add.* polo septentrionali Bε Alter vero] *om.* Wα Wε<sub>2</sub> vero] *om.* Mλ; *add.* in 10 Mo; *add.* polo Mσ; *add.* polus Mχ Vθ scilicet] *om.* Mχ Mψ Pθ Pq Qδ Rδ Wε<sub>1</sub>; sit Cη Eτ Pγ Sκ Wβ Wι
- 5 meridionalis] australis Mχ; *add.* scilicet Bε Eτ Pθ Rδ; *add.* et<sup>5</sup> Aα Cη Ev Pγ Vβ(*interlin.*) Wβ Wε<sub>2</sub> maxime] *illeg.* Wα distet] distat Qλ Sκ Wι; distant Eη; *add.* ayfano(?) Mv a plano] *rep.* Wε<sub>2</sub> puncto] *add. and del.* B alter vero Pγ qui est] in quo sit Mσ Vθ est] *om.* Eδ; et Aα Bγ Bθ Cε Cη Cι Dη Eζ Eτ Ev Mη Mλ Mv Mo Mψ Nα Pγ Pδ Pθ Po Pτ Pv Vβ Vπ Xα oculus] circulus Nδ sit] et Mσ Wε<sub>1</sub>; destsa<sup>2</sup>(?) arcus ABCD et est Mχ; sitque Qβ colurus] coriusles Eα; corulus Bθ
- 6 transiens] *add.* in spera Mσ Vθ; *add.* per speram Wε<sub>1</sub> maximas] *add. and del.* suas Ov solis] *om.* Xβ sit] *om.* Xβ; scilicet Bε Eη; ut Mv Mφ Vι Wα; *add.* productus circulus Mσ Vθ; *add.* productus colurus Wε<sub>1</sub> sit ACBD] *om.* Mχ ACBD] ABCD Aα Bγ Bθ Cη Cι Eα Eβ Eη Eτ Ev Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mλ Mv Mo Mq Mσ Mv Mφ Mψ Nα Oξ Oτ Ov Pα Pγ Pδ Pλ Pμ Pv Pq Pτ Pv Qβ Qγ Qδ Qλ Rδ Re Sδ Tδ Vβ Vι Vπ Vψ Wα Wβ Wε<sub>1</sub> Wε<sub>2</sub> Wι Xα Xβ; AD BC Bε Linea quoque CD] *repeated* Vπ CD] ED Eζ; TD Rδ equidistans] *eque distans some; add.* a Aα Bθ Dη Mψ Qδ; *add.* in Fζ plano] *om.* Oξ; plana Nε; planum Cη
- 7 est] sit Rε est equator] sit diametrum circuli equinoctialis Mσ Vθ EH] EB Eδ; EF Aα Bθ Cη Sk Vπ; ET Ev; GF Eτ; *add.* est Qδ EH ... Cancrici] et linea EH sit diametrum circuli seu tropici Cancrici Mσ Vθ Cancrici] ☉ Mχ Wε<sub>2</sub> Cancrici GF tropicus] *om.* Pγ GF] SF (*or* scilicet F) Nα GF ... Capricorni] et linea GF sit diametrum circuli seu tropici Capricorni Mσ Vθ tropicus Capricorni] *om.* Cε Capricorni] ♄ Mχ Wε<sub>2</sub> et hii] et *corr. to* que Mσ; hii *corr. to* et CD, EH, GF sint Pq; que Vθ Wε<sub>1</sub> hii] H, N Xβ duo] 2 many; *om.* Vθ duo etiam] *om.* Eα etiam] *om.* Bθ Cε Fβ Mq Vπ Vψ Wε<sub>1</sub>; *erased* Pτ; que Aα equidistant] *eque distant or distant eque some; equidistans Aα Mδ; equidistantes Pq; equidistent Bε Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mq Mφ Oξ Oξ Oτ Ov Pα Pλ Pμ Pv Qγ Qλ Tδ Vι Wα Xβ; add.* a Aα Cη Eτ Nα Vβ Wι
- 7-8 Cancrici ... linea] *om.* Qδ

<sup>4</sup> In many mss *Sit* forms the end of the previous sentence (especially when the previous *est* is given as *et*) or the sentence division is ambiguous. If *Sit* is the verb of the previous clause, then *colurus* becomes the subject of the *sit* in line 6.

<sup>5</sup> This variant probably began with a misreading of the abbreviated ending of *meridionalis*.

so that the north pole touches plane MBN at point B. However, let the other one, that is the southern one, be at the greatest distance from the plane at point A, which is the eye of the observer. Let there be the colure passing through the greatest declinations of the sun;<sup>6</sup> let it be ACBD. Likewise line CD parallel to the plane, is the daily equator, EH the Tropic of Cancer, GF the Tropic of Capricorn and these two are likewise parallel to the

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<sup>6</sup> I.e., the colure or great circle passing through the solstices.

plano. Linea vero EF est ecliptica.

10 Exeant igitur a puncto A polo australi, scilicet ab oculo videntis, due linee per duas extremitates equatoris scilicet C et D ad duo puncta in plano P et X, eritque linea PX diametrum equatoris. Et ab eodem puncto alie due linee scilicet per E, H extremitates tropici Cancrī veniant in planum in punctis Z et Y et hec linea ZY erit diameter

- 8 vero] *om.* Bγ; autem Bε EF] EH Sκ est] *om.* Mv Qλ Wε<sub>2</sub>; sit diameter Mσ Vθ Wε<sub>1</sub> ecliptica] ecliptica Xβ; ecliptice Mσ Vθ Wε<sub>1</sub>; ecliptica Cη Mδ Mλ Mo Mv Mφ; edipica Nα; elitica Eα
- 9 Exeant] *add.* autem Pδ; *add.* vero Eδ Eζ igitur] *om.* Mχ; ergo *few*; ergo igitur Xα A] *om.* Eδ; *repeat* Wε<sub>1</sub>; id est A Vβ; poli australi ab Cη A polo australi] poli(*add.* and expunged hoc modo A) australis ab australi polo Pγ; A poli australis ab australi polo Sκ; *add.* ab australi Wι polo] puncto Nα; *add.* seu polo Xβ australi] haustrali scilicet Rε; astrealis Vθ; *add.* ab astralo polo Eτ ab] A, B Xβ due] 2 / 2<sup>e</sup> some; et Ev linee] *add.* C Nα per] *om.* Mη
- 10 duas] 2 / 2<sup>as</sup> some equatoris] dyametri circuli equinoctialis Mσ Vθ Wε<sub>1</sub>; *add.* diei Dη; *add.* and *canc.* et ab eodem puncto Wβ scilicet] *om.* Cι; *add.* per puncta Mσ Vθ C et D] CD many; AC Fα; DC Lβ ad] *om.* Vπ; A, D Xβ duo] 2 many plano] *add.* equatoris Cε; *add.* scilicet Eα P et X] scilicet PQ Mσ Vθ Wε<sub>1</sub>; P et ex Wβ; P et ex *corr.* to P et X Sκ; T et X Mχ linea] *om.* Wβ PX] P et V Nα; P et X Mv Rδ; PQ Mσ Vθ Wε<sub>1</sub>; TX Mχ; X Mψ
- 10-11 scilicet ... equatoris] *om.* Aα
- 11 diametrum] diametraliter Ev equatoris] circuli equinoctialis in plano Mσ Vθ; *add.* Posito ergo circino in medio eorum scilicet in puncto B, describe circulum transeuntem per predicta duo puncta P, Q qui sit circulus PAQO et ille erit circulus equinoctialis in plano correspondens circulo in spera cuius diameter est linea CD Mσ Vθ Wε<sub>1</sub> Et] Deinde Mσ Vθ Wε<sub>1</sub> eodem] alio Mv puncto] *add.* scilicet A Mχ; *add.* scilicet A veniant Mσ Vθ Wε<sub>1</sub> due] 2 / 2<sup>e</sup> some scilicet] *om.* Dη Mδ Vθ Vψ per] *om.* Mo Mψ Pτ E, H] *om.* Mσ Vθ Wε<sub>1</sub>; HE many; EB Eδ; EY Aα Bθ Ev Vπ; HC Nε Tδ; *add.* et per Pv; *add.* per Dη Nα Pτ; *add.* scilicet Mλ extremitates] *add.* dyametri Mσ Vθ; *add.* scilicet Cε Dη
- 12 tropici] circuli Mσ Vθ Cancrī] ☉ Mχ Wε<sub>2</sub> veniant ... Z et Y] scilicet per puncta E, H ad duo puncta in plano qui sunt S, v. Mσ Vθ Wε<sub>1</sub> in punctis] *om.* Tδ Z et] *superscr.* Bγ Z et Y] ZY some; R et Y Rδ; Y Cη; Z et I Eη; et Y Pμ et hec ... erit] eritque illa linea SV Mσ Vθ Wε<sub>1</sub> ZY] R et Y Rδ; Z et Y Mv Sκ Wε<sub>2</sub>; ZI Eη erit] *om.* Pγ Sκ
- 12-13 Z et Y ... tropici] R et D caput Nα



plane. Line EF, however, is the ecliptic.

Let two lines extend therefore from point A, the south pole, that is from the eye of the viewer, through the two ends of the equator, that is, C and D, to two points in the plane, P and X, and line PX will be the diameter of the equator. And from the same point [A] two other lines, that is, through E and H the ends of the Tropic of Cancer should meet the plane at points Z and Y and this line ZY will be the diameter of the same Tropic [projected] in the plane. And similarly another two lines through G and F, the ends of the Tropic

- eiusdem tropici in plano. Similiter et alie due linee per G, F extremitates tropici Capricorni plano incidentes in punctis M et N; faciunt ex ipsa linea MN diametrum
- 15 Capricorni in plano. Extractis igitur super medietatibus quorumlibet diametrorum in linea MBN figuratorum circulis, fient circuli in plano primi ex spera per visum
- 13 eiusdem] *om.* Mσ Vθ Wε<sub>1</sub>; eius Pδ; eius eiusdem Pυ tropici<sub>1</sub>] *add.* Cancrī Bε Mσ Vθ Wε<sub>1</sub> in ... tropici<sub>2</sub>] *om.* Pα Xα plano] *add.* Describe igitur circulum circa punctus B transeuntes per hec duo puncto, scilicet S, V, et sit circulus STVR. Et ille representabit in plano circulum Cancrī correspondentem circulo in spera cuius dyiameter est linea EH. Mσ Vθ Wε<sub>1</sub> Similiter] *add.* autem Eδ Po et] *om.* Bθ; etiam Pλ; ab eodem puncto exeant Mσ due] 2 *some*; *add.* similiter Mq per] scilicet Mo; *corr.* to scilicet PQ G, F] F, G *many*; *om.* Mσ Vθ Mψ extremitates] *add.* diametri Mσ Vθ Wε<sub>1</sub> tropici<sub>2</sub>] *om.* Cε
- 13-14 Similiter ... plano] *om.* Eτ Pγ Sκ tropici<sub>2</sub> ... incidentes] *om.* Mo
- 14 Capricorni] γ<sub>o</sub> Mχ Vθ Wε<sub>2</sub>; *add.* in Aα Bθ Dη Eυ Mμ Nε Pq Qδ Vπ; *add.* scilicet per puncta G, F Mσ Vθ Wε<sub>1</sub> incidentes] *rep.* Pα faciunt ex ipse] Eritque hec Mσ Vθ Wε<sub>1</sub> faciunt ... MN] faciunt ex ipsa linea M et N, faciunt ex ipsa linea MN Wβ ipsa] *om.* Rε MN] M et N Cε Pυ Rδ; que N Qμ diametrum] *add.* tropici Mλ Mq Vθ
- 14-15 MN ... plano] vide [*illeg.*]: diametrum tropici Capricorni in plano Wε<sub>1</sub>(*marg.*)
- 15 Capricorni] [sign] Mχ Vθ Wε<sub>2</sub> in plano] *om.* Mψ plano] *add.* corendes(?) circulo in spera cuius diameter est linea GF Mσ; *add.* (??) Potiens linea exentiō ab oculo A per punctum EF diametrum zodiaci in plano ouδup na altera linearum qu<sup>o</sup> circuli qu tropico ☉ in puncto Z aliqua in tropico γ<sub>o</sub> in puncto M Mχ; *add.* Descriptio igitur circulo circa punctum B transientem per illa duo puncta, scilicet M, N, qui sit circulo MKNL. Ipse erit tropicius Capricorni (γ<sub>o</sub> Vθ) in plano correspondens circulo in spera cuius dyiameter erit linea GF. Mσ Vθ Wε<sub>1</sub> super] sic Eα; *interlin.* Pτ quorumlibet] quarumlibet Bγ Cη Dη Eδ Eζ Mλ Mv Mo Mψ Nα Po Pq Pτ Pυ Sκ Vβ Wβ Xα diametrorum] 9ioliem Pγ
- 15-16 Extractis ... circulis] Postea invento(in Wε<sub>1</sub>) puncto medio inter duo puncta (inter ... puncta *om.* Wε<sub>1</sub>) S, N qui sit punctus X. Describe circulum transeuntem per eadem duo puncta scilicet S, N qui necessario transibit per puncta A, O si bene est factum; et erit circulus SANO et ipse erit ecliptica in plano correspondens circulo in spera cuius dyiameter est linea EF. Et sic habes quomodo per circulos in spera descriptos Mσ Vθ Wε<sub>1</sub>
- 16 linea] *om.* Dη MBN] BN Nα figuratorum] figuratarum Mχ Pq Qδ; sig<sup>a</sup>tuārum Cη; signatorum Cι Dη Mλ Mv Mo Mv Mψ Nα Oξ Pδ Pθ Pτ Wβ; signatarum Aα Bγ Bθ Eδ Eζ Eη Eυ Po Pυ Vβ Vπ; signatoriarum Mη; significatarum Eτ Pγ Sκ Wι; signorum Cε Nε; *add.* in Mv circulis] *om.* Mo; circulus Pγ fient] fiant Mσ Vθ; sicut Cη in] *om.* Mo Wε<sub>1</sub>; ibi Mv ex] in Mv visum] intasum(?) Pγ; vissimi(?) Sκ
- 16-17 in ... proportionaliter] *om.* Nα Rε

of Capricorn, meeting the plane at points M et N; they make from this line MN the diameter of [the Tropic of] Capricorn [projected] on the plane. When therefore circles are drawn on the centres of whatever diameters represented in line MBN, they will become the first circles in the plane projected proportionally from the sphere by sight

proportionaliter proiecti.

- 17 proportionaliter] *om.*  $W\varepsilon_2$  proportionaliter proiecti] proportio  $S\kappa$  proiecti] *ms*  $M\chi$  ends; *add.* Et exemplum patet videre in figura precedenti et sequenti.  $W\varepsilon_2$ ; *add.* et vide in figura sequenti  $W\varepsilon_1$ ; *add.* hec est figura  $V\beta$ ; *add.* Pro exemplo vide figuram sequentem  $M\sigma$ ; *add.* sequitur figura  $R\delta$ ; *add.* sicut patet in sequenti figura hac  $F\beta$ ; *add.* ut hic  $P\nu$  (*fol. 73<sup>v</sup>; arrow to image*)  $R\varepsilon$ ; *add.* ut in figura  $N\alpha$ ; *add.* ut in figura patet  $PQ$ ; *add.* vide in figura  $V\theta$ ; *add.* vide in folio hoc exemplum immediate sequens  $T\delta$ ; *add.* qui erit in basis(!) sive fundamentum [*illeg.*] astrolabii et linea  $MBN$  erit orizon [*illeg.*] linea vero  $AB$  meridiana linea in planispero sive astrolabio locabit  $M\chi$

[*or stereographically*].

[ FIGURA 17 ]

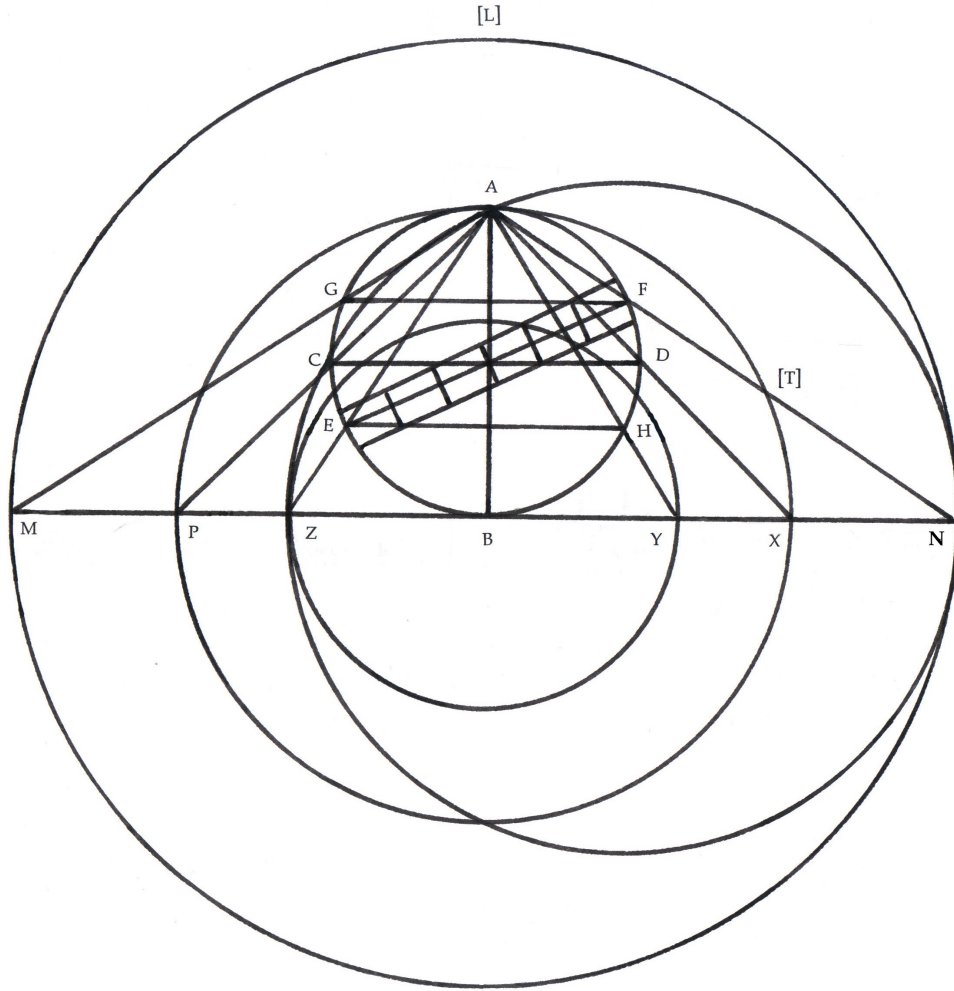


Figura projectionis spere in planum /  
Figure of the projection of a sphere on a plane.

[Complete diagram]<sup>7</sup> Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ  
Mσ Mυ(fol. 409<sup>v</sup>) Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv<sub>1</sub>(fol. 74<sup>v</sup>) Pv<sub>2</sub>(fol. 75<sup>v</sup>) Qβ Qγ Qδ  
Qλ Qμ Rδ Re Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ

[Partial diagram]

[Outline, or space only] Aα Bθ Cε Dη Eζ Ev Lβ Mφ Mχ Pv Vπ Vψ Wα Wε<sub>2</sub>

<sup>7</sup> This diagram is found as stand alone images (i.e., without text) at the end of Cap. 22 in mss Ra(fol. 16<sup>v</sup>) and Sβ(fol. 12<sup>ra</sup>). They are not collated with this diagram.

[No space] Eδ<sup>8</sup> Mψ Nα Xα  
Pθ: “Q”

[Caption]

Figura ... planum] Bγ Bε Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mη Mλ Mν Mo Mρ Nε Oζ Oξ Oτ Ou  
Pα Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rδ Sκ Tδ Vβ Vι Wβ Wε<sub>1</sub> Wι Xβ; om. Mσ Mυ Pυ<sub>1</sub> Rε;  
Projectio spere in planum] Eα Mδ Nδ Pγ Sδ

sphere] om. Qδ plano] add. per visum Mλ; add. interlin. al' plano Vβ; add. Figura capituli 17 Bε

[Lettering on the diagram]

A] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ  
Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ;  
add. oculus videntis Eα Eβ Fα Fβ Fζ Oζ Pα Pρ Qλ Sδ; add. oculus Lε Lη Mo Tδ; add. oculus  
intuentis Pδ; add. oculis videntis existens in polo antarctico Pυ<sub>1</sub>; add. oculus videntis Rδ; add.  
oculus videntis et polus meridionalis Oξ; add. polus australis Bε Pμ Pρ; add. polus australis vel  
oculus videntis Po Wι; add. polus meridionalis Vβ; add. polus meridionalis vel oculus Pυ<sub>2</sub>; add.  
polus meridionalis vel oculus videntis Mλ; add. image of head/shoulders looking down through the pole  
Pυ<sub>1</sub> B] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε  
Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub>  
Wι Xβ; om. Sκ; add. polus septentrionalis Bε Eη Oτ(later hand) Pυ<sub>1</sub>; add. polus septentrionalis  
contingens planum Mλ Pυ<sub>2</sub>; add. polus septentrionalis in plano contingens Pμ Po Vβ Wι; add.  
septentrionalis Pρ; add. [illeg.] Mρ C] Bγ Bε Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ  
Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rε  
Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; illeg. Eη; D Rδ D] Bγ Bε Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε  
Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ  
Qλ Qμ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; illeg. Eη Nδ Rδ E] Bγ Bε Cη Eβ Eη Eτ Fα Fβ Fζ  
Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ  
Qγ Qδ Qλ Qμ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; H Cι Eα Pδ Rδ F] Bγ Bε Cη Eβ Eτ Fα Fβ  
Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub>  
Qβ Qγ Qδ Qλ Qμ Rε Sδ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; om. Eη; G Cι Eα Pδ Rδ Sκ G] Bγ Bε Cη  
Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pλ Pμ Po  
Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; F Cι Eα Pδ Rδ H] Bγ  
Bε Cη Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pλ  
Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; illeg. Rδ; E Cι Eα Pδ  
M] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ  
Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub>  
Wι Xβ; add. diameter Capricorni Pυ<sub>1</sub> N] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη  
Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ  
Rδ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; add. Capricorni Pυ<sub>1</sub> P] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα  
Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mσ Mυ Nδ Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub>  
Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Sκ Tδ Vβ Vθ Vι Wβ Wε<sub>1</sub> Wι Xβ; add. diameter equinoctialis Pυ<sub>1</sub>  
X] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ Mν Mo Mρ Mυ Nδ Nε Oζ Oξ Oτ  
Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ<sub>1</sub> Pυ<sub>2</sub> Qβ Qγ Qδ Qλ Rδ Rε Sδ Sκ Tδ Vβ Vι Wβ Wι Xβ; om. Qμ; Q

<sup>8</sup> The diagrams in ms Eδ are unrelated to the text.

Mσ Vθ Wε<sub>1</sub>; *add.* equinocialis Pv<sub>1</sub> γ] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη  
 Mλ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pv<sub>1</sub> Pv<sub>2</sub> Qβ Qγ Qδ Qλ Rδ Rε Sδ  
 Tδ Vβ Vι Wβ Wι Xβ; *om.* Qμ Sκ; v Mσ Vθ Wε<sub>1</sub> z] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε  
 Lη Mδ Mη Mλ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pv<sub>1</sub> Pv<sub>2</sub> Qβ Qγ Qδ  
 Qλ Qμ Rε Sδ Sκ Tδ Vβ Vι Wβ Wι Xβ; R Rδ; S Mσ Vθ Wε<sub>1</sub>; *add.* diameter Cancri Pv<sub>1</sub> *add.* L]  
 Cη Eβ Eη Fα Lε Lη Mδ Mο Mρ Nδ Oζ Oξ Oτ Oυ Pα Pρ Qβ Qγ Qμ Tδ; *add.* s Bε *add.* T] Fβ  
 Mλ Mν Mυ Pα Pμ Pο Pτ Pv<sub>2</sub> Qβ Qλ Vι Wβ; c Sκ; e Xβ

[Zodiacal bands]<sup>9</sup>

*om.* Cι Eα Mσ Oξ Pγ Pδ Pv<sub>1</sub> Rε Sκ Vθ Wε<sub>1</sub>; *bands with names of the signs* Bγ Bε Cη Eβ Eη Eτ Fα Fζ  
 Lγ Lε Lη Mδ Mη Mλ Mν Mο Mρ Oζ Oτ Oυ Pα Pλ Pμ Pο Pρ Pv<sub>2</sub> Qβ Qγ Qδ Qλ Qμ Tδ Vβ Wβ Wι;  
*bands but no names* Mυ Nε Pτ Rδ Sδ Vι Xβ; *bands with Leo | Libra | Sagittarius only* Fβ

## [Other information]

GF] *add.* tropicus Capricorni Bε Cη Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Mη Mν Mο Mρ Nε Oζ Oξ Oτ Pα Pλ  
 Pμ Pο Pρ Pτ Pv<sub>2</sub> Qγ Qδ Qλ Qμ Sδ Sκ Tδ Vβ Vι Wβ Wι Xβ; *add.* Capricorni Lη Mδ Mσ Vθ Wε<sub>1</sub>  
 EH] *add.* tropicus Cancri Bε Cη Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Mδ Mη Mν Mο Mρ Nε Oζ Oξ Oτ  
 Pα Pλ Pμ Pο Pρ Pτ Pv<sub>2</sub> Qγ Qδ Qλ Qμ Sδ Sκ Tδ Vβ Vι Wβ Wι Xβ; *add.* Cancri Lη Mσ Vθ Wε<sub>1</sub>  
 CD] *add.* equinoctialis Bε Eβ Eτ Fα Fβ Fζ Lγ Lε Mν Mο Mσ Nε Oζ Oξ Oτ Pα Pλ Pο Qλ Sδ Vβ Vθ  
 Wε<sub>1</sub> Wι; *add.* equator diei Pρ EF] *add.* ecliptica Mσ Oξ Wε<sub>1</sub>; *add.* ecliptica Pρ; *add.* tropicus  
 Arietis Sκ MBN] *add.* planum Cι Pρ Rδ Wε<sub>1</sub>

## [Projected circles in the plane]

*add.* Cancri Mσ Vθ; *add.* circulus Cancri Wε<sub>1</sub>; *add.* circulus Cancri in plano Bγ; *add.* tropicus Cancri  
 in plano Oξ *add.* circulus Capricorni Mσ Vθ Wε<sub>1</sub>; *add.* circulus Capricorni in plano Bγ; *add.*  
 tropicus Capricorni in plano Oξ *add.* circulus equinoctialis Wε<sub>1</sub>; *add.* circulus equinoctialis  
 vel Arietis et Libre in plano Bγ; *add.* equator Cη; *add.* equinoctialis Mσ Vθ; *add.* equinoctialis in  
 plano Oξ *add.* ecliptica Mσ Wε<sub>1</sub>; *add.* eclipticus in plano Vθ Oξ; *add.* zodiacus Cη; *add.*  
 zodyacus in plano Bγ

*add. on circle of Capricorn:* K, L Mσ Wε<sub>1</sub>; Z, L Vθ *add. on equator:* O Mσ Vθ Wε<sub>1</sub> *add. on*  
*circle of Cancer:* T, R Mσ Vθ Wε<sub>1</sub> *add. as centre of circle of the ecliptic:* X Mσ Vθ Wε<sub>1</sub> *circle of*  
*ecliptic in plane] om.* Rε

<sup>9</sup> Note: in most diagrams the zodiacal names, Cancer to Sagittarius, read from left to right along the bottom band, and Capricorn to Gemini read from right to left along the top band and are also written upside down. In a few cases Capricorn to Gemini are written from right to left, but right-side up. In ms Nε the bands are drawn but they are not divided into signs.



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[CAPITULUM 18.]<sup>1</sup> PUNCTI IN SPERA EQUIDISTANTIS ZODIACO IN PLANUM INSCRIPTIO

Si autem cuiuslibet puncti in spera equidistantis ecliptice in planum proicere velimus, sic fiet. Circulus AB transeat per polos mundi, qui sunt A et B, B autem contingens planum; et linea MBN est communis sectio circuli AB et plani. CD est diameter

- 1 *Cap. 18 follows Cap. 20-22 Bκ* Puncti ... inscriptio] *om.* Aα Bκ Cε Eα Eδ Mψ Nα Pγ Xα; Alius modus proiciendi speram in plano Dη; Capitulum. De inscriptione in plano puncti equidistantis zodiaco Fβ(*twice*); Capitulum. De descriptione puncti in spera equidistantis zodiaco in planum Bε; Cuiuslibet puncti in spera equidistantis ecliptice in plano proicere Wι; De alicuius puncti in spera equidistantes ecliptice inscriptione in plano. Cap. Mλ; De proiectione puncti in spera equidistantis ecliptice(*add. interlin. al' zodiaco Vβ*) in plano(*add. interlin. al' planum Vβ*) Pτ Vβ; De punctis equidistantibus ecliptice inscribendis hec est ars Mν; De ymaginatione spere in plano Dγ<sup>2</sup>; Descriptio puncti in spera equidistantis zodiaco in planum Pδ Rδ(*add. etc.*) Wβ(*add. Capitulum*); Proiectio cuiuslibet puncti equidistantis equinoctiali in planum Bγ; Proiectio puncti in spera equidistantis ecliptice(zodiaco Rε) in planum Bθ Pυ Rε Vπ; Proiectio spere in planum Eυ; Puncta (Punctum Pλ) in sphaera equidistantia (equidistantis Pλ) zodiaci in austrum in planum Pλ Pϑ
- in<sub>1</sub>] om.* Nε *in<sub>2</sub> ... inscriptio] om.* Xβ *planum] plano Vψ inscriptio] om.* Pν; descriptio Cι Eζ Mη Nε Pο Pθ Vψ; descripto Qμ; proiectio Cη Eτ; proiectio seu scriptio Mυ Vι
- 2 *autem] om.* Mυ Vι; alicuius Mλ; vero Wε<sub>2</sub> *cuiuslibet] cuius Mη puncti] om.* Mν *in<sub>1</sub>] om.* Eη; *interlin.* Bε *in spera] om.* Mϑ *ecliptice] om.* Aα Qμ; ecliptica Eα; ecliptice Cη Mλ Mφ Sδ *planum] add. circulum Mo Mϑ proicere] eicere Vψ; proicere Eβ Fβ Lε Oξ Oτ Oυ Pθ Pμ Sδ Tδ Xα; proicere Pϑ; prouocere Mδ*
- 2-3 *si ... fiet] om.* Bκ Dγ
- 3 *velimus] verius Mν; volumus Nα Wε<sub>2</sub> sic] si Xα sic fiet] faciemus hoc modo Eδ fiet] fit Eυ; add. Fiat Bε Circulus] ms Lζ restarts AB] om.* Sκ *transeat] transea Pδ; transiens Vβ Wι; transiens corr. to transeat Pτ per] perto Sδ mundi] om.* Bκ Dγ *B<sub>2</sub>] om.* Bκ Cε Dγ Mη *autem] om.* Bκ Dγ Lζ Mλ Nα
- 4 *contingens] contiget Pδ contingens ... est<sub>1</sub>] om.* Sκ *planum] interlin.* Vβ *et<sub>1</sub>] add. in Bθ MBN] BMN Bγ Cη Cι Eδ Eζ Eτ Mη Mν Mψ Nε Qμ Vβ Vπ Wβ Wι; BNM Aα Bθ Eυ; BNMBN Nα; MBV Dη; MN Xα est<sub>1</sub>] om.* Dη Eτ Pγ *communis] add. linea BMN Sκ sectio] centio Pα; sectivo Dγ plani] om.* Mψ *diameter] and elsewhere dyametraler Aα Bθ; and elsewhere dyametrilater Vπ*

<sup>1</sup> Mss Mσ Vθ Wε contain alternate versions of this capitulum; see below, "Appendix 18: Version B" and "Appendix 18: Version C". Ms Wε<sub>2</sub> then contains the standard version of the capitulum (beginning fol. 116<sup>r</sup>) after the alternative versions.

<sup>2</sup> Ms Dγ continues: Capitulum 17 is omitted, and the rest of the capitula are out of order. Capitulum 18 is actually the last capitulum in this manuscript; see the manuscript description in the Introduction.

[CHAPTER 18.] THE INSCRIBING ON A PLANE OF A [CIRCLE]<sup>3</sup> ON A SPHERE PARALLEL TO THE ZODIAC

However, if we wished to project on a plane [the image]<sup>4</sup> of any point [i.e., circle] in the sphere parallel to the ecliptic<sup>5</sup> it will be done thus. Let circle AB pass through the poles of the globe, which are A and B, B, however, touching the plane; and line MBN is the common section of [the plane of] circle AB and the plane [of projection]. CD is the diameter

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<sup>3</sup> The mss read *puncti*, where they should read *circuli*.

<sup>4</sup> There must be some understood noun here in order to explain the genitive construction in the Latin. None is obviously suggested but “image” or “projection” might suffice.

<sup>5</sup> This is also treated in Ptolemy’s *Planisphaerium*; see *Opera Omnia, 2: Opera astronomia minora*, ed. J. L. Heiberg (Leipzig: Teubner, 1907), pp. 252-258. [J.S.]

5 equatoris, EF diameter zodiaci, GH diameter unius ex equidistantibus zodiaco eorum  
 qui sunt ad partem septentrionis, KL diameter alterius equidistantis zodiaco qui est ad  
 partem meridiei. Unde uterque duorum arcuum CE et DF est declinatio zodiaci ab  
 equatore; duo autem arcus CG et DH sunt due maxime declinationes circuli cuius  
 diameter GH ab equatore. Eodemque modo duo arcus CK et DL sunt due maxime  
 10 declinationes circuli cuius diameter KL ab equatore. Transeant ergo lineae AKOM, ACP,

- 5 equatoris ... diameter<sub>1</sub>] *om.* Lβ EF] CF Eτ Sκ EF ... diameter<sub>2</sub>] *om.* Bθ  
 zodiaci] *and elsewhere* zodyaci Bγ Fβ Wι zodiaci GH diameter] *om.* Vπ Wβ  
 GH] *om.* Rδ unius] *om.* Dη; huius Nα ex] *om.* Cι Lβ Rε  
 equidistantibus] *add.* a Aα Bθ Eυ Qδ eorum] *om.* Aα Bγ Bκ Cε Dγ Eδ Eζ Eυ Lζ  
 Mη Mλ Mν Nε Pο Pτ Pυ Qδ Qμ Rε Sκ Vβ Vπ Wβ Wι
- 5-6 eorum ... zodiaco] *marg.* Mψ
- 6 qui sunt] *marg.* Eζ ad] *illeg.* Rδ ad partem] *om.* Vψ equidistantis]  
 distantis Pν; *add.* a Bκ Lζ est] sit Rε
- 6-7 septentrionalis ... partem] *om.* Mν
- 7 meridiei] meridionalem Rε Xα Unde] *om.* Vψ duorum] *om.* Aα Vπ; 2 *some*;  
 eorum Xβ CE] *illeg.* Xβ; C<sup>e</sup> Bγ Cη; C Aα Bθ Eτ Eυ Mν Sκ Vπ; CD Eδ Mδ; CT Mυ; ET  
 Mφ; RC Pν DF] *corr. from* DE Pο; DS Nα; DT Eζ est] *om.* Qμ; et est de Cε; et sunt  
 Xα; ex Bθ Vπ ab] *om.* Pγ
- 8 duo] 2 *some* CG] GC *some*; EG Cη Qδ; G Wα; GE Bε Fβ Fζ Lβ Lγ Pα Pμ Qβ Sδ; GT  
 Oυ(*add. in marg.* al' GC); OG Pγ Pτ; TG Rδ DH] AG Mν due] *om.* Nδ; 2 *some*  
 maxime] *add.* solis Mψ circuli] *om.* Nα cuius] cuiuslibet Aα
- 9 diameter] dyametri Aα; *add.* est Dη GH] *om.* Eδ; H Cε; et H est Nα; *add.* declinat Rε;  
*add. interlin.* est Bγ equatore] *add.* diei Dη Mψ; *add.* Eodem modo duo arcus CG et DH  
 sunt due maxime declinationes circuli cuius dyameter GH ab equatore Xα  
 Eodemque] Eodem Aα Eυ Mλ Pτ Wα duo] 2 *some*; *om.* Oζ Pλ; et Bε; *add.*  
 autem Xβ CK] *corr. from* DK Pο; EK Qδ; EL Eδ DL] DS Aα Bθ Eυ; XOL Eδ  
 sunt] est Eδ due] 2 *some*; *om.* Bε Eη Oζ Pρ Xα; et Mυ maxime] *add.* solis  
 Mψ
- 9-10 GH ... diameter] *om.* Pγ Sκ
- 10 ergo] *add.* due Bθ Vπ cuius] circuli Xα cuiuslibet Aα diameter] dyametri Aα  
 KL] *om.* Bε Eη Qλ Wα; KGH Rδ; OL Fβ; *add.* declinat Rε; *add.* est Dη equatore]  
*add.* diei Pτ AKOM] ABOM Cε; AKLOM M O A Lβ; AVEM Eδ; NKOM Nα; OM Mν  
 ACP] *rep.* Pδ; *corr. from* AC Pο; AQV Eδ; ATB Rδ; ATP Eζ
- 10-11 AKOM ... ALSN] AQOM, ACPA ET QAGRIAH ET Y A D R A F C N A L V F S Aα; AK OM AC PA EZ QA  
 GIR AB ZY AD YX AP TU AL VS Qδ

of the equator, EF the diameter of the zodiac,<sup>6</sup> GH the diameter of one [of the circles] parallel to the zodiac of those which are towards the region of the north, KL the diameter of another parallel to the zodiac which is towards the region of the south. Hence each of the two arcs CE and DF is the declination of the zodiac from the equator; moreover the two arcs CG and DH are the two extreme<sup>7</sup> declinations from the equator of the circle whose diameter [is] GH. Similarly the two arcs CK et DL are the two extreme declinations from the equator of the circle whose diameter [is] KL. Therefore, let the lines AKOM, ACP,

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<sup>6</sup> More correctly (here and throughout), the ecliptic. In these last chapters (17 to 22) the author is less exact in his terminology.

<sup>7</sup> In this case, and in line 9, *maxime* cannot mean “greatest” since one of the arcs in each case (DH here, and CK in line 9) is actually the minimum declination of the parallel circle. Hence I have read *maxime* as the “extremes” or the points of the greatest and the least declinations.

AEZQ, AGIR, AHZ'Y, ADX, AFTV, ALSN.

Eritque PX diameter equatoris qui transibit per A; nam cum sit ei equalis et A, erit quoque PB equalis BA. Iterum ZV erit diameter zodiaci qui etiam transibit per A quoniam ipse dividit equatorem per equalia. Et IZ' erit diameter in plano circuli cuius GH est diameter in spera. At vero MN erit diameter in plano circuli cuius KL est diameter in

- 11 AEZQ] A et Q Bθ Ev Vπ; ACZQ Eδ; AE et Q Nα; AEQ Mq Pq; AERQ Rδ Wβ; AE ZQ Pλ; AT ZQ Lβ AGIR] ACZI Cε; AG et Pλ; AGI et Nα; AGIT Pγ; AGN Bθ Ev Pq Vπ; AGU Cι; AGZR Dγ Eδ Lζ Mλ Mv Mo Pτ Pv; GIR Wε<sub>2</sub> AHZ'Y] ABZY Xα; AH et P Pλ; AHRY Rδ; AHTY Bγ; AHYZ Wε<sub>2</sub>; AKRI Nα ADX] ADR Bθ Ev Vπ Wβ; ADC Nα; ADLX Mq; ADY Lβ AFTV] *illeg.* Mu; AFCB Eτ Pτ; AFCN Bθ Ev; AFCV Bγ Eδ Eζ Mη Mv Mo Pv Vι Vπ Wε<sub>2</sub>; AFQV Wι; AFTN Eα; AFTO Mλ; AFXV Mψ; ASTV Wα; ECTB Sk ALSN] *illeg.* Mu; AFSV Eτ; AILV Wβ; AL et N Pq; ALBN Nα; ALNS Bθ Ev Vπ; ALSC Vι; ALSTI Mφ; ALSV Lβ Qβ Sk; ALTV ALSN Pλ; IASV Eζ
- 12 eritque] et erit Mλ PX] *corr. from* punctus Bγ; pars Dγ; PS Bκ Lζ; per X Lβ Xβ; punctus Aα Bθ Cε Cη Eδ Eζ Eτ Ev Mη Mv Pγ Po Qμ Sk Vπ Wι; PVS Pv; PY Wβ; PYS Mo diameter] diametri Dγ; *add. interlin.* circuli in plano scilicet Oτ(*later hand*) qui] *om.* Qλ; et Qγ transibit] sibit Wα nam] *add. interlin.* prohat hoc Oτ(*later hand*) cum ... erit] cumlibet(?) IA Sk; quolibet CI equalis IA ei Eτ sit] *om.* Cε ei] CB Xα et A erit] A ei Cε; A IA Nα; CA *or* EA erit Mu; CB erit Xα; et A ei Eδ Ne; et IA ei Eδ; et IA erit Bγ; ex B scilicet BP et BA est Eα; ex erit Eα; IA ei Bθ Dγ Po Eζ Lζ Mλ Mv Pτ Pv Qμ Vβ Wβ; LA ei Aα Ev Vπ; TD et AB erit Xα A] *add. vel* ZA Pδ
- 12-13 cum ... BA] cuiuslibet ei ϕ equalis KL ei quoque PA equalis KL ei quoque PB equalis NA Pγ ei ... PB] *om.* Pq et ... equalis] *om.* Pλ erit quoque] eritque Mφ Rδ Wε<sub>2</sub>
- 13 quoque] *om.* Nδ; *corr. from* quousque Fζ PB] BA Vπ; PA Bθ Cε Cη Dη Eδ Eζ Ev Mη Mλ Mv Mψ Nα Po Pτ Pv Qμ Re Sk Vβ Wβ Wι; PH Bκ Dγ Lζ BA] *illeg.* Sk; BH Dγ; BQ Bε; NA Nα; VA Cη Mψ Re Vβ Wβ; *add.* equalis BA Bθ; *add.* P MN Cι Iterum] Idem *some*; Item *some* ZV] AB Cε; et B Ev Vπ; RN Nα Rδ; ZB Aα Bθ Pλ Pq Qμ ; ZN Cη Sk; ZT Eα erit] *om.* Wι diameter] *add.* KL Pμ etiam] *om.* Vπ quoniam] qui Nα
- 14 ipse] *om.* Vπ dividit] *add.* per Cη per] *add.* alia Pγ; *add.* aliqua Aα Bγ Bθ Cη Sk Vβ Vπ Wι Et IZ' erit] C E et erit et erit Nα; 7 Z 7 erit [= et Z et erit?] Qμ IZ'] *om.* Tδ; IT *corr. from* et Bγ; A et Z Cε; IR Rδ; XZ Eδ; YZ Mδ Qδ; Z Vβ; ZZ Aα Bθ Bκ Cη Dγ Eτ Ev Mη Mλ Mv Pλ Pq Sk Vπ Wι; ZZ *corr. to* ZX Lζ erit] est eius Mv; *add.* me Pv in ... cuius] *om.* Nδ plano circuli] planas circulus Nα circuli] circulo Mφ cuius] *add.* dyiameter Mδ GH] HGH Eδ; KL *corr. in marg. to* GH Oτ
- 14-15 plano ... in<sub>1</sub>] *om.* Nε plano ... in<sub>2</sub>] *om.* Pγ cuius ... circuli] *marg.* Bγ GH ... cuius] *om.* Aα Cη Eτ Sk Wι
- 15 in<sub>1</sub>] *add.* ipsa Qδ spera ... in<sub>2</sub>] *om.* Pv At] *ac some*; A C Nα; A.T Vψ; et *some*; aut Pτ vero] *om.* Re MN] MA Xα erit] eritque Mη plano ... in<sub>3</sub>] *om.* Ne KL] HL Eδ in<sub>3</sub>] *add.* plano Xβ
- 15-16 At ... spera] *om.* Bθ

AEZQ, AGIR, AHZ'Y,<sup>8</sup> ADX, AFTV, ALSN cross.

And PX will be the diameter of the equator which will pass through A; for since [the angle] is equal at it [i.e., P] and A, PB will also be equal to BA. Again ZV will be the diameter of the zodiac which will also pass through A since this very one [i.e., the zodiac] divides the equator in half. And IZ' will be the diameter in the plane of the circle whose diameter is GH in the sphere. Whereas on the other hand MN will be the diameter in the plane of the circle whose diameter is KL in

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<sup>8</sup> Two points are labelled "Z" in this chapter. To distinguish between them some manuscripts use two forms of the letter, i.e., the regular "Z" and an earlier form which looks like "Ç". I have chosen to simply label the second one as "Z'", i.e., Z-prime.

spera; eritque etiam arcus PQ similis arcui CE, uterque enim subtenditur angulo PAQ in circumferentia utriusque circuli existente; et PR est similis arcui CG propter eandem causam, et PO similis CK. Eodemque modo et propter eandem causam arcus XS erit similis DL, et XY similis DH.

20 Cum igitur aliquem circulum equidistantem zodiaco velis depingere in plano, si fuerit meridionalis a zodiaco, sume in equatore a puncto X versus A arcum unum

16 eritque] erit Bε Eα Eβ Eζ Fα Fβ Lγ Lε Lη Mδ Oζ Oξ Oτ Oυ Pα Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Wα Wε<sub>2</sub>; eruntque Bγ Dγ; que Cε; *illeg.* Mυ etiam] *om.* Aα Bθ Cε Eα Eυ Mν Vπ Vψ; que Qδ arcus] *om.* Eυ Pα PQ] APQ Pτ; CP Wι; PBA or PHA Nα; PG Cε; *add.* per Mρ CE] DE Pγ; TE Rδ enim] IZ Aα Bθ Eυ Vπ subtenditur] *corr. from* subtendiatur Bγ; sub cum dicitur Sκ; sub dicitur Cη; subspenditur Cε angulo] *om.* Aα Bθ Eυ Pρ Vπ Wι; arcui Cε Cη Dγ Eδ Eζ Eτ Lζ Mη Mλ Mν Mο Pγ Pτ Pυ Qμ Sκ Vβ; *corr. from* arcui Bγ PAQ] PACI(?) Cε; PACR Mο; PIQ Pγ Sκ; PLQ Pα

17 utriusque] *om.* Fβ circuli] *om.* Eτ Pγ Sκ; oculi Aα; *add.* in circumferentia utriusque circuli Tδ existente] existens Bε Cι Eα Eβ Eη Fα Fβ Lγ Lε Lβ Lη Mδ Mυ Mφ Mψ Oζ Oξ Oτ Oυ Pα Pδ Pθ Pλ Pμ Pν Pρ Qβ Qδ Qγ Qλ Tδ Vι Vψ Wα Wε<sub>2</sub> Xα Xβ; existenti Bγ Cη Cε Dγ Eδ Eζ Eτ Lζ Mη Mλ Mν Pγ Pο Pτ Pυ Sδ Sκ Vβ Wβ; existentis Dη Mο Nα et] etiam Qδ PR] per Pγ; PI Sκ; PN Mψ Nε; PR et PV Eδ; PZ Wβ est] *om.* Eξ; ex Dγ arcui] *om.* Aα Bγ Cη Eδ Eζ Eτ Eυ Mλ Mν Pτ Pυ Qμ Rε Sκ Vβ Vπ Wβ Wι; est Bθ CG] GC *some*; GO Fβ; GT Aα Bγ Bε Cε Cη Cι Eβ Eδ Eζ Eη Eτ Eυ Lβ Lγ Mδ Mν Oτ Pλ Pο Pτ Qγ Qμ Rδ Wι

17-18 CG ... similis,] *om.* Nα Pγ

18 et<sub>1</sub> ... causam<sub>2</sub>] *om.* Cε Nε PO] *om.* Wβ; PPO Mν similis] *om.* Rε CK] EK Pυ; TK Rδ Eodemque] *om.* Mυ; Eodem Eα Eβ Eη Lβ Mν Pν Pρ Pτ Qγ Qλ Tδ Wα; Eodem quoque Eζ propter] *om.* Eζ causam<sub>2</sub>] *add.* et pone similis Pγ arcus] *om.* Mψ XS] ES Pγ; XB Mψ

19 DL] DQ Wι; DS Eυ; OL Wβ XY] ex Y Mη; GY Eβ; XI Mυ; XV Eυ; XZ Eα; ZY Eδ

19-20 similis ... zodiaco] *om.* Pγ

20 Cum igitur] Si Cε Dη igitur] *om.* Eυ Mν Mο; autem Pθ aliquem] aliud Wβ circulum] *om.* Aα Bγ Bθ Bκ Cη Dγ Eδ Eζ Eτ Eυ Lζ Mλ Mν Nα Nε Pο Pτ Pυ Qμ Vπ Wι; arcum Rε equidistantem] distantem Wι velis] vis *many* in] *om.* Nε

21 fuerit] fuit Lβ equatore] *add.* et illius circuli Aα a<sub>2</sub>] *om.* Eυ A] *om.* Eζ Fβ Lβ Wε<sub>2</sub>; K Mψ A arcum] AR. Cum Pρ arcum] punctum Cε unum] unum unum Cε

21-22 versus ... ex] *om.* Dγ



the sphere; and in addition arc PQ will be similar to arc CE, for each is subtended by angle PAQ standing on the circumference of each circle; and PR is similar to arc CG for the same reason, and PO is similar to CK. And in the same way, and for the same reason,<sup>9</sup> arc XS will be similar to DL, and XY similar to DH.

When therefore you wish to plot on a plane any circle parallel to the zodiac, if it be south of the zodiac, assume on the equator from point X towards A a single arc

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<sup>9</sup> It is possible, but I think not probable, that “in the same way” and even “for the same reason” could be part of the previous sentence.

25 equalem arcui composito ex declinatione zodiaci ab equatore, et illius circuli pingendi a zodiaco, ut est hic arcus XS qui componitur ex arcu XT, qui est declinatio zodiaci ab equatore, et arcu TS qui est declinatio illius a zodiaco. Postea in parte opposita, subtrahe declinationem zodiaci ab equatore de declinatione huius a zodiaco, si potes, ut hic arcum PQ de arcu OQ et residuum quod est PO sume a puncto P versus A. Quod si non potes subtrahere declinationem zodiaci ab equatore de declinatione huius a zodiaco, fac

- 22 pingendi] *om.* Oζ ΠΛ PQ; depingendi Qδ; *corr. from* periungenda Wε<sub>2</sub> arcui] *om.* ΠΛ PQ composito] *add. and del.* equalem Bγ ex] *om.* Vπ declinatione] *corr. from* delectatione Bγ
- 23 ut] *om.* Nε; et PQ; qui Nδ est] *add.* n [enim?] Vπ XS] ex S Mη; NL Nα; X Cε Eα; XC Σκ; XG Pγ XI] ET Eη; QT Wβ; XC Mv Nα PQ; XX Bθ; *corr. from* TB Mψ qui] cui Cε
- 24 equatore] *add.* et illius circuli pingendi a zodiaco ut est hic arcus XS componitur ex arcu XT qui est declinatio zodiaci ab equatore Xα equatore et arcu] arcui et equatore Nε TS] BR Mψ; ST Aα Eζ Mη Qμ; TZ Eα qui ... subtrahe] que trahe Xα illius] eius Qδ; *add. in marg.* scilicet circuli equidistantis quem vis pingere Ov illius a zodiaco] dedinatio zodiaci illius Vπ a] *om.* Bθ Lβ Pδ in] *om.* ΠΛ in parte opposita] *om.* Aα Bγ Bθ Bκ Cε Dγ Eδ Eζ Ev Lζ Mη ΜΛ Mv Mψ Nε Po Pτ Pv Qμ Re Vβ Vπ Wβ subtrahe] *add.* CE Eτ
- 24-25 et arcu ... equatore] *om.* Cη Eτ Pγ Wι; *marg.* Bγ Postea ... zodiaco] *om.* Nα
- 25 zodiaci] illius Mψ de] *om.* Eα Mδ Mv Pγ Pθ PQ; et Eζ huius] *add. in marg.* scilicet circuli pingendi Ov a] *om.* Wβ potes] pones *corr. to* potes Bθ; potest Mδ hic] *om.* Mv Mφ Vι Wα Wε<sub>2</sub>
- 26 arcum] *om.* Eδ Eζ Eτ Fα Mv Pγ Qμ Re Wβ Wι; *interlin.* Bγ Po PQ] APQ MQ PQ de arcu OQ] PQEL Eα; XQ Mψ OQ] CQ Qβ; EQ Fβ Lγ Lε Mψ Pα Pμ Qδ Qλ Sδ Tδ est] *om.* Nα PO] PEL Eα residuum] siduum Qβ sume] *om.* Eτ P] *om.* Cη Dη Eτ Pγ Wι; *interlin.* Bγ; B Vπ P versus A] *om.* Cε; A Mo
- 26-27 si non potes] *om.* Eτ Pγ; *add.* <sup>va</sup>ut hic arcum PQ de arcu OQ<sup>cat</sup> Nα
- 27 subtrahere] extrahere Xβ declinationem] *add.* et Eβ Eη Oξ zodiaci] *add.* et Bε Eη Lβ Lε Lη Mδ Qγ Qδ Qλ Wα ab] *om.* Mv de] *om.* Cι Eη Mδ huius] eius Nα Re Vβ; *add.* circuli Bε(*interlin.*) Lβ Oζ Oτ Ov(*marg.*) ΠΛ Pq fac] fiat Mo
- 27-28 fac ... subtrahe] si potes, ut hic arcum PQ de arcu OQ et residuum quod est PO sume a puncto P versus A. Quod si non potes subtrahere declinationem zodiaci et ab equatore [*illeg.*] Eη fac ... de] *om.* Pγ fac ... zodiaco] *marg.* Bγ; *om.* Cη Eτ Ev Mv Nε Wι
- 27-29 fac ... equatore] *marg.* Bε

equal to an arc composed of the declination of the zodiac from the equator, and [the declination]<sup>10</sup> of that circle to be drawn from the zodiac, as here it is arc XS which is composed of arc XT, which is the declination of the zodiac from the equator, and of arc TS which is the declination of that [circle] from the zodiac. Then, on the other side, subtract the declination of the zodiac from the equator from the declination of this [circle] from the zodiac, if you can, as here arc PQ from arc OQ and assume the remainder which is PO from point P towards A. But if you cannot subtract the declination of the zodiac from the equator from the declination of this [circle] from the zodiac, do

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<sup>10</sup> When speaking of circles parallel to the zodiac/ecliptic and of their distance from the ecliptic, one should really use the term “latitude” to distinguish it from the modern concept of declination (that is, vis-à-vis the celestial equator). However, I have kept the term “declination” in this chapter, to reflect the Latin.

30 e converso scilicet subtrahe declinationem huius a zodiaco de declinatione zodiaci ab equatore, et residuum sume a puncto P, non versus A sed versus partem oppositam; protrahe itaque AS et AO usque secent diametrum MBN in punctis M et N, eritque MN diameter circuli qui queritur.

Si autem ipse fuerit septentrionalis ab orbe signorum, sume declinationem compositam sub P in parte opposita, et differentiam duarum declinationum sub X si

28 e converso] Lβ Mδ Mv Mφ Vι Wψ Wε<sub>2</sub>; e 9o *most* scilicet] *om.* Pq; videlicet Bκ Dγ Lζ huius] *om.* Mδ Nδ; EQ Mψ; *add.* circuli Lβ Oζ Oτ Ov(*marg.*) Pλ Pq zodiaco] Z Mψ de] *om.* Aα Eζ Mη Pθ Sκ; *interlin.* Mδ; a Mλ

29 residuum] *om.* Mv Mφ Qλ Vι Wα Wε<sub>2</sub> sume] *om.* Mδ Nδ; *add.* non Eα puncto] *add.* versus Pq P] *om.* Xα; x Mψ P non] P Mv Mφ Qδ Vι Wε<sub>2</sub>; PN or PV Eβ Fα Fβ Fζ Lε Lγ Lη Nε Oξ Ov Pα Pμ Pν Qβ Qγ Qλ Sδ Tδ Wα; PV *corr.* to P non Oτ; P ut Rδ; PV non Pλ; per v Lβ; v Mδ Nδ non ... sed] *om.* Xβ sed versus] *om.* Bε Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mq Mv Mφ Nδ Oξ Ov Pα Pμ Pν Pq Qβ Qγ Qδ Qλ Sδ Tδ Vι Wα Wε<sub>2</sub>; *add.* *interlin.* Oτ(*later hand*) oppositum] *add.* A Xβ

30 protrahe] PRHT Mq; subtrahe Xα; *add.* partem Eζ protrahe itaque] *om.* Mδ Nδ AS] AB or AL Mψ; AC Nα; ALS Rε; has Pq AO] AC Pγ; ALO Rε; OO Mψ usque] *add.* quo Bκ Dγ Eα Mλ Mo Mq Mψ Nα Pv Rδ Rε Xα; *add.* quoque Vψ secent] recent Ev Pγ; sescent Eζ MBN] ZNBN Vψ in] a Mη punctis] puncto Aα Bγ Dη Ev Qμ Vπ M] *om.* Cε; CO Wβ eritque MN] *om.* Mδ; que OM Pγ MN] in N Wβ; OM Bθ Bκ Cε Dγ Eα Eζ Et Lζ Mη Mv Mo Pτ Pv Vπ Wι; OMN Qδ; ON Ev

31 qui] quod Cη Pq Wι

32 ipse] *om.* Cε Dη fuerit] *om.* Eα septentrionalis] at<sup>1</sup>ol' Qλ signorum] *add.* *interlin.* id est zodiaco Oτ(*later hand*); *add.* tunc Pq sume] summe Aα; *add.* de Mv

33 compositam] *om.* Mv; oppositam Bθ Eα Nα Wι; postpositam Pγ compositam ... declinationum] *om.* Ev sub P] *om.* Mδ Nδ in parte opposita] *om.* Aα Bγ Bθ Bκ Cε Cη Dγ Eδ Eζ Et Lζ Mη Mλ Mv Mo Mψ Nα Nε Pγ Pτ Pv Qμ Rε Vπ Wβ Wι; *interlin.* Po opposita] oppositam or opposita M Cι et] secundum Wε<sub>2</sub> et differentiam] A et D M Xβ differentiam] *om.* Xα; *illeg.* Mψ duarum] 2 *some*; duarum duarum Cε Pq declinationum] *om.* Eα; *add.* duarum Xα x] decem Mη; R Wβ si] et Nα; *add.* in *marg.* Huic littere que dicit “sub decem si” continuat littera qui est in principio columne secundi folii quo littera sic incipit “declinatio zodiaci ab equatore” et est ibi consimilis crux. ✕ Mη<sup>11</sup>

<sup>11</sup> In ms Mη folios 43v-44r contain a star list; the text continues on fol. 44v, marked with ✕. In the ms, *littere* and *littera* are written as *lictete* and *licteta*.

the opposite, that is, subtract the declination of this [circle] from the zodiac from the declination of the zodiac from the equator, and assume the remainder from point P, not toward A but toward the opposite direction; and so extend AS and AO until they cut diameter MBN at points M and N, and MN will be the diameter of the circle which is sought.

If however this were to be north from the circle of signs, assume the combined declination below P on the opposite side, and the difference of the two declinations below X if

35 declinatio zodiaci ab equatore est minor, aut super si est maior, et protrahe lineas ab A ex diametro MBN et scindent diametrum IZ' circuli qui queritur, ut patet in hac figura.

- 34 zodiaci] *om.* M $\rho$  ab equatore] *om.* W $\epsilon_2$  minor] bor M $\psi$  super] supra B $\kappa$  L $\epsilon$  si] eum E $\alpha$  X $\alpha$ ; sei S $\delta$ ; *add. interlin.* scilicet declinatio V $\beta$  protrahe] subtrahe C $\eta$  E $\delta$  E $\zeta$  E $\tau$  M $\eta$  M $\nu$  P $\gamma$  Q $\mu$  W $\iota$ ; *corr. from* subtrahe B $\gamma$  P $\rho$  lineas] linea E $\nu$  ab A] AB et KL V $\psi$  A] equatore C $\epsilon$ ; *add.* id est F $\beta$ ; *add.* que A $\alpha$  B $\kappa$  L $\zeta$  M $\lambda$  V $\beta$ ; *add.* que est N $\alpha$
- 35 ex diametro] *corr. from* que est diametro P $\rho$ ; que est diametrum C $\eta$  E $\tau$  P $\gamma$ ; que est diametro B $\theta$  D $\gamma$  E $\alpha$  E $\delta$  E $\zeta$  E $\nu$  M $\eta$  M $\nu$  P $\tau$  P $\nu$  Q $\mu$  V $\pi$  W $\iota$  X $\alpha$ ; *add.* tabii P $\mu$  MBN] BMN M $\psi$ ; in BN F $\beta$ ; in MBN P $\lambda$ ; MMBN P $\rho$  et scindent] et cindent L $\beta$  L $\epsilon$  L $\eta$  O $\xi$  P $\mu$  P $\nu$  Q $\beta$  Q $\gamma$  Q $\lambda$  S $\delta$ ; descindent M $\rho$ ; rescindent B $\gamma$  C $\eta$  E $\alpha$  E $\tau$  P $\gamma$  B $\theta$  D $\gamma$  E $\delta$  E $\zeta$  E $\nu$  E $\zeta$  M $\lambda$  M $\nu$  P $\rho$  P $\tau$  P $\nu$  Q $\mu$  R $\epsilon$  V $\beta$  V $\pi$  W $\iota$ ; recindet A $\alpha$  Q $\delta$  X $\alpha$ ; rescindit M $\eta$ ; scindet C $\epsilon$  IZ'] *om.* A $\alpha$  B $\theta$  B $\kappa$  C $\epsilon$  E $\nu$  L $\zeta$  M $\eta$  M $\nu$  M $\rho$  V $\iota$  V $\pi$  W $\epsilon_2$ ; duo / 2 M $\delta$  N $\delta$ (et?) P $\alpha$ ; et etiam P $\nu$ ; et Z E $\delta$  M $\nu$ ; IR R $\delta$ ; IT B $\gamma$ ; RI N $\alpha$ ; secundum Q $\delta$ ; XZ P $\tau$ ; Z F $\alpha$  F $\beta$  L $\beta$  L $\eta$  V $\beta$ ; ZIZ M $\psi$ ; ZZ / ZZ / ZZ C $\eta$  E $\tau$  M $\lambda$  P $\gamma$ ; *add. interlin.* [illeg.] P $\rho$  qui] *om.* N $\epsilon$  qui ... figura] *illeg.* M $\psi$  ut patet] utque P $\lambda$  V $\pi$ ; ut sufficient W $\epsilon_2$ ; videlicet R $\delta$  patet] *illeg.* W $\epsilon_2$ ; satis B $\gamma$  C $\eta$  E $\tau$ ; satis patet P $\gamma$  V $\beta$  W $\iota$  patet ... figura] est hic D $\gamma$  L $\zeta$ ; in figura apparet ue sequitur B $\kappa$ ; supra patet M $\lambda$ ; utque figura V $\iota$  hac] *om.* B $\gamma$  C $\epsilon$  C $\eta$  E $\alpha$  E $\delta$  E $\zeta$  E $\tau$  M $\nu$  M $\nu$  M $\rho$  N $\alpha$  O $\zeta$  P $\gamma$  P $\rho$  Q $\lambda$  V $\beta$  W $\alpha$  W $\beta$  W $\epsilon_2$  W $\iota$  X $\alpha$  X $\beta$ ; sequenti D $\eta$ ; subscripta P $\tau$  R $\epsilon$ ; suprascripta P $\nu$ ; *add.* presenti F $\beta$  figura]<sup>12</sup> *ms* L $\zeta$  skips to Cap. 20; in *ms* B $\kappa$  Cap. 18 is preceded by Cap. 20-22 and Cap. 19 is omitted; *mss* M $\psi$  W $\iota$  end; *add.* etc. R $\delta$ ; *add.* et sequenti P $\beta$ ; *add.* precedentii P $\rho$  Q $\delta$  V $\beta$ ; *add.* presenti E $\nu$  P $\rho$ ; *add.* sequenti E $\alpha$  E $\eta$  E $\tau$  Q $\gamma$ ; *add.* Explicit A $\alpha$  (*ms* A $\alpha$  ends); *add.* Explicit imaginatio projectionis spere in planum etc. R $\delta$ ; Explicit tractatus de compositione astrolabii secundum Messahalach D $\eta$ <sup>13</sup>

<sup>12</sup> Ms W $\epsilon_2$  continues with additional repetitive material.

<sup>13</sup> Because of the non-standard order of the capitula in D $\eta$ , this is the last capitulum of the *Compositio* and hence the explicit is written here.

the declination of the zodiac from the equator is less, or above if it is greater, and draw lines from A through [the ends of] the diameter to MBN, and they will cut off the diameter IZ' of the circle which is sought, as is clear in this diagram.

[ FIGURA 18 ]

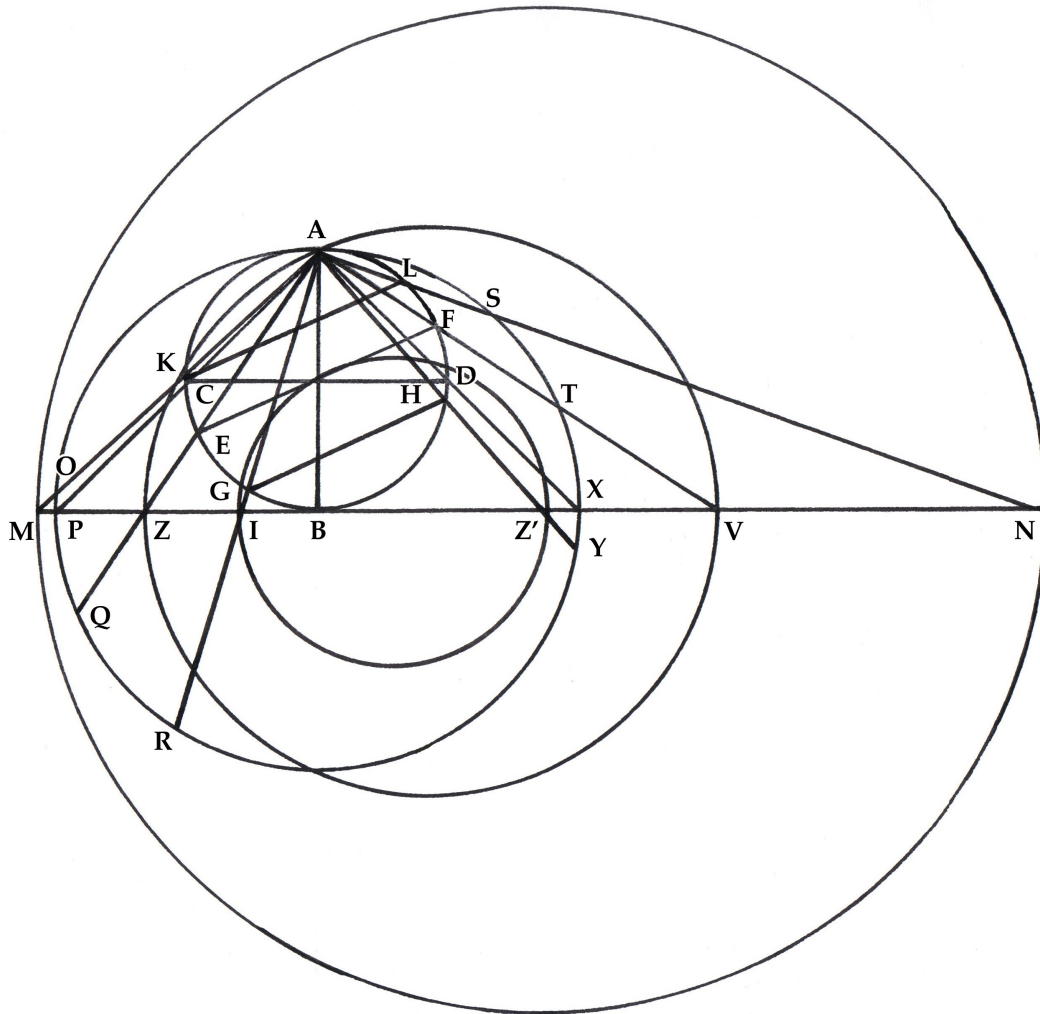


Figura inscriptionis in plano puncti in spere equidistantis zodiaco /  
 Figure of the inscribing in a plane of a circle<sup>14</sup> on the sphere parallel to the zodiac

[Complete diagram] Bγ Bε Bκ Cη Cι Eα<sup>15</sup> Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo  
 Mq Nδ Ne Oξ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pq Pτ Pv<sup>16</sup> Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Sk Tδ Vι(fol.

<sup>14</sup> As noted above, while the text reads *puncti*, it should read *circuli*.

<sup>15</sup> In ms Eα the circles in the sphere slope in the opposite direction from those in the normal diagrams, which throws off the lettering on the circles in the plane.

<sup>16</sup> The diagram in ms Pv is the mirror image (left/right) of the normal layout of this figure.



334<sup>r</sup>) Wβ Wι<sup>17</sup> Xβ

[*Partial diagram*] Mν Vβ

[*Outline, or space only*] Aα Bθ Dγ Dη Eζ Eυ Lβ Mφ Pν Vπ Vψ Wα Wε<sub>2</sub>

[*No space*] Cε Eδ<sup>18</sup> Mυ Mψ Nα Xα

Pθ: "R"

[*Caption*]

Figura ... zodiaco] Bγ Bε Cη Cι Eβ Eη Eτ Fα Fβ(*twice*) Fζ Lγ Lε Lη Mδ Mη Mo Nδ Ne Oζ Oξ Oτ Ou Pα Pδ Pλ Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rδ Sδ Σκ Tδ Wβ Xβ; *om.* Bκ Lζ Mρ Re Vι; Figura inscribendi punctum equidistantem zodiaco in plano Wι; Figura inscriptionis alicuius puncti equidistantis zodiaco in alteram partem Pυ; Figura proiectione in plano cuiuslibet puncti circuli in sphaera equidistantis a zodiaco Eα; Proiectio in plano pluncti equidistantis ecliptice in sphaera Pγ; *add.* Figura capituli 18 Bε

in sphaera] *om.* Pμ Po; in utrum partem Mλ

[*Lettering on the diagram*]

A] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rδ Re Sδ Σκ Tδ Vι Wβ Wι Xβ B] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *om.* Fβ Oζ Pτ Qδ Xβ; *illeg.* Mη Rδ D] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *om.* Fβ Qδ Xβ; *illeg.* Rδ E] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *om.* Oζ Xβ; *illeg.* Rδ F] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *illeg.* Rδ; c Xβ G] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ; *om.* Po Wι Xβ; *illeg.* Rδ H] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *om.* Pρ Xβ; *illeg.* Rδ I] Bγ Bε Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pδ Pλ Pμ Po Pρ Pτ Qβ Qγ Qδ Qμ Re Σκ Tδ Vι Wβ; *illeg.* Qλ; *om.* Xβ; *illeg.* Rδ; γ Sδ; z Mη Mλ Mo Pγ Pυ Wι; z Bκ; *add.* R Eα K] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *om.* Pμ Po Xβ; *illeg.* Mη L] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι; *illeg.* Rδ; v Xβ M] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mρ Nδ Ne Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Re Sδ Σκ Tδ Vι Wβ Wι Xβ; *illeg.* Rδ; *cut off* Eα Mλ

<sup>17</sup> The diagram in ms Wι is poorly drawn which leads to mis-lettering.

<sup>18</sup> The diagrams in ms Eδ are unrelated to the text.

Mo N] Bγ Be Cη Ci Eβ Eη Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mλ Mo Mρ Nδ Oζ Oξ Oτ Ou Pa Pγ Pδ  
 Πα Ρμ Ρο Ρτ Ρυ Qβ Qγ Qλ Qμ Re Sδ Sk Tδ Vi Wβ Xβ; *om.* Eτ Mη Ne Po Qδ Wi; *illeg.* Rδ; *cut off* Bκ;  
 s, v Ea O] Bγ Be Bκ Cη Ci Eβ Eη Eτ Fa Fζ Lγ Le Lζ Lη Mδ Mη Mρ Nδ Ne Oζ Oξ Oτ Pa Pδ  
 Πα Ρο Ρτ Qβ Qγ Qλ Qμ Rδ Re Sδ Sk Tδ Vi Wβ Xβ; *om.* Ea Fβ Ou Pγ Ρμ Po Ρυ Qδ Wi; *cut off* Mλ  
 Mo P] Bγ Be Bκ Cη Ci Ea Eβ Eη Eτ Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ  
 Oτ Ou Pa Pγ Pδ Πα Ρμ Po Ρο Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Re Sδ Sk Tδ Vi Wβ Wi Xβ; *illeg.* Rδ Q]  
 Bγ Be Bκ Cη Ci Eβ Eη Eτ Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pa Pδ Πα  
 Ρμ Po Ρο Ρτ Ρυ Qβ Qγ Qλ Qμ Rδ Re Sδ Sk Tδ Wβ Wi Xβ; *om.* Ea Pγ Qδ Vi R] Bγ Be Bκ Cη  
 Ci Ea Eβ Eη Eτ Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πα Ρμ Po Ρτ  
 Ρυ Qβ Qγ Qλ Qμ Rδ Re Sδ Sk Tδ Wβ Wi Xβ; *om.* Qδ Vi; *illeg.* Mη; N Po S] Bγ Be Bκ Cη Ci Eβ  
 Eη Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Oζ Oξ Oτ Ou Pa Pδ Πα Ρμ Po Ρο Ρτ Ρυ Qβ Qγ  
 Qδ Qλ Qμ Rδ Re Sδ Sk<sup>19</sup> Tδ Vi Wβ Wi Xβ; *om.* Ea Eτ Ne Pγ T] Bγ Be Bκ Cη Ci Eβ Eη Fa Fβ  
 Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Oζ Oξ Oτ Ou Pa Pδ Πα Ρμ Po Ρο Qβ Qγ Qδ Qλ Qμ Rδ Re  
 Sδ Sk Tδ Vi Wβ Wi Xβ; *om.* Ea Eτ Ne Pγ Ρτ Ρυ v] Bγ Be Bκ Cη Ci Eβ Eη Eτ Fa Fβ Fζ Lγ Le  
 Lζ Lη Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πα Ρμ Po Ρο Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Re  
 Sδ Sk Tδ Vi Wβ Wi; *om.* Xβ; *illeg.* Rδ; T Ea x] Bγ Be Bκ Cη Ci Ea Eβ Eη Eτ Fa Fζ Lγ Le Lζ Lη  
 Mδ Mη Mλ Mo Mρ Nδ Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πα Ρμ Po Ρο Ρτ Qβ Qγ Qδ Qλ Qμ Re Sδ Sk Tδ  
 Vi Wβ Xβ; *om.* Fβ; *illeg.* Rδ; Y Pu; Z Wi y] Bγ Be Bκ Cη Ci Ea Eβ Eη Eτ Fa Fζ Lγ Le Lζ Lη Mδ  
 Mλ Mo Nδ Ne Oζ Oξ Oτ Ou Pa Pδ Πα Ρο Ρυ Qβ Qγ Qλ Qμ Rδ Re Sδ Sk Tδ Vi Wβ Wi Xβ; *om.* Fβ  
 Mη Mρ Pγ Ρμ Po Ρτ Qδ z] Bγ Be Bκ Cη Eβ Eη Eτ Fa Fβ Fζ Lγ Le Lζ Lη Mδ Mλ Mo Mρ Nδ  
 Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πα Ρμ Po Ρτ Ρυ Qβ Qγ Qδ Qλ Qμ Re Sδ Sk Tδ Vi Wβ Xβ; *om.* Ci Mη  
 Ρο; x Wi; *illeg.* Rδ; *add.* Q Ea z'] Be Bκ Cη Ci Ea Eβ Eη Eτ Fa Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mo  
 Mρ Nδ Ne Oζ Oξ Oτ Ou Pa Pδ Πα Ρο Ρο Ρτ Ρυ Qβ Qγ Qλ Qμ Re Sδ Sk Tδ Wβ Wi Xβ; *om.* Fβ Qδ  
 Rδ; R Bγ Pγ Vi; x Ρμ

## [Other information]

*point A]* *add.* oculus Lη; *add.* polus meridionalis videns Bκ Lζ Mλ Ρμ Po Ρυ Wi *point B]* *add.*  
 polus septentrionalis contingens planum Bκ Lζ Mλ Ρμ Po Ρυ Wi; *add.* ad septentrionalem Xβ  
*line CD]* *add.* equator Bκ Lζ; *add.* equator diei Mλ; *add.* equator in spera Xβ *line EF]* *add.*  
 ecliptica Mλ; *add.* zodiacus Bκ Lζ Po Ρυ *line GH]* *add.* equidistans zodiaco in(*om.* Po Wi;  
 versus Bκ Lζ) septentrionalem Bκ Lζ Mλ Oξ Po Wi *line KL]* *add.* equidistans zodiaco  
 in(versus Bκ Lζ) meridionali Bκ Lζ Mλ Po *line MBN]* *add.* planum Be Cη Ci Eβ Eη Eτ Fa Fβ  
 Fζ Lγ Le Lη Mδ Mo Nδ Ne Oζ Oξ Oτ Ou Pa Pδ Πα Ρμ Ρο Ρτ Qγ Qδ Qλ Qμ Rδ Sδ Sk Tδ Wβ Xβ  
*circle ACBD]* *add.* circulus magnus transiens per polos Lζ *circle IZ']* *add.* circulus  
 equidistans zodiaco in plano Xβ; *add.* equidistans zodiaco septemtrionali Bκ Lζ Ρμ Po Wi; *add.*  
 equidistans zodiaco in septemtrione Qγ; *add.* equidistans zodiaco septemtrionali in plano Mλ;  
*add.* equidistans zodiaco in septemtrione in plano Bγ Ρυ; *add.* primus circulus equidistans zodiaco  
 Be(*later hand*); *add.* zodiacus Wi *circle MN]* *add.* circulus equidistans Mδ Nδ; *add.* circulus  
 equidistans zodiaco Eβ Eη Lγ; *add.* circulus equidistans zodiaco in australis in plano Fζ Ne Xβ;  
*add.* circulus equidistans zodiaco in(versus Oξ) austrum Fa Oξ; *add.* circulus equidistans zodiaco  
 in austrum in plano Fβ Le Lη Oζ Ou Pa Ρο Ρτ Qβ Qγ Qλ Qμ Sδ Tδ Wβ; *add.* circulus equidistans  
 zodiaco in meridionem Ρμ Wi; *add.* equidistans zodiaco meridionalis Bκ Lζ; *add.* equidistans

<sup>19</sup> In ms Sk, point S is on arc AV rather than on arc AX.

zodiaco meridionalis in plano Mλ; *add.* equidistans zodiaco in meridiem Po; *add.* equidistans zodiaco in meridiem in plano Pv; *add.* equidistans zodiaco in austrum in plano Bγ; *add.* secundus circulus equidistans zodiaco Bε(*later hand*) *circle PX*] *add.* equator Bε Cη Eβ Eη Fα Lγ Lζ Lη Mδ Mo Nδ Oτ Pλ Po Pρ Qβ Qμ Sδ; *add.* equator(*corr. to zodiacus Fζ*) in plano Bγ Cι Eτ Fβ Fζ Lε Mη Mλ Nε Oζ Oξ Ou Pα Pμ Pτ Qγ Qδ Qλ Sκ Tδ Vι Wβ Xβ; *add.* equinoctialis in plano Pv Rδ *circle ZV*] *add.* zodiacus Bε Bκ Cη Eβ Eη Fα Lγ Lζ Lη Mδ Mo Nδ Oτ Pλ Pμ Po Pρ Qβ Qμ Sδ Wι; *add.* zodiacus(*corr. to equator Fζ*) in plano Bγ Cι Eτ Fβ Fζ Lε Mη Mλ Nε Oζ Oξ Ou Pα Pτ Pv Qγ Qδ Qλ Rδ Sκ Tδ Vι Wβ Xβ *add. circle and circulus Cancri Pv*

[*Marginal note*] Eτ Fζ Mη Qδ Xβ

CD	equator in spera
EF	zodiacus in spera
KL	equidistantis zodiaco in spera australis
GH	equidistantis zodiaco in spera septentrionalis GH] LH Mη
PX	dyiameter equatoris in plano
ZV	dyiameter zodiaci in plano
MN	dyiameter equidistantis zodiaco in austrum in plano in austrum] austral' Qδ
IZ	dyiameter equidistantis zodiaco in septentrione in plano IZ] ZZ FMη Qδ Xβ in plano] <i>om.</i> Xβ
B	polus septentrionalis in plano in] in in Mη
A	polus meridialis videns super planum meridialis] <i>add. and del.</i> in plano Eτ

## [ APPENDIX 18: Version B ]

*Mss Mσ, Vθ, and Wε, which contain only capitula 17 and 18, have such a significantly different version of this proposition (especially after line 10) that it needs to be given separately as a whole.*

## PROIECTIO IN PLANUM CIRCULI EQUIDISTANTIS ECLIPTICE

Si autem aliquem circulum in spera equidistantem ecliptice in planum proicere velimus, fiat sic. Circulus AB transeat per polos mundi, qui sint puncta A et B; punctus autem B qui est polus septentrionalis sit contingens planum; et linea MBN est communis sectio circuli AB qui est colurus solsticiorum et plani scilicet linea MBN. Linea CD est diameter circuli equinoctialis, linea EF diameter ecliptice, linea GD diameter unius circuli equidistantis ecliptice versus partem septentrionis, linea CH diameter unius alterius circuli equidistantis ecliptice versus partem meridiei. Unde uterque duorum arcuum CE et DF est declinatio ecliptice ab equinoctiali. Et arcus GC est maxima declinatio circuli cuius diameter est linea GD ab equinoctiali. Similiter arcus DH est maxima declinatio circuli cuius diameter est CH ab equinoctiali.

Transeant ergo due linee a puncto A per extremitates dyametri equinoctialis scilicet per puncta C, D ad puncta in plano qui sunt M, Q. Eritque linea MQ diameter equinoctialis qui describatur circa puncto B et transibit per punctum A. Nam linee MB et QB erunt equales linee AB et sit circulus MAQO qui erit equinoctialis in plano proportionalis circulo equinoctialis in spera cuius dyameter est linea CD.

Deinde a puncto A protrahantur due linee per extremitates dyametri ecliptice, scilicet per puncta E, F usque ad puncta K, L in plano quarum una est linea AEKY et alia lineam AFXL. Eritque linea KL dyameter ecliptice qui dividatur per medium in puncto V et describatur circa idem punctum circulus transiens per puncta K, L qui etiam transibit per puncta A quare ipse dividit equinoctialem per equalia et erit circulus KALO qui erit circulus in plano proportionalis ecliptice in spera cuius dyameter est linea EF.

Postea a puncto A protrahantur due linee per extremitates dyametri GD usque ad puncta in plano P, Q, dyameter circuli in plano proportionalis circulo in spera cuius dyameter est linea GD equidistans ecliptice. Dividatur ergo linea PQ in duo equalia in puncto R circa quem describatur circulus transiens per puncta P, Q qui erit circulus in plano proportionalis circulo in spera equidistanti ecliptice versus septentrionem, scilicet cuius dyameter est linee GD.

Deinde a puncto A exeant due linee per extremitates dyametri CH ad puncta M, N in plano, eritque linea MN dyameter circuli in plano qui est proportionalis circulo in spera cuius dyameter est linea CH equidistans ecliptice. Dividitur ergo linea MN per medium in puncto X'

- 1 Proiectio ... ecliptice] *om.* Mσ Vθ      7 septentrionis ... partem] *om.* Vθ      11 A<sub>2</sub>] *om.* Vθ  
 equinoctialis] *add.* qui describatur eis Mσ      12 C] G Vθ      17 K, L] *om.* Wε  
 AEKY] ACKY Vθ      AFXL] AFR *or* AFX Wε<sup>20</sup>      19 K, L] M, L Mσ; *corr. from* M, L Wε  
 quare] quia Vθ      20 KALO] KAL Wε      21 est] *add.* enim Mσ      24 R] I Vθ  
 29 X'] R Wε

<sup>20</sup> The handwriting in Wε is such that it is difficult to distinguish an X from an R. The same is true at line 29.

30 circa quem describatur circulus transiens per puncta M, N qui erit in plano circulus proportionalis  
circulo equidistanti ecliptice versus meridiem, scilicet cuius dyiameter est linea CH.  
Est etiam arcus YZ similis arcui EG, uterque enim subtenditur angulo YAZ in  
circumferentia utriusque circuli existenti. Et arcus MY est similis arcui CE propter eandem causam.  
Et eodem modo arcus MZ est similis arcui CG. Et propter eandem causam arcus QX est similis  
35 arcui DF; et arcus XS est similis arcui FH; et arcus QS similis arcui DH. Exemplum productorum  
habes in sequenti figura.

32 EG] CG Vθ      34 QX] QXL or QRL Wε      35 XS] ZB Wε      DH] DK Wε  
productorum] dictorum Wε      habes] habebus cuidcuirz ac lunde(?) Wε

## [ APPENDIX 18: VERSION C ]

*Mss Mσ, Vθ, and Wε also contain yet another version of this proposition.*

## ALIUD EXEMPLUM.

Sit ut prius circulus AB colurus solstitiorum transiens per polos mundi, qui sunt A et B, B  
autem contingens planum; et linea MBN est communis sectio circuli AB et plani. Linea CD est  
dyiameter equinoctialis, linea EF dyiameter ecliptice, linea GH dyiameter unius circulorum  
5 equidistantium ecliptice eorum qui sunt ad partem septentrionis, linea KL dyiameter alterius  
circuli equidistantis zodiaco qui est ad partem meridiei. Unde uterque duorum arcuum CE et DF  
est declinatio ecliptice ab equinoctiali; duo autem arcus GC et DH sunt due maxime declinationes  
circuli cuius dyiameter est GH ab equinoctiali. Similiter duo arcus CK et DL sunt due maxime  
declinationes circuli cuius dyiameter KL ab equinoctiali. Transeant ergo lineae AKOM, ACP, AEZQ,  
10 AGIR, AH et Y, ADX, AFTV, ALSN.

Eritque linea PX dyiameter equinoctialis qui transibit per A; nam XB et BP sunt equales BA.  
Item linea ZV erit dyiameter ecliptice qui etiam transibit per A quia ipse dividit equinoctialem per  
equalia. Et linea IZ' erit dyiameter in plano circuli cuius linea GH est dyiameter in spera. At vero  
linea MN erit dyiameter in plano circuli cuius linea KL est dyiameter in spera. Extractis igitur  
15 medietatibus quarumlibet dyametrorum in linea MBN figuratorum et descriptis circulis secundum  
exigenciam earundem, erit circulus PAX equinoctialis in plano et circulus ZAV ecliptica in plano.  
Et circulus IZ' est circulus equidistans ecliptice versus septentrionem et circulus MN erit circulus  
equidistans ecliptice versus meridiem. Est etiam arcus PQ similis arcui CE, uterque enim  
subtenditur angulo PAQ in circumferentia utriusque circuli existenti; et arcus PR est similis arcui  
20 CG propter eandem causam. Similiter arcus PO est similis arcui CK. Et propter eandem causam  
arcus XS est similis arcui DL. Et arcus XY similis arcui DH.

Cum igitur aliquem circulum equidistantem ecliptice velis depingere in plano, si fuerit  
meridionalis ab ecliptica, sume in equinoctiali a puncto X versus [A] arcum unum equalem arcui  
composito ex declinatione ecliptice ab equinoctiali, et illius circuli depingendi ab ecliptica, ut est  
25 hic arcus XS qui componitur ex arcu XT, qui est declinatio ecliptice ab equinoctiali, et arcu TS qui

5 partem] om. Wε      6 zodiaco] add. sive ecliptico Wε      9 AEZQ] AZQ Wε      10 ADX]  
DX Wε      13 IZ'] I Wε      17 IZ'] I Wε      est] om. Vθ      19 PR] PQR Wε

est declinatio illius circuli ab ecliptica. Postea in parte opposita, subtrahe CE declinationem ecliptice ab equinoctiali de declinatione huius circuli ab ecliptica, si potes, ut hic arcum PQ de arcu OQ et residuum quod est arcus PO sume a puncto P versus A. Quod si non potes subtrahere declinationem ecliptice ab equinoctiali a declinatione huius circuli ab ecliptica, fac e converso, scilicet subtrahe declinationem huius circuli ab ecliptica de declinatione ecliptice ab equinoctiali, et residuum sume a puncto [P] non versus [A] sed versus partem oppositam. Protrahe itaque lineas AS et AO quousque secent dyametrum MBN in punctis M et N, eritque linea MN [dyametrum] circuli meridionalis equidistantis ecliptice qui queritur.

Si autem talis circulus equidistans ecliptice fuerit septentrionalis ab ecliptica, subtrahe declinationem compositam ex declinatione ecliptice ab equinoctiali et declinatione illius circuli depingendi ab ecliptica sub puncto P in parte opposita, sicut est hic arcus PQR qui componitur ex arcu PQ qui est declinatio ecliptice ab equinoctiali et arcu QR qui est declinatio ecliptice huius circuli ab ecliptica. Postea in parte opposita sume differentiam duarum declinationum, scilicet declinationis ecliptice ab equinoctiali et declinationis circuli depingendi ab ecliptica sub puncto X, ut est hic arcus XY qui remanet post subtractionem arcus ST qui est declinatio ecliptice ab equinoctiali ab arcu STX qui est compositus ex declinatione ecliptice ab equinoctiali, scilicet arcu ST, et declinatione huius circuli ab ecliptica, scilicet arcu TX. Et hoc si declinatio ecliptice ab equinoctiali fuerit minor quam aggregatum ex declinatione eodem et declinatione circuli depingendi ut hic fit. Si vero declinatio ecliptice ab equinoctiali fuerit maior quam declinatio circuli describendi ab ecliptica, sume differentiam earum super punctum X versus punctum T. Et protrahe lineas a puncto A ad dyametrum MBN et abscindent lineam [in Z'] et I qui erit dyameter circuli septentrionalis equidistantis ecliptice qui queritur, ut satis patet in hac figura.

29 a] *om.* Mσ Vθ      32 AO] AC Wε      34 ecliptice] *om.* Wε      36 depingendi] *om.* Wε  
 37 ecliptice<sub>1</sub> ... ecliptice<sub>2</sub>] *om.* Vθ      QR] PR Wε      42 TX] TXV Wε      47 hac] *om.*  
 Vθ      hac figura] figuris precedentibus et sequentibus. Nota quod precedentes canones sunt extracti per [*illeg.*] Magistrum Johanem de Gmundia ex [*illeg.*] compositione astrolabii ipsius Messahalach qui sequuntur. Wε<sup>21</sup>; *mss* Mσ Vθ *end*

<sup>21</sup> At this point ms Wε continues with the Wε<sub>2</sub> versions of capitula 17 and 18 as collated above.

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## [CAPITULUM 19.] ALIUS MODUS FACIENDI AZIMUTH

5 Possunt etiam azimuth hoc modo fieri. Sint 3 circuli, ut prius: ABCD Capricorni; FGHI Arietis; LMNP Cancri. Accipe igitur a puncto H de quarta HG 48 gradus latitudinis ubi sit K; et tantumdem ab F de opposita quarta FI ubi sit Q, et ubi linea a G in K protracta diametro AC occurrerit, sit R; ubi vero linea a G in Q protracta diametro AC occurrerit, sit S, quod est cenith. Deinde super diametrum RS divisum per medium in puncto X

- 1 *om.* Cε Dγ Eα Eδ Eζ Eν Nα Pγ Po Qμ Rα Sβ Xα; De alia inscriptione azimuth Bε(*add.* Capitulum 19); De azimuth aliter inscribendis Bγ; De azimuth(acimuth Bθ) faciendis Bθ Vπ(*add.* Rubrica); De azimuth perficiendis Mη Pυ; De secundo modo faciendi azimuth Dη; De 2<sup>o</sup> modo inscribendi azimuth Vβ; Secundus modus inscribendi(describendi Wβ) azimuth Eτ Fβ(*add. in marg.* Modus inscribendi azimuth) Mν Mυ Vι Wβ; Tertius modus describendi azimuth Rε  
faciendi] inscribendi Mλ Pτ azimuth] azimuth Oζ; azymuth Mλ; *add.* est talis Cη; *add.* etc. Rδ; *add.* et suff' Mλ; *add.* Rubrica Lβ
- 2 Possunt] Post Mν; Post hoc Qδ etiam] autem Tδ azimuth] *om.* Eυ; azymuth throughout Mλ hoc modo] *rep.* Rδ; huius modi Vψ fieri] *add.* oportet Qδ Sint 3] Sintque Vπ 3] *om.* Qδ; 3<sup>s</sup> Bε; tres Eδ Mo Mq Nα Pγ Pq Tδ Vψ; 93 Cε; 2 Pτ; duo Mη prius] *add.* scilicet Bε ABCD] ab eo Pγ
- 3 FGHI] *marg.* Bε a] et Eυ H] HK Bθ Eυ Qδ Vπ; hic Cε de quarta] diei quarta Eζ; de 14 Cη Mν Pγ; e 4<sup>a</sup> Vπ; ex Bθ Eυ quarta and elsewhere] 4<sup>a</sup> many HG 48] HG XG *corr. to* HKG Pq HG ... de] *om.* Cε 48] 84 Rε; ea Pγ; E 8 or EG Xα 48 gradus] 4 DX Nα latitudinis] *om.* Mo Rε
- 4 ubi<sub>1</sub>] ut Bγ Bθ Cη Eα Eδ Eζ Eτ Eυ Mη Mν Pγ Vπ ab F] ABF Mν Sκ; ABF *corr. to* ab F Oτ; BF Cη; ab F quarta *corr. to* ab FGI Pq; A B T Nα F] C Bθ de] *om.* Pδ Pq opposita] *add.* de Mν Mφ Vι; *add.* scilicet Qβ de ... G] *marg.* Lε quarta] *om.* Nε interlin Bε quarta FI] si Cε FI] *om.* Vψ; FR Dγ Xα; *illeg. corr. to* scilicet Pq ubi<sub>2</sub>] nisi Pγ; ut Nδ; ut *corr. to* ubi Sδ Q et] quare Cη Mν; quia Sκ; QR Pγ ubi<sub>3</sub>] I ibi Nα a G] AG several; a AG Pγ K<sub>2</sub>] H Qδ; HK *corr. to* K Sδ protracta] proiecta Mν
- 5 occurrerit<sub>1</sub>] decurrit Bγ Cη; decurrerit Wβ sit<sub>1</sub>] *add.* ibi Tδ; *add.* s quod est cenith Lγ sit<sub>1</sub> ... sit<sub>2</sub>] *om.* Xα R] I Xβ; *add.* punctus oppositus cenith Pδ R ... sit<sub>2</sub>] *om.* Bθ Cε Dγ Eτ Fζ Mη Nα Pα Pγ Qβ Rε Sδ Vπ Vψ; *marg.* Oτ ubi vero] et Eυ vero] autem Bε a G] AG several in Q] interlin. Bε; *add.* and del. per Wα Q protracta] *om.* Eη protracta] in Bε occurrerit<sub>2</sub>] *add.* sit R et linea a G in Q diametro protracta AC occurrerit Qδ
- 6 S] *add.* per zenith s Qδ quod est] *om.* Pγ quod est cenith] *om.* Sβ est] *om.* Bθ Eτ Eυ Mν Nε Pυ Qμ; interlin. Bγ Po Vβ; scias esse Dγ Rα Xα cenith and elsewhere] zenith Bε super] *om.* Bε Eη Oζ Pλ Pq diametrum] interlin. Bγ; *om.* Cη Eτ Pγ RS] HRS Dγ; IG Pγ; IS Pμ Pν Wβ; RG Bθ Eυ; vs Xβ; YS Nα divisum] divisi Cη Pγ; divisi Mν; *ms* Xα ends x] s Pγ; 4 Wβ



[CHAPTER 19.] ANOTHER WAY OF MAKING AZIMUTHS<sup>1</sup>

And again, azimuths can be made in this way. Let there be 3 circles, as before: ABCD, the [Tropic or circle] of Capricorn; FGHI [the circle through the beginning] of Aries; LMNP [the Tropic or circle] of Cancer. Therefore take from point H, in the quarter HG, 48 degrees of latitude<sup>2</sup> where K is; and in the same way from F in the opposite quarter FI where let it be Q, and where the line extended from G to K meets diameter AC, let it be R; indeed, where the line extended from G to Q meets diameter AC, let it be S, which is the zenith. Then on the diameter RS divided in half at point X

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<sup>1</sup> This method (among others) of drawing azimuths has been studied by J. L. Berggren in “Medieval Islamic Methods for Drawing Azimuth Circles on the Astrolabe,” *Centaurus*, 34 (1991), 309-344. It is what he has called “An Anonymous Method” (pp. 330-333) found in our text and in the writings of al-Sijzī and al-Bīrūnī.

This method is also given by Abū ‘Alī al-Ḥasan al-Marrākushī (p. 332) who introduces some errors, one of which (dividing individual “quadrants” [SG, GR, RI and IS] into equal parts rather than dividing the whole circle, or the two semicircles, into equal parts) is copied here at lines 12 and 13.

See also Samsó, *On Both Sides*, pp. 429-430. Samsó notes (p. 430) that “these two chapters [i.e., 19 and 20] pose the problem of the source used: neither al-Sijzī nor al-Bīrūnī seem to have been known in the Islamic West, and al-Marrākushī’s *Mabādi’*, a work written in Egypt which shares a common error with the *De compositione*, was never accessible in a Latin or Hebrew translation. The method probably derives from an unknown source or was actually used by astrolabe-makers. Whatever the case, it is also in the treatise by Rudolf of Bruges.” [Notes refer to Julio Samsó, “al-Bīrūnī in al-Andalus,” in Josep Casulleras and Julio Samsó, eds., *From Baghdad to Barcelona: Studies in the Islamic Exact Sciences in Honour of Prof. Juan Vernet* (Barcelona: Instituto “Millàs Vallicrosa”, 1996) 2: 583-612, reprinted in Samsó, *Astronomy and Astrology in al-Andalus and the Maghrib* (Aldershot: Ashgate-Variorum, 2007), VI; and Richard Lorch, “The treatise on the astrolabe of Rudolf of Bruges,” in Lodi Nauta and Arjo Vanderjagt, eds., *Between demonstration and imagination. Essays in the history of science presented to John D. North* (Leiden: Brill, 1999), p. 90.]

<sup>2</sup> Latitude 48°N passes through Orléans, Munich/München and Vienna/Wien.

10 describe primum azimuth, et sit eius ea pars que incidit in circulum horizontis manifesta; reliqua vero quasi occulta quia postmodum delebitur que necessario transibit per puncta G, I sicut orizon. Cumque divideris per medium semicirculos SGR, RIS in punctis Z, O, eice lineam ZO longe in utramque partem transeuntem necessario per centrum X. In illa enim invenies centra reliquorum azimuth hoc ordine. Divides, scilicet portionem

- 7 describe] describere Qδ; inscribe Eδ; scribe Eα; *add. and del.* in circulum Vπ ea] *om.* Nα Sβ; EA Sκ; illa Dη Eβ Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mv Mφ Nδ Oξ Oτ Pα Pλ Pμ Pν Pρ Qβ Qγ Qλ Sδ Tδ Vι Wα Xβ; *add. interlin.* illa Mρ Po que] quem Vπ; qui Mv incidit] cadit Bε; incedit Bθ; scindit Lε Tδ in] *om.* Eα Eβ Ev Mv circulum] circulo *some* manifesta] in anima Cη Eτ; manifestam Dγ
- 8 vero] *add.* manifesta Eδ quasi] *om.* Wβ; 9 Cε; Q Cη Eτ Fζ quia] Q Cη Eτ; que Nα postmodum] postea Dη; postea modum Nα delibitur] describitur Rε que] quod Bθ; *add.* ut Mv Vι; *add. and del.* ut Mφ necessario] acto Pθ transibit] *om.* Mv
- 9 G, I] G Vψ; G, R Pγ Tδ; S, I Wβ sicut] *add.* Z Rα Cumque] *illeg.* Eη; Consequenter Bγ Bθ Dγ Eα Eδ Eζ Mv Nα Pγ Po Pτ Pv Qδ Qμ Rα Rε Sβ Vβ Vπ; Con[sequente]r Cη Eτ Mη Mλ; Cum Vψ Cumque divideris] *om.* Lβ divideris] divisio Bγ Bθ Cη Dγ Eα Eτ Ev Mλ Mv Pγ Pτ Qδ Sβ Vβ Vπ; desens Qλ per medium] *om.* Pv semicirculos] semicirculis Bγ Bθ Dγ Eα Mλ Pτ Pv Qδ Sβ Vβ(*interlin.*) Vπ; semicirculi Eζ Eτ Mη Mv; semicirculi *corr. to* semicirculos Po SGR] OGR Mη; SGE Vι; SR Bε Eδ SGR, RIS] *om. and blank* Sκ; SGIRIS Mv; SGRI Mo; SGRNS Rε Vβ RIS] *om.* Pμ Pρ; RS Cε; NS Nα; RXIS Ev; RYS *corr. to* RIS Tδ; VH *corr. to* RIS Po; SV Wβ; XIS Bθ; *add.* ipsas Eα in punctis] *om.* Mv
- 10 Z, O] *om.* Pρ; et O Dγ; R, O Nα, Rδ Z, O eice] zodiace Nε eice] *om.* Pδ; *illeg.* Pv; ehice Xβ; eijce Pρ Rε; proice Bε Pv eice lineam ZO] *om.* Oζ ZO] *om.* Bθ Cη Eδ Eτ Ev Mη Po Qμ; et O Dγ; RO Nα, Rδ longe] *om.* Cη; longam Bγ(*interlin.*); in punctis Mδ Nδ in] *om.* Eβ Qδ necessario] *om.* Dη centrum] punctum Cε Dη Mo x] x. [ Fβ Qλ; R Nα; Y Bθ Ev Vπ Wα; 4 Pγ Wβ
- 10-11 transeuntem ... enim] proiecta Oζ Pv
- 11 In ... enim] *illeg.* Eη; In alia enim Nα; In illa Pv; In illa enim N Mv; In illa enim scilicet linea longe in utramque partem eiecta Qγ; In illa enim scilicet linea longe in utramque partem proiecta Oτ Pμ; In illa enim sicut linea longe in utramque partem proiecta Bε; In illa etiam Pθ; In illa linea N Pτ; In illa N Fβ Mη Mv Qλ Wβ; In illa N scilicet linea longe in utramque partem proiecta Fζ Lγ Oζ Oξ Pρ; In illa scilicet linea longe in utramque partem eiecta Lβ; In illa vero Cε Mo Mρ; In illa vero linea Dη; In illis enim scilicet linea longe in utramque partem proiecta Qβ Sδ; In linea N Cη; In linea N illa(*interlin.*) Bγ; In scilicet linea ZO illa enim Nε Sκ; Scilicet in illa v Wα; Scilicet linea ZO XI illa N Cι; *add. interlin.* scilicet linea Vβ; *add. in marg.* scilicet linea longe in utramque partem eiecta Ov invenies] *om.* Pτ; *illeg.* Eη; *add.* 4 Eδ; *add.* omnia Eα Eζ centra] *om.* M; centrum Bθ Ev Qδ Rδ Vπ; *add. interlin.* 9 Bγ Divides] divide Bε Lε Mδ Mv Oζ Ov Pv Vπ scilicet] *om.* Fβ Pρ portionem] positionem Xβ

draw the first azimuth, and that part of it which falls on the circle of the horizon should be visible; the rest, however, as if hidden (because afterwards will be deleted) which necessarily will cross beyond points G, I, just as the horizon. And when you have divided the semicircles SGR, RIS in half at points Z, O, extend line ZO in length in each direction, necessarily passing through centre X. For in that [line] you will find the centres of the remaining azimuths in this sequence. You will divide, that is the portion

15 primi azimuth que est RI, in 9 partes equales; que licet sit maior quarta, tamen gerit potestatem quarte circuli. Similiter etiam divides portionem IS in 9 partes equales; que licet actu sit minor quarta, imposita tamen est quarta et prima nona ab R sit RT, secunda TY, tertia YZ', quarta Z'X' ita quod ubi linee a puncto S, quod est cenith, ad

- 12 primi] *om.* Mo azimuth] *om.* Cε que est] *om.* Eη; scilicet Bε RI] *om.* Pq; *interlin.* Po; 12 Cη Wβ; 15 Bθ Dγ Ev; I Vι; IRG Bε(*marg.*); IZ Vψ; IZ/13 Eτ; N Rε; NS Nα; RS Pτ; RZ Pγ; XI Mq 9] novem *some; illeg.* Pγ; 0 Mv; 4 Eτ; 41 Cη; et Nα partes] *om.* Pq equales] *add.* ita quod Pτ que licet] que I3 Bθ Cε Cη Ev Lη Pμ Vπ Xβ; q I3 Bε(*add. interlin. licet*) Eα Eβ Eδ Eζ Eη Fα Fβ Lγ Mv Oζ Oξ Oτ Ov Pα Pγ Pθ Po Pv Qβ Qγ Qλ Sδ Vι Wα Wβ; quilibet Lε Mo Mv Nα Qδ; q libet Mη Pv Pq Pτ Tδ sit] *om.* Fζ; *interlin.* Oξ maior] *illeg.* Pλ quarta] *om.* Cε; *interlin.* Bε Eη; *add.* in potentia Eα Pδ tamen] *om.* Pα Tδ; T *corr. in marg. to* tamen Ov; cum Cε Nε Qβ Qδ Vπ; *add.* circuli Dη gerit] geminat Rε; geritur Bθ Vπ
- 13 potestatem] partem Ev; portionem Rε; vicem Dη Similiter] super Vψ divides] *om.* Qβ; divides Bε portionem] positionem Xβ IS] IG Bθ Ev Pv; RIS Bε(*interlin.*) 9] novem *a few* equales] *om.* Dγ Rα Sβ
- 13-14 tamen ... quarta,] *om.* Bγ Cη Eτ Pγ
- 14 que licet] et I3 Fβ; I3 Cε Eδ Eζ Mη Mv Pθ Pτ Qλ Sκ Wα Wβ; licet Bθ Cι Eα Ev Fα Mλ Nα Pδ Po Pv Qμ Rδ Rε Vβ Vπ Vψ; q/que I3 Eβ Fζ Lβ Lγ Lε Lη Oζ Oτ Pα Pμ Pv Qβ Sδ XβI (q) I3 *corr. in marg. to* (q) licet Ov; que libet Pq Tδ actu] acta Pv Qβ Sδ; actū Fβ; A C T N Rε; ac<sup>u</sup> Eα; arcu Cι imposita] impotens Dη; impotentia Bθ Dγ Mλ Mo Mv Mφ Nα Pδ Pτ Pv Sκ Vβ Vι Vπ est] *add.* maior Qλ Sβ Wα nona] *om.* Pτ; *corr. interlin. to* nota Pλ ab R] ab BR Cη; a B2 Wβ; A.B.R Nα Sκ Vψ; a puncto R Tδ RT] IR Vψ; RS Pτ
- 14-15 et ... Z'X'] *marg.* Ov
- 15 secunda] 2<sup>a</sup> *many*; a Nα TY] TN Pτ; TP Sκ; TU *corr. to* TV Pv; TV Bγ Bθ Cε Dγ Eζ Mλ Mv Nα Qγ Rα Rε Vβ Vπ; TX Cη Qδ Sβ Wβ; Y Pγ TV ... Z'X'] *illeg.* Pv tertia] 3<sup>a</sup> *many* tertia YZ] *om.* Cη; tertia VY Bγ(*marg.*) tertia ... Z'X'] tertia quarta ZY, YZ Wβ YZ'] *corr. from* YT Po; RY Nα; VI Cε; VN est Rε; VR Pγ; VX Sβ; VY Bθ Dγ Eζ Ev Mη Mλ Mv Pτ Pv Qμ Rα Vβ Vπ; VZ Qγ; X Wα; Y Qδ; YR Sκ quarta Z'X] *om.* Eτ Pγ Rε quarta ... est] Nono YR [*illeg.*] quod nisi linee a punctos op[*illeg.*] Nα Z'X'] *illeg* Eη; *corr. from* YZ Po; IZ Cε Mv; RY Rδ; X7 Sβ; YZ Bγ Bθ Cη Dγ Eζ Ev Mη Mλ Pθ Pτ Pv Qμ Rα Vβ Vπ Vψ; ZC Xβ; *add.* 5<sup>a</sup> Dη; *add. interlin.* et deinceps Bγ; *add.* et sic de aliis Mo ita quod] idque Eα; item quod Rε; *add.* 3 Qδ; itaque Xβ ubi] *om.* Lη Mo; ibi Rδ; nisi Nδ; videlicet Vπ linee] *om.* Rε s] SOZ Eδ; scilicet Pλ; scilicet P Qδ; supra Mη quod est] *om.* Cε

of the first azimuth which is RI,<sup>3</sup> into 9 equal parts; though it [RI] is greater than a quarter, nevertheless it carries the weight [or value] of a quarter of a circle. Similarly you will also divide the portion IS into 9 equal parts; though it is less than a quarter as drawn, nevertheless a quarter is assigned, and the first ninth from R should be RT, the second TY, the third YZ', the fourth Z'X' so that the centres of the other azimuths will be set where lines from point S, which is the zenith,

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<sup>3</sup> This is erroneous; the entire semicircle SIR (or the entire circle) should be divided into equal parts, rather than just the individual "quadrants" (SG, GR, RI and IS). The same error is repeated in the next line. The text is following the lead of al-Marrākushī who appears to have introduced the error. See Berggren, "Medieval Islamic Methods," p. 332.

partes tantum nonas ducte, scilicet ad secundam, quartam, sextam, octavam, et deinceps pretermisiss in partibus diametrum primi azimuth tetigerint centra reliquorum azimuth statuentur; et omnes per S cenith circuietur ita ut partes eorum orizontem vel circulum Capricorni excedentes minime figurentur. Et sic invenies ad dextram centri x 8 centra secundum numerum eorundem; ac parem a se distanciam similiter facies ad sinistram

- 20
- 16 partes] pares Pδ Vβ; partes pares Xβ tantum] tm many nonas] corr. interlin. to notas Pλ; notas Pρ ducte] deducta Bγ; deducte Bθ Cε Cη Dγ Dη Eα Eδ Eζ Eτ Ev Mλ Mv Mo Nα Po Pτ Pv Qδ Qμ Rα Re Sβ Vβ Vπ Wβ; ducte corr. to deducte Pγ scilicet] om. Nα Pρ Re Sκ secundam] 2<sup>am</sup>/2 many; om. Vψ quartam] 4<sup>am</sup>/4 many; add. gradus Ev quartam ... octavam] 4<sup>m</sup> 8<sup>m</sup> corr. in marg. to quartam, sextam, octavam Bγ sextam] 6<sup>am</sup>/6 many; om. Pγ Po Pτ; add. primi azimuth Pμ sextam, octavam] om. Mv octavam] 8<sup>am</sup>/8 many; 8<sup>am</sup> corr. to 6<sup>am</sup> octavam Po et] add. sic Nε Re Wβ deinceps] inceptus Pδ
- 17 pretermisiss] premissis Vψ partibus] add. et ubi Mo diametrum] triametrum Pv; add. tre Po tetigerint] tetigerit many; tangerit Sδ; add. ibi Mo tetigerit ... azimuth] om. Ev centra] centrum Nα reliquorum] aliquorum Xβ
- 18 statuentur] statuent Nα; statuenture Cη omnes] add. partes Bε Dη Eβ Eη Fα Fζ Lβ Lγ Lη Mδ Mρ Mφ Nδ Ne Oζ Oξ Ov Pa Pλ Po(interlin.) Pρ Pv Qγ Qδ Qλ Tδ Vι Wα Xβ per ... partes] marg. Ov per S] pars Re; partes Mo S] om. Pρ; interlin. Pθ; G Mv Oτ Qμ; 6 Nα; 8 Cη; octo Mη cenith] om. Bγ Cη Eδ Eζ Mη Mv Oτ Qμ circuietur] illeg. Bε Mv; circinentur Mo Mφ Rα Vψ; circuentur Nα; circuietur Cι; circulentur Bγ; circumentur Pθ; continentur Dη Mρ ita] om. Fβ Sκ; infra Vψ ut] om. Mv; quod Cε Dη; add. Qquod Po vel] per Bγ circulum] circulorum Lβ
- 19 excedentes] extendentes Nα minime] medie Eα sic] si Rδ; sicut Pδ; super Vψ ad dextram] ad extram Vπ centri] om. Eη x 8]<sup>4</sup> illeg. Bγ; x Bε Xβ; xC Nα; xG Lβ; xS Cε Nδ Pρ Rδ Vψ; x[ Cι Eη Fβ Pδ Pθ Sκ Vβ; x. [.8 Eα; xS.x.8 P; x scilicet Nε; x scilicet / X S Re; x 9 Mρ; IG Bθ; 18 Cη Eτ Ev Mv Pγ Vπ; 48 Mδ; 4 [ Wβ centra] centrum Vψ; add. ita Cε
- 20 eorundem] eorum Bε Xβ ac] AC Dη a se] om. Bε Cη Eη Vβ Wβ; interlin. Bγ; A S E Dη; ad se Mv [accusative]; si se Xβ parem] partem Pθ Po Pτ Vπ Vψ a] ad Vψ similiter] sic Mv Mφ Vι
- 20-21 ad ... facis] om. Xβ

<sup>4</sup> The phrase “x 8” (i.e., “... centre [point] x, eight centres ...”) causes a great deal of scribal confusion. Sometimes “x” becomes “10” (and combines with “8” to become “18”) and sometimes “8” becomes “S” which sometimes is written as “[” which can be read as “scilicet”. As seen in the apparatus, further confusion and misreadings (e.g., “x” is read as “4”) can also occur.

drawn only to nine parts [i.e., points]<sup>5</sup> (that is to the second, fourth, sixth, eighth, and so on) will have touched [i.e., intersected] the diameter of the first azimuth in the omitted parts [i.e., the area of plate below the horizon]; and all [the azimuths] will circle through S, the zenith, such that parts of them extending beyond the horizon or the circle of Capricorn are minimally drawn. And so you will find to the right of centre X eight centres according to the number of the same; and in like manner you will create to the left of X an equal distance from them.<sup>6</sup>

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<sup>5</sup> That is to 9 of the 18 points of division along the semicircle RS. This produces azimuths spaced  $10^\circ$  apart.

<sup>6</sup> This sentence contains problems of strict translation and interpretation. However, the sense is that one constructs on the right of X a mirror image of what is on the left of X, that is, a set of centres on which you would construct the rest of the azimuths.

X. Et nota cum facis divisionem quartarum per 9 ubi quelibet nona continet 10 gradus quod cuilibet none licet essent inequales contingent 10 gradus et exhibunt inde azimuth continentis 5 gradus; et si fieret divisio quartarum ad 20 exirent azimuth ad 10 gradus in subdupla proportione.

- 21 x] 10 Bθ Cη Eτ Mv Pγ Po Vπ Wα Wβ; 4 Oξ; R Nα; xS Rδ; .x[. Eα Pδ Pθ Sκ Vβ; *add.* maior et nō reliqua vero quasi occulta quia postmodum delebitur que necessario transibit per puncta G, I sicut horizon Fβ(*repeat of ll. 9-10*) nota] nota nota Eδ; nota quod Bε Cη Eτ Pγ Vβ(*interlin.*) Wβ; nota quod *corr. to* nota Bγ nota cum] cumque Fβ; nō | tñ Rε facis] fecis Bε Cε Dγ Ev Mλ; facies Lε Mφ Qλ Vι Wα; facis *corr. from* facies Eζ; feceris Bθ(*add. ad*) Dη Fβ Mo Mv Nα Pτ Pv Qδ Rε Vβ Vπ(*add. ad*) per 9] *om.* Mη; 90 Pγ 9] 90 Cη Eτ ubi] ut Cε; *add.* vero Bθ Vπ nona] *om.* Fζ Ov; nota Vπ; *add. and del.* quelibet Qλ; *add.* quelibetque Wα continet] habet Bθ Ev 10] x *many; illeg.* Pτ
- 22 quod] vel Xβ quod ... gradus] *om.* Bγ Cη Eδ Eζ Eτ Ev Lβ Mη Mv Pγ Po Qμ Vζ cuilibet] quilibet Nα none] novene Dγ Mλ Rα essent] sint Eα contingent] *om.* Cε; attingent Sκ 10] x *several*; 19 Nε exhibunt] exirent Mφ Vι inde] *om.* Rε; *add.* gradus Nδ
- 23 et ... gradus<sub>2</sub>] *om.* Eτ Pγ si] similiter Mv fieret] facies Mv; eet(?) Eα ad<sub>1</sub> 20] per 2 Rε 20 ... ad<sub>2</sub>] *om.* Nε exirent] exierent Qλ; exiret Cη; exuent Lβ; *corr. from illeg.* Po 10] 20 Nα; *add.* ad Qμ gradus<sub>2</sub>] *om.* Eα
- 24 in subdupla] sub duppaci Nα proportione] *add.* et ecce sequentur figura Rε; *add.* etc. Nε Rδ; *add.* exemplic sic Eδ; *add.* Explicit Po Mη Rα; *add.* Explicit gradus in subdupla proportione expli[cit] Eζ; *add.* semper Bγ; *add. in marg.* ut patet in figura Po; *add.* ut patet in hac figura. Explicit Sβ



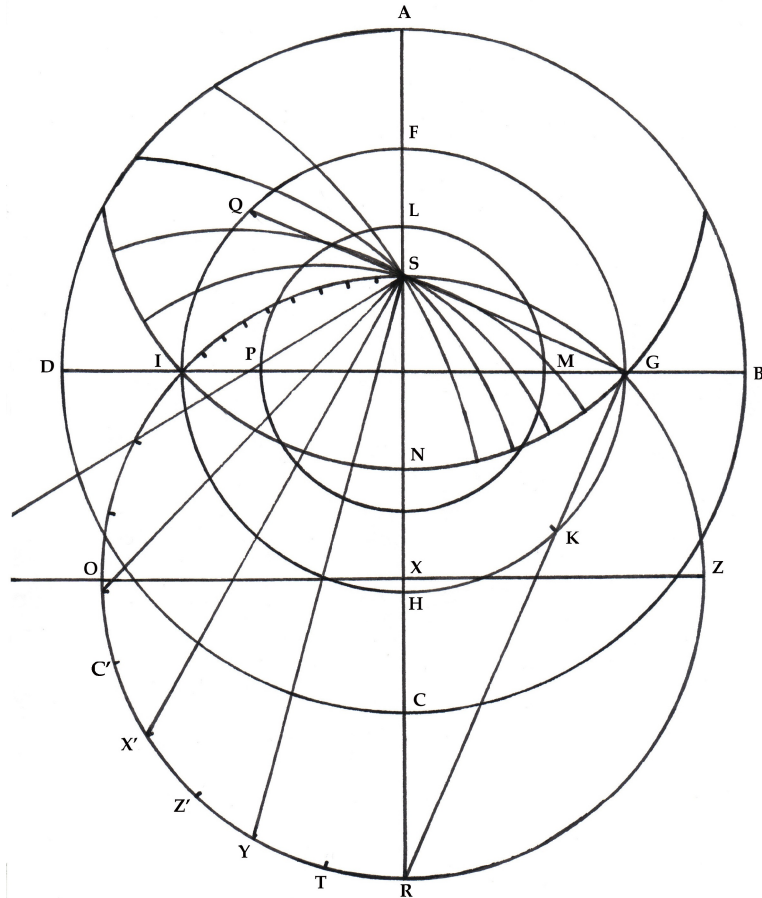
And note, when you divide the quarters by 9 where any ninth contains 10 degrees, that though they are unequal to any of the nine<sup>7</sup> they will extend 10 degrees, and azimuths containing 5 degrees will then be produced; and if the division of the quarters into 20 [degree segments] were made, azimuths of 10 degrees would be produced, in a half proportion.<sup>8</sup>

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<sup>7</sup> Since the text contains a mathematical error, the divisions of the semi-circle are not equal; those in one “quarter” segment will be larger than those in the other “quarter” segment. While they represent divisions of 10 degrees on the sphere, in fact they are drawn larger or smaller than 10 as a result of being projected on the plane.

<sup>8</sup> The text is re-iterating the fact that the spacing of the azimuths are half of the degrees in the divisions of the first azimuth. Thus dividing the first azimuth into “10-degree” segments will produce azimuths representing 5 degree spacing; and dividing the first azimuth into “20-degree” segments will produce azimuths representing 10 degree spacing.

[ Figura 19 ]



Secundus modus inscribendi azimuth<sup>9</sup> /  
A second method of inscribing azimuths

[Complete diagram] Bγ Bε Cη Ci Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mλ<sup>10</sup> Mv Mo Mq

<sup>9</sup> Since the text incorporates the error of dividing each of the two “quadrants” (SI and IR) into 9 parts, rather than the whole semicircle SIR into 9 (or 18) parts, the drawing of all the azimuth lines becomes virtually impossible (the radii of the circles become extreme as one approaches S along the semicircle SIR). Therefore I have followed the medieval scribes in drawing only a few of the lines from S and a few of the azimuths. Note: the diagram reflects the text and not the correct means of drawing azimuths.

<sup>10</sup> The diagrams in mss Mλ and Rα are, for the most part, reversed left/right. The divisions are numbered similar to ms Pv. The lettering in Mλ and Rα is not listed in the apparatus criticus.

Mv(fol. 409<sup>r</sup>) Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qδ Qλ<sup>11</sup> Qμ(fol. 155<sup>v</sup>) Rα<sup>12</sup> Rδ  
Sδ Tδ Vβ Vι(fol. 333<sup>v</sup>) Xβ

[Partial diagram] Σκ Wβ

[Outline, or space only] Bθ Dγ Dη Eζ Ev Lβ Mφ Pv Re Sβ Vπ Vψ Wa

[No space] Cε Eδ<sup>13</sup> Nα Oξ

Pθ: "S"

[Caption]

Secundus ... azimuth] Bγ Cι Eβ Eη Eτ Fβ Fζ Lγ Lε Mη Mv Nε Oτ Ou Pα Pδ Pτ Pv Qβ Qγ Qδ Qλ  
Sδ Tδ Xβ; om. Mv Pλ Po Vι; Aι' modus azimuth Mφ; Figura faciendi azimuth Rδ; Figura  
inscriptione azimuth Pμ; Figura secundi modi inscribendi azimuth Vβ; Primus aliorum modorum  
faciendi azimuth Eα; Secunda figura inscriptione azimuth Mλ; 3<sup>a</sup> figura azimuth Re; 3<sup>us</sup> modus  
imponendi azimuth Bε( add. Figura capituli 19<sup>i</sup>)

inscribendi] om. Cη Fα Lη Mo Mδ Nδ Qμ; faciendi Oζ Pγ Pρ

[Lettering on the diagram]

A] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mv Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ  
Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vι Xβ B] Bγ Bε Cη Cι Eα Eη Eτ Fα Fβ  
Fζ Lγ Lε Lη Mδ Mη Mv Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pρ Pτ Qβ Qδ Qλ Qμ Rδ Sδ Tδ  
Vβ Vι Xβ; om. Qγ; cut off Eβ; D Pμ Po Pv C] Bγ Bε Cη Cι Eα Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη  
Mv Mo Mρ Mv Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Nδ Qβ Qγ Qδ Qλ Qμ Sδ Tδ Vβ Vι Xβ;  
om. Rδ; faint but legible Eβ D] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mv Mo  
Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vι Xβ; B Pμ Po Pv

F] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mv Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα  
Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vι Xβ G] Bγ Bε Cη Cι Eα Eβ Eη Eτ  
Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mv Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Qβ Qγ Qδ  
Qλ Qμ Rδ Tδ Vβ Vι Xβ; I Pv; s corr. to G Sδ H] Bγ Bε Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε Lη Mδ  
Mη Mv Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ  
Vι Xβ; om. Eη I] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mv Mo Mρ Mv Nδ Nε  
Oζ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vι Xβ; G Pv K] Bγ Bε Cη  
Cι Eα Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mo Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pρ Pτ Qβ Qγ Qδ Qλ Rδ Tδ Vβ  
Vι Xβ; om. Eτ Mη Mv Mρ Mv Pμ Po Pv Qμ; faint Eβ; H corr. to K Sδ; add. latitudinis gradus Pρ

L] Bγ Bε Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε Lη Mδ Mη Mv Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ  
Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vι Xβ; om. Eη M] Bγ Bε Cη Cι Eα Eβ  
Eη Fα Fβ Fζ Lγ Lε Lη Mδ Mo Mρ Mv Nδ Nε Oζ Oτ Ou Pα Pγ Pδ Pλ Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rδ  
Sδ Tδ Vβ Vι Xβ; om. Eτ Mη Mv Pv; P Pμ Po N] Bγ Bε Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lη Mδ

<sup>11</sup> The diagram in ms Qλ is very faint, perhaps because it was drawn in a different colour of ink. The lettering is barely readable, and the lines and circles have almost disappeared.

<sup>12</sup> See above, note 10.

<sup>13</sup> The diagrams in ms Eδ are unrelated to the text.

Mo Mq Mu Nd Ne Oz Ot Ou Pγ Pd Pl Pμ Po Pq Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vi Xβ; *om.*  
 Et Mη Mv Πα ο] Bγ Be Cη Ci Ea Eη Et Fa Fβ Fζ Lγ Le Lη Mδ Mη Mv Mo Mq Mu Nd Ne  
 Oz Ot Ou Pa Pd Pl Pμ Po Pq Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vi Xβ; *faint Eβ; om.* Pγ ]  
 Bγ Be Cη Ci Ea Eβ Eη Fa Fβ Fζ Lγ Le Lη Mδ Mo Mq Mu Nd Ne Oz Ot Ou Pa Pγ Pd Pl Pq Pτ Qβ  
 Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vi Xβ; *om.* Et Mη Mv; M Pμ Po Pv ο] Bγ Be Cη Ci Ea Fa Fβ Fζ  
 Lγ Le Lη Mδ Mo Nd Ne Oz Ot Ou Pa Pγ Pd Pl Pq Pτ Qγ Qδ Qλ Rδ Vβ Vi Xβ; *om.* Eη Et Mη Mv  
 Mq Mu Pμ Po Pv Qβ Qμ Sδ Tδ; *faint Eβ* ρ] Bγ Be Cη Ci Eβ Eη Et Fa Fβ Fζ Lγ Le Lη Mδ Mv  
 Mo Mq Mu Nd Ne Oz Ot Ou Pa Pγ Pd Pl Pμ Po Pq Pτ Pv Qβ Qγ Qδ Qλ Qμ Sδ Tδ Vβ Vi; *om.* Ea  
 Mη Rδ; x Xβ σ] Bγ Be Cη Ci Ea Eβ Eη Et Fa Fβ Fζ Lγ Le Lη Mδ Mη Mv Mo Mq Mu Nd Ne  
 Oz Ot Ou Pa Pγ Pd Pl Pμ Po Pq Pτ Pv Qβ Qγ Qδ Qλ Qμ Rδ Sδ Tδ Vβ Vi Xβ; *add.* zenith Pq  
 χ] Bγ Be Cη Ci Ea Eη Et Fa Fβ Fζ Lγ Le Lη Mδ Mη Mv Mo Mq Mu Nd Ne Oz Ot Ou Pa Pγ  
 Pd Pl Pμ Po Pq Pv Qβ Qγ Qδ Qλ Qμ Tδ Vβ Vi Xβ; *om.* Rδ; *faint Eβ; H Pτ; H corr. to x Sδ* z Bγ  
 Be Cη Ci Ea Eη Et Fa Fβ Fζ Lγ Le Lη Mδ Mη Mo Nd Ne Oz Ot Ou Pa Pd Pl Pμ Po Pq Pτ Pv Qβ  
 Qγ Qδ Qλ Sδ Tδ Vβ Vi Xβ; *om.* Mv Mq Mu Pγ Qμ; *faint Eβ; R Rδ*

[*Lettering of the divisions of the first azimuth (arc RI)*<sup>14</sup>]

*om.* Cη Ea Eη Mη ιζ'z''x'v Pv τovz' Pγ tvy Vβ tvyz' Bγ tvyz'c' Pμ  
 tvyz'z'' Po tyz'[illeg.] Eβ tyz'cx' Πα tyz'ec' Fζ tyz'ec' Ne tyz'x'  
 Mv Pl Pq Pτ Qδ tyz'x'c' Ci Fa Fβ Lγ Le Lη Mδ Mq Oz Pd Qβ Qγ Qμ Sδ Tδ tyz'x'c'g  
 Nd Ot tyz'x'e X'β tyz'x'f Vi tyz'x'r or tyz'x'c' Be tyz'x'σ Ou  
 tyz'x'z''Et Mv yz'x'c' Mo *lettering transferred to circle of Capricorn]* c'xz'ytv Rδ

[*Other information*]

*divisions of RI*] 1, 2, ... 7, 8 Pv<sup>15</sup> *divisions of G to AC]* 15, 30, ... 75, 90 Pv *divisions of I to B/D*  
*to A]* 15, 30, ... 75, 90 Pv *add.* Capricorni Pq *add.* Arietis et Libre Pq *add.* circulus  
 Cancrī Pq *centre of equator/tropics]* *add.* E Qμ

<sup>14</sup> The arc RI of the first azimuth is not always divided into 9 parts, nor are all the points of division necessarily lettered. As well the lettering generally extends from R to O only.

<sup>15</sup> The divisions in ms Mλ are similarly numbered.

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## [CAPITULUM 20.] ALIUS MODUS FACIENDI AZIMUTH

5 Alius modus faciendi azimuth levior et planior predicto: fac circulum Capricorni ABCD et equatorem diei EFGH super centrum I, et faciemus partem circuli emisperii BFHD et protrahemus diametros EG, HF ortogonaliter secantes se super I, sitque punctus K cenith capitum. Faciemus rursus posito centro in diametro AG in continuum

- 1 Alius ... azimuth] *ms* Gα *begins; om.* Bγ Bκ Cε Cη Dγ Eα Eβ Ev Gα Nα Pγ Qμ Rα Sβ Vχ; Capitulum de alio modo faciendi azimuth Bε; De 3<sup>o</sup> modo faciendi azimuth Xβ; De 3<sup>o</sup> modo inscribendi azimuth Vβ; Item de azimuth Pυ; Item de azimuth scilicet aliter. Rubrica. Bθ Vπ; 4<sup>us</sup> modus describendi azimuth Rε; *add. in marg.* Capitulum 20 Bε; *add in marg.* 3<sup>us</sup> modus inscribendi azimuth Fβ(*i.e., repeated*)  
*before* Alius] *add.* Item Pμ Rδ; *add.* Sequitur Pν Alius] Sequitur tercius Mν; Tercius Dη Pδ Vι Wβ; 3<sup>us</sup> Fβ Mν Ov Pq Pτ faciendi] *om.* Oφ Mq; conficiendi Pq; de Mλ; describendi Wβ; inscribendi Dη Fβ Mν Mν Pτ azimuth] azymut Mλ; azymuth Oφ; *add.* et c. Nε; *add.* melius Pμ
- 2 Alius] *mss* Lζ Oφ Vχ *restart* faciendi] conficiendi Pq; inveniendi Rε levior] *twice* Fζ et planior] *om.* Wβ planior] *corr. from* plenior Vι predicto] *om.* Rε fac] faciemus Oφ circulum] *add.* emisperii Gα Capricorni] *om.* Mo
- 2-3 Capricorni ... circuli] *om.* Ev
- 3 et equatorem diei] *om.* Mλ diei] *om.* Bγ Bθ Bκ Cε Cη Dγ Eδ Eζ Eτ Ev Gα Mν Mo Nα Pγ Pτ Pυ Rε Sβ Vβ Vπ Wβ; *interlin.* Po; qui est Oφ Vχ EFGH] GFEH Bθ Bκ Cε Cη Dγ Eδ Eζ Eτ Gα Mη Mλ Mν Po Pτ Pυ Rα Sβ Vπ Wβ; GFEG Pγ centrum] *om.* Vι I] *om.* Vπ faciemus] facies Eη; facies hijs Eα partem] *om.* Oζ Pλ Pq; *add.* per Cε Mλ circuli] circulum Pλ emisperii] *om.* Cη Eζ Mν Pγ; *interlin.* Bγ BFHD] BFCH Gα; BFGD Qβ; BHFD Pγ; BHFDO Mo; BSHD Pυ Sκ; GSHDO Cε
- 4 et ... HF] *marg.* Bε; *om.* Cη diametros] *add. interlin.* equatoris Bε EG] AG Bγ Bθ Cε Lζ Mη Mλ Mν Mo Nα Oφ Pγ Pτ Pυ Rα Rε Sβ Vβ Vπ Vχ; *corr. from* AG Po EG, HF] *om.* Eδ, Mδ Nδ; AGHF Gα Qμ; EG, GH, HF Qβ Sδ secantes] cecantes Eζ; tangisse Xβ se] *om.* Bθ Ev Gα sitque] *om.* Ev; scilicet Wβ κ] *om.* Nδ Wα; *marg.* Fβ; A Cε; *add.* in Nε; *add.* punctus Bε Eβ Eη Fα Lβ Lγ Lε Lη Mδ Mq Oζ Oξ Oτ(*interlin.*) Ov Pλ Pμ Pq Qβ Qγ(*marg.*) Qλ Sδ Tδ Xβ
- 5 cenith and elsewhere] zenith Bε Nα Pq; *twice* Rα Faciemus] *om.* Cη; faciemusque Bε Oφ *add. interlin.* ~I uno altero circulo Bθ rursus] *add.* in Nα centro] *om.* Oζ Pq in<sub>1</sub>] *om.* Eδ; *interlin.* Po in diametro] *om.* Nα AG] EG Bε Dη Eβ Eη Fα Fζ Lγ Lβ Lε Lη Mδ Oζ Oξ Oτ Ov Pα Pλ Pμ Pν Pq Qβ Qγ Xβ; G *interlin.* Gα
- 5-6 continuum directumque] continuum directum Bγ Cη Dγ Eζ Eτ Lβ Lζ Mo Po Pτ Xβ; continuum et directum Bθ Cε Dη Ev Mλ Mν Nα Pγ Pυ Vβ Vπ; continuum et directumque Qδ; continuum et in directum Wβ; continuum in continuum directum Eδ; directum continuumque Pθ Rδ; motinum directumque Wα

## [CHAPTER 20.] ANOTHER WAY OF MAKING AZIMUTHS

Another way of making azimuths,<sup>1</sup> easier [to execute] and clearer than the one mentioned above: make the circle of Capricorn, ABCD, and the equator, EFGH, on centre I, and we will make part of the horizon circle, BFHD, and we will draw the diameters EG, HF perpendicularly intersecting at I, and let point K be the zenith overhead. Again we will make – the centre positioned in diameter AG extended uninterrupted

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<sup>1</sup> This method is the same as in Capitulum 19, only here the first azimuth is correctly divided into equal segments. As well the lines which are drawn to the division points (and which intersect with the diameter of the first azimuth circle) start not from the zenith point but from the projection of the point on the sphere diametrically opposite the zenith point.

For Samsó's comments on possible sources for this capitulum, see Cap. 19 note 1.

directumque protracta super punctum O circulum transeuntem per H, K, F puncta qui sit KFLMNH. Protrahemusque diametrum NL equidistantem HF in utramque partem quantum oportuerit; et dividemus semicirculum MLK per trinos et trinos vel quinos et quinos gradus vel denos et denos, prout volumus facere azimuth. Et punctum M, qui est  
10 punctus oppositus summitati capitum, coniungemus cum unaquaque illarum

- 6 directumque] directum Qμ punctum] *om.* Sβ O] C Mv; D Et H, K, F] *del.* Pq; HKP Nα qui sit] que sit Bκ Fα Lβ Lε Mδ Oτ Oυ Qλ Pμ Tδ; que sit sint Oφ; q sint Bε Pq Sδ; que sint Bθ Lη Qβ VψWβ; que sunt Qδ Vι Vπ; quid sit Mη; sit Ev; *add.* circulus Bγ; *add. interlin.* scilicet circulus Vβ
- 7 KFLMNH] KAFLMNH Nα; KFBMNH Gα; KFCLMNH Eυ; KFELMNH Vπ; KFLMN Fα; KFLVMH Eτ; KFMNH Pγ; azimuth Wβ; *corr. from* KLFMNH Pθ Protrahemusque] Protrahemus Vπ; Protrahemus quocumque Lβ; Protrahemus quoque Eβ Fα Fβ Fζ Lγ Lε Lη Mq Mv Mφ Oζ Oξ Oτ Oυ Pα Pλ Pμ Pν Qβ Qγ Qδ Qλ Sδ Tδ Vι Wα Wβ Xβ diametrum] *om.* Eη Oφ NL] *om.* Pq; <sup>N</sup>L Vχ; vel Pγ equidistantem] equidistanter a Vβ; equidistantes Nα HF] HG Mδ; *ms* Bδ starts in] *om.* Cε; M Nα
- 8 quantum] quam Cη Dγ; qucm(!) Mv oportuerit] obtuerit Pγ; *add. interlin.* que sit NOL Pq semicirculum] circulum Bθ(*add. interlin.* semi) MLK] BMN Gα; KFLM Rε; LMK Eα; MKK Mv; MKL Cε Mv Nδ Vψ; MLB Eδ; MTK Bδ trinos<sub>1</sub> / trinos<sub>2</sub>] 3 / 3 *some* trinos et trinos] tercios et tercios Fα; ternos et ternos Dη et trinos] *om.* Cε Fζ Pλ Pq Qμ; gradus Vχ et trinos ... quinos<sub>2</sub>] *om.* Vι vel] *om.* Pν; *add.* per Cε Dη Pθ
- 8-9 trinos<sub>1</sub> ... denos<sub>2</sub>] ternos gradus vel quinos aut denos Oφ; 3(tres Dγ; trinos Bγ(*interlin.*) Mo Mq Rα Rε Sβ Vβ) vel(et Mq; *add.* per Gα Po Rε) quinos(q Nα) gradus vel denos(10 Nα) Bγ Bθ Bκ Cη Dγ Eδ Eζ Eτ Eυ Gα Lζ Mη Mλ Mv Mo Mq Nα Pγ Po Pτ Pυ Qδ(*add.* et dinos) Rα Rε Sβ Vβ Vπ Wβ; 3<sup>nos</sup> et quinos et trinos gradus vel denos Nε; trinos et quinos vel quinos et trinos gradus vel duos Sk quinos / quinos] 5 / 5 *some* et quinos] *om.* Pμ et<sub>3</sub> ... gradus] *om.* Qμ Vχ
- 9 gradus] 6<sup>a</sup> Bδ vel<sub>2</sub>] *add.* per Cε denos<sub>1</sub> / denos<sub>2</sub>] 10 / 10 *some* et denos] *om.* Bδ Cε Cι Eα Pδ Qμ Vχ Vψ prout] per ac Xβ; secundum quod Oφ Vχ; ut Qδ facere] *om.* Vπ Et facere] *om.* Gα M] *om.* Bγ Bδ Eη Ev; *interlin.* Bθ
- 10 punctus] *om.* Ev; punctum *some* oppositus] oppositum *some*; *add. interlin.* zenith seu Bε capitum] capitis Vψ coniungemus] iungemus Rε cum] *om.* Eη unaquaque] una quarum Mλ; utraque Dη illarum] *om.* Sβ; illa Cε; aliarum Mv Mφ Qλ Vι Wα



and straight – a circle on point O passing through points H, K, F which is to be [circle] KFLMNH. And we will draw diameter NL parallel to HF in both directions as much as it ought to be; and we will divide semicircle MLK by 3 at a time and 3 at a time or 5 at a time and 5 degrees at a time or 10 at a time and 10 at a time to the extent that you wish to make azimuths. And we will connect point M which is the point opposite to the high point overhead with each of those

divisionum usque ad lineam LN, sintque linee producte MP, MR, MS, MT, MY, MZ, MF'.<sup>2</sup>  
 Post hoc posito centro super puncta P, R et cetera describe circulos transeuntes per  
 punctum K, qui est cenith caputum; et illi, si perficerentur, transirent per punctum M qui  
 est oppositum cenith caputum; quare cum per opposita transeant in spera erunt omnes  
 15 ex circulis maioribus; horum autem circulorum solum facies partes apparentes supra

- 11 LN] HI Qδ; LM Bθ Ev Vπ; M Pγ sintque] sicque Nα; sicutque Sκ linee] *om.* Mo  
 MP] *twice* Rα; in P Oζ; OP Mλ; RAP Pγ; *add.* MQ Bθ Bκ Dγ Lζ Mλ Oφ Rε Vβ Vπ Vχ  
 MP ... MF'] MQ MS ML MP MT Gα MR] *om.* Mv; MV Xβ MS] S Bδ MS ... MT]  
 scilicet MF Bδ MT] *om.* Mv Mφ MF Bδ; *add.* ML Bγ Bθ Bκ Cε Cη Dγ Eδ Eζ Eτ Ev Lζ  
 Mη Mλ Oφ Pγ Po Pτ Pv Qδ Rα Sβ Vπ Vχ; *add.* ML MV MX Qμ Rε; *add.* MN Eτ; *add.* MR Cε;  
*add.* MU MV Mv; *add.* MV Bγ Bθ Bκ Cε Cη Dγ Eδ Eζ Lζ Mη Mλ Oφ Pγ Po Pτ Pv Rα Sβ Vβ  
 Vπ Vχ Wβ; *add.* MV EM VX Ev; *add.* MX Bγ Bθ Bκ Cε Cη Dγ Eδ Eζ Eτ Lζ Mη Mλ Mv Mφ  
 Oφ Po Pτ Pv Rα Sβ Vβ Vπ Vχ MY] MX Eα Pγ; *add.* Mζ MX Qδ MZ] *om.* Eα; HZ Eδ  
 Eζ; MC Bδ; MR Rδ; MX, MX MR Nα MF'] *om.* Sβ; M[*illeg.*] Rε; MSF Bγ Bθ Bκ Cη Dγ Eδ Eζ  
 Ev Lζ Mη Mλ Mv Oφ Pγ Po Pτ Pv Qμ Rα Vβ Vπ Vχ
- 12 Post hoc] *om.* Cε posito] opposito Mv Mφ Vι Wα super] sic Qγ puncta]  
*add.* -que Cε P, R] *illeg.* Qμ; F,Z,Y Pφ; PFRS Dη; PM Mη; P,Q,R Bγ Bθ Bκ Cη Dγ Eδ Eζ Eτ  
 Ev Lζ Mλ Mv Mo Nα Oφ Po Pv Rα Rε Sβ Vβ Vπ Vχ; per a R Pγ; R,P,L,S,Q Gα et  
 ceteris] *om.* Fβ Gα describe] describes *many*
- 13 K] HIK Pγ qui,] que *some* caputum] *om.* Cε Ev Vπ illi] *om.* Mv; quidem Vχ;  
*add.* *interlin.* que Vι; *add.* *interlin.* scilicet circuli Vβ si] 3 Xβ perficerentur]  
 aperficerentur Eζ; superficierentur Nε Vψ transirent] *marg.* Pτ; exirent Bθ Qδ Vπ;  
 transiuntemrent Lγ punctum<sub>2</sub>] *add.* K ... punctum (= *repeat of l. 13*) Wβ
- 14 est] *add.* punctus Cε caputum] capitis Mo; *add.* Glossa:(*om.* . Bκ) Et nota quod  
 invenies circulum transeuntem per cenit et principium Arietis et Libre et erit priumum  
 azimuth; et secundum quod deprimitur vel elevatur cenit secundum. Hoc oportet  
 querere centrum illius in diversis locis in dyametro ita quod primum azimuth semper  
 transeat per cenit et principium Arietis et Libre. Bκ Lζ quare cum] qui arcum Pγ  
 cum] eam Pv per] *om.* Mλ Oξ Rα opposita] *add.* puncta Bε Bδ Bκ Cι Dγ  
 Dη Eβ Eη Gα Lε Lη Mδ Mη Mλ Mv Mφ Mφ Nδ Nε Oζ Oξ Oτ Ou Oφ Pδ Pθ Pμ Pv Pφ Qμ  
 Rα Rε Sβ Sκ Tδ Vβ(*interlin.*) Vψ Xβ spera] sui Oξ Pμ Qγ erunt] erit Eζ;  
 eruntque Ev omnes] *add.* erunt omnes Eδ
- 15 ex] *om.* Gα; in Mη maioribus] minoribus *corr. in marg. to maioribus Sδ; add.* horarum  
 Rε; *add.* T Oξ autem] *om.* Qδ; de Wβ autem circulorum] *om.* Nε solum]  
 solis Bθ Sκ supra] extra Fβ Mv Mφ Vι Wα; infra Rε; super Mδ Qγ

<sup>2</sup> Some manuscripts, including some early ones, give this point a double lettering, i.e., “SF” in both the text and in the diagram. The majority use an “F” which I mark as “F’” (F-prime) in order to distinguish it from the “F” which helps define the equator.

divisions right up to line LN, and let the extended lines be MP, MR, MS, MT, MY, MZ, MF'. Next, after positioning the centre on points P, R et cetera, draw circles passing through point K, which is the overhead zenith, and if they were completed [properly] they would pass through point M which is opposite the overhead zenith; therefore when they pass through opposite [points] on the sphere, they will all be from the greater circles;<sup>3</sup> however, of these circles you will construct only the parts appearing above

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<sup>3</sup> I.e., “great circles” – circles on a sphere which pass through opposite points, usually, but not necessarily, the poles.

circulum emisperii usque ad circulum Capricorni, eruntque inter quoslibet duos ex  
 circulis illis tot gradus quot intercipiebantur inter divisiones semicirculi KFLM. Cum  
 autem hoc feceris, sume de linea LN aperte 11 partes equales OF', OZ et cetera. Et  
 super illa puncta positis centris describe circulos transeuntes per K, eruntque illi  
 20 azimuth. In aliis duabus quartis factis similiter sicut priores totidem gradus inter se

- 16 circulum,] *add.* Capricorni Nε; *add. interlin.* eius Vβ eruntque] eritque Eζ  
 quoslibet duos] quos Wα duos] 2 *many*; 3 Cη Eτ; *add.* circulos Dη ex] *om.*  
 Vι
- 17 tot] quot Gα; *add. in marg.* similiter est q̄n ymo mediatis tamen Sβ gradus] gradibus  
 Nα; *add.* similiter est q̄n immo medietas tamen Gα Rα quot] quod Eη Mv Rα  
 intercipiebantur] inter 2 puncbantur (!) Xβ inter] *add. interlin.* lineas Bγ  
 semicirculi] circuli Vψ KFLM] KFMS Cε Eα; KKN Sβ
- 18 hoc] *om.* Nε Pγ; hec Eζ sume] sumte Wα linea LN] LMEA LN Qλ Wα LN]  
 LM Eζ; M Gα; *corr. from* LM Po aperte] apparente Eδ; ex parte Pδ 11] *om.* Cε Fζ;  
 EM Pq; N<sup>4</sup> Bγ Bδ Bθ Dη Gα Lζ Mo Mq Mv Mφ Nε Oφ Pθ Pλ Po Pτ Qγ Qλ Rδ Re Sδ Tδ Vβ  
 Vι Vχ Vψ Wβ Xβ OF', OZ] *corr. from* OF O2 Oξ; D.F.O.R.O.[*illeg.*] Nα; GSF, GZ, GY Vχ;  
 OF'OR Mq; OF', OR, OY Rδ; OF', OZ, OY Cι Eα Eτ Nε Pδ Pθ Qδ Vψ Wβ; OP OQ OR OS Re; OSF,  
 OZ Qμ; OSF, OZ, OY Bγ Bθ Bκ Cη Dγ Eδ Eζ Ev Lζ Mη Mλ Mv Mo Oφ Pγ Po Pτ Pv Rα Sβ  
 Sk Vβ Vπ; OSFO, ZO, Y Cε et cetera] *om.* Nα
- 19 super] similiter Mδ Nδ Qγ Rδ illa] *om.* Pγ; ista Nα centris] circinis Sβ  
 describe] describere Vψ κ] H Pγ Vπ
- 20 aliis] illis Nα duabus] *om.* Mq; 2 / 2<sup>bus</sup> *some*; C Pγ duabus quartis] 24 Pv  
 factis] facies Re; f̄c̄is Dγ Lγ similiter] sit Mv sicut] *om.* Qλ totidem]  
 Dη Mv; totidemque *all others*<sup>5</sup>
- 20-21 totidem ... priores] *om.* Lβ Qδ

<sup>4</sup> Whether a ms has “N” or “11” can be problematic since they tend to be written in almost exactly the same way. I choose to treat as “N” any reading which is marked off with dots, i.e., “.N.” since this is a common way in which individual letters (signifying particular points) are indicated in the text in many mss.

<sup>5</sup> The *-que* is redundant here.

the circle of the horizon as far as the circle of Capricorn, and there will be between whichever two of these circles as many degrees as were cut off between the divisions of semicircle KFLM. However, when you have done this, take from line LN clearly 11 equal parts OF, OZ and so on. And on those points taken as centres draw circles passing through K, and these will be the azimuths. In the other two quarters made similarly just as the previous ones they will separate off just as many degrees between them

intercipient quot priores, et hec est figura.

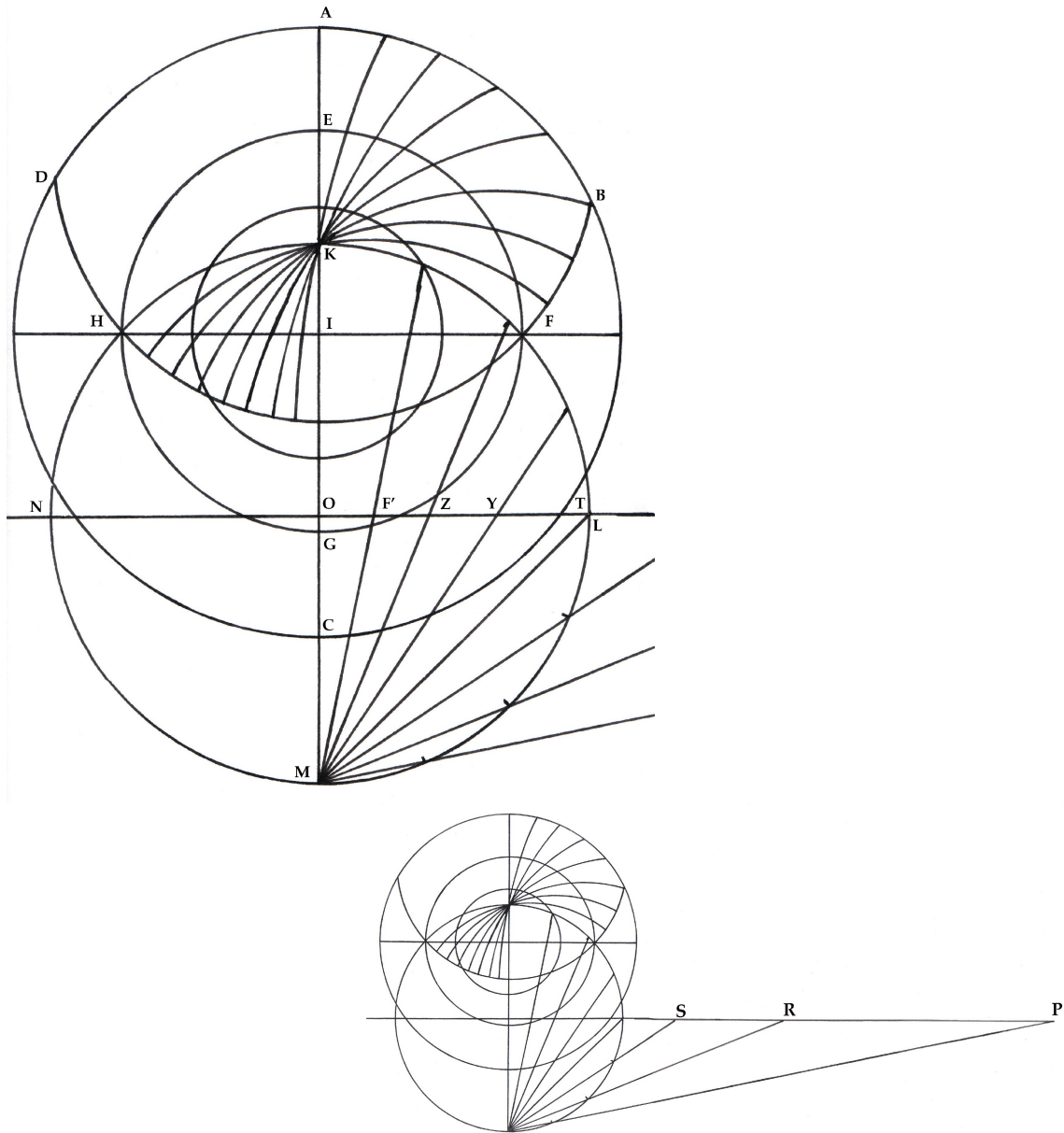
- 21    intercipient] capient Cε    quot] que Sκ; quod Mλ    et ... figura] *om.* Vχ; et hoc patet in figura Bε; et huius est figura que sequitur Eτ; et huius est figura(*add. interlin. invendiat scilicet*) antecedens Vβ; et patet in presenti figura Vι; ut apparet in hec figura ultima Pτ; ut in supra figura Cε; ut patet in(*add. hac Bκ; add. predicta Dη*) figura Bκ Nα Rε; ut patet in figura supraposita Pυ    hec] hic / hoc *some*; huius Bγ Cη    hec est] habunt Rδ    est] est ē Oξ; *add. precedens Lη    figura] add. presens Fβ; add. supra Bγ Cη Dγ Eδ Eζ Gα Lζ Mλ Mν Po; add. talis Pο; add. Explicitur compositio astrolabii cum [illeg.] nobilibus Gα<sup>6</sup>; ms Gα ends*

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<sup>6</sup> Because of the ordering of the capitula in ms Gα, and this being the end of the text of the *Compositio*, the explicit is here.

as the previous ones. and this is the figure.

[ FIGURA 20 ]



Tertius modus inscribendi azimuth /  
A third method of inscribing azimuths

[Complete diagram] Bγ Bε Bκ Cη Cι Eα Eβ(upside down) Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ  
Mη Mλ Mν Mo<sup>7</sup> Mρ Mυ(fol. 409<sup>r</sup>) Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pτ Pυ Rα Rδ Rε

<sup>7</sup> The diagram in Mo is a combination of both Figura 20 and Figura 21. The lettering noted here is only that which relates to Figura 20.



Qβ Qγ Qδ Qλ Qμ(*fol. 156<sup>r</sup>*) Sδ Tδ Vβ Vi(*fol. 333<sup>v</sup>*) Xβ

[*Outline, or space only*] Bθ Dγ Dη Eζ Eυ Lβ Mφ Pν Sβ Sκ Vπ Wα Wβ

[*No space*] Bδ Cε Eδ<sup>8</sup> Gα Nα Vχ

Pθ: “T”

[*Caption*]

Tertius ... azimuth] Bγ Eβ Fζ Lγ Lε Mη Mν Nε Oξ Pα Pδ Pλ Pτ Qλ Sδ Tδ Xβ; *om.* Mρ Mυ Rα Vi;  
 Alius figura de inscriptione azimuth levior et melius quam priores Pμ; Bona doctrina inscribendi  
 azimuth Bκ Lζ; Figura de inscriptione azimuth Pο; Figura inscriptionis azymuth melior Mλ;  
 Figura faciendi(?) azimuth Rδ; Figura inscriptionis azymuth secundum alium modum et bonum  
 Oφ; Figura inscriptionis azimuth secundum 3<sup>m</sup> modum Fβ(*twice*); Figura 3<sup>i</sup> modi inscribendi  
 azimuth Vβ; Secundus aliorum modorum azimuth Eα; Tertius modus azimuth et est levioris Pυ;  
 4<sup>a</sup> figura azimuth Rε; Quartus(*corr. from Tertius*) modus imponendi azimuth Bε(*add. Figura*  
*capituli 20<sup>mi</sup>*); Tertius modus Mρ

Tertius] 3<sup>us</sup> *many*; Alius Eη Eτ inscribendi] *om.* Cη Fα Lη Mδ Nδ Oζ Oτ Oυ Qγ Qμ;  
 conficiendi Pρ; faciendi Pγ Qβ; imponendi Eη; scribendi Cι Qδ azimuth] *add. cum*  
 inscriptione lineae crepusculi et aurore Mo<sup>9</sup>

[*Lettering on the diagram*]

A] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mo Mρ Mυ Nδ Nε Oζ Oτ  
 Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vβ Vi Xβ; *cut off* Oξ

B]<sup>10</sup> Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mλ Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ  
 Pα Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vβ Vi Xβ; *om.* Eτ Mη Mν Pγ Qγ; S Mo

B'] v Rδ C] Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mo Mρ Mυ Nδ Nε Oζ  
 Oξ Oτ Oυ Oφ Pα Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qμ Rδ Rε Sδ Vβ Vi Xβ; *om.* Eτ Mη Mλ Mν Pγ Pδ

Qλ Rα Tδ D]<sup>11</sup> Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mρ Mυ Nδ Nε  
 Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rε Sδ Tδ Vβ Vi Xβ; *om.* Eτ

Mν; T Mo; v Rδ D'] Rδ E] Bγ Bε Bκ Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ  
 Mν Mo Mρ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ

Tδ Vβ Xβ; *om.* Eη Mυ Vi F] Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mλ Mo Mρ  
 Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pο Pρ Pτ Pυ Qβ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vβ Vi Xβ;

*om.* Eτ Mη Mν Pμ Qγ G] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν  
 Mo Mρ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Tδ Vβ

<sup>8</sup> The diagrams in ms Eδ are unrelated to the text.

<sup>9</sup> The caption in Mo reflects the fact that the diagram is a conflation of Figura 20 and Figura 21.

<sup>10</sup> Many, if not most, diagrams have “B” twice, once at the end of diameter HIFB, and a second time where the arc of the horizon intersects with the Tropic of Capricorn (DHFB).

<sup>11</sup> Many, if not most, diagrams have “D” twice, once at the end of diameter DHIF, and a second time where the arc of the horizon intersects with the Tropic of Capricorn (DHFB).

Vι Xβ; *om.* Mυ H] Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mλ Mο Mρ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vβ Vι Xβ; *om.* Eτ Mη Mν Mυ I] Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vβ Vι Xβ; *om.* Eτ Mν K] Bγ Bε Bκ Cη Cι Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rε Tδ Vβ Vι Xβ; *om.* Eα Sδ; *illeg.* Rδ; O Eτ; *add.* zenith Pρ L] Bγ Bε Bκ Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qλ Qμ Rδ Rε Sδ Tδ Vβ Vι Xβ; *om.* Mη Mλ Pγ Qδ; N Rα M] Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pδ Pλ Pμ Pο Pρ Pυ Qβ Qγ Qδ Qλ Rα Rδ Rε Sδ Tδ Vβ Vι Xβ; *om.* Eτ Mη Mλ Qμ; *cut off* Eη Pτ; H Mν; N Pγ N] Bγ Bε Bκ Cη Cι Eα Eβ Eη Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pδ Pλ Pο Pρ Pτ Qβ Qγ Qδ Qλ Qμ Rδ Rε Sδ Tδ Vβ Vι Xβ; *om.* Eτ Mη Mλ Mν Pυ Rα; *cut off* Pμ; M Pγ O] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Oφ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qλ Qμ Rα Rδ Rε Sδ Tδ Vβ Vι Xβ

[Lettering along line OL extended]<sup>12</sup>

[O] F' RY [L] SP(?) Q Rδ; [O] F' ZXT [L] SP Nδ; [O] F' ZYT [L] SRP Bε Cη Eα Eβ Eη Fα Fζ Lη Nε Oζ Oτ Oυ Pλ Pρ Qβ Qγ Qλ Qμ Sδ; [O] F' ZY [L] TS Mδ; [O] F' ZYT [L] Pα Pτ; [O] F' ZYT [L] SR Oξ Pδ Qδ<sup>13</sup>; [O] F' ZX Y T [L] S Cι Lε Lγ; [O] F' ZY [L] ST Tδ; [O] F' ZY [L] TR Q Mη; [O] F' ZY [L] TSVP Xβ; [O] F' ZYT [L] SR Fβ; [O] F' ZYVS Eτ; [O] F' ZYX [L] TPυ; [O] F' ZYX [L] TSP Pμ; [O] F' ZYX [L] TSRP Mο Mρ; [O] PQRST [L] VXYZ [*illeg.*] Rε; [O] SF' ZYT [L] SRP Mν; [O] SF' ZYV [L] TSRQP Oφ<sup>14</sup>; [O] SF' ZYVT Mλ; [O] SF' ZYX [L] TSQ Pο; [O] SF' ZYX [L] TSBγ; [O] SF' ZYX [L] VT Vβ; [O] SF' ZYXV [L] TSR Bκ; [O] SF' ZYXV [L] TSRQ Lζ; [O] YXT [L] SRQP Mυ; [O] YXVT [L] SRQP Vι; [O] Z' ZY 7 V Pγ<sup>15</sup>; [O] ZXY [*om.* L] TSQ Rα<sup>16</sup>

[Other information]

*divisions of arc from H to line IG] 10, 20, ... 80, 90 Vβ*      *divisions of arc from H to IA] 15, 30, ... 75, 90 Rα*  
*divisions of arc from F to circle of Capricorn (at B) to A] 10, 20, ... 80, 90 Vβ*      *add. Arietis et Libre, equator diei Pρ*      *add. Cancrī Pρ*      *add. Capricornī Pρ*      *add. cenith Oφ*  
*add. centrum Oφ*      *add. circulus hemisperii Pρ*      *add. oppositum cenith Oφ*  
*add. quelibet azimut continet 7 gradus cum division Lζ*

<sup>12</sup> Note in many cases the line and letters extending to the right run off the page or into the gutter where they cannot be seen. Occasionally the line OL extended is continued down at right-angles, with the letters along this extension. In any case, only the visible letters are recorded here.

<sup>13</sup> In ms Qδ the lettering runs from O out to the left along line ON extended.

<sup>14</sup> In ms Oφ the lettering is repeated, right to left, along line ON extended.

<sup>15</sup> In ms Pγ arc MH is divided PRSTXL.

<sup>16</sup> In ms Rα the lettering runs from O out to the left along the line ON extended.

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## [CAPITULUM 21.] DE POSITIONE LINEE CREPUSCULI ET AURORE

5 Cum vis ponere lineam crepusculi et aurore, describe equidistantem orizontem sub eo ad partem puncti oppositi cenith capitum cuius latitudo ab orizonte sit 18 graduum ad tot enim gradus sole existente sub orizonte apparet lux solis. Illum autem hoc modo describes: fac circulum Capricorni ABCD, et Arietis et Libre EFGH super

- 1 De ... aurore] *om.* Bγ Bδ Cε Dγ Eα Eυ Pγ Pτ Rα Sβ Vχ Vψ Xβ Nα; Capitulum de compositione linee crepusculi et aurore Bε; De linea crepusculi Pυ; De linea crepusculi et aurore Oφ(*add. marg.* De compositione linee crepusculi et aurore); De linea crepusculi ponenda. Rubrica Bθ Vπ; Descriptio linee crepusculorum. Capitulum Wβ; Descriptio linee crepusculi et aurore Rε; Lineam de crepusculo Lζ; Modus inscribendi linee crepusculi et aurore Pμ; *add. marg.* Capitulum 21 Bε
- before* De] *add.* Capitulum Fβ; *add.* Sequitur de positione linee cpe. Pυ positione] compositione Nδ; impositione Dη Eη Oυ Pδ; inscriptione Cη Eτ Fβ Mv Mo Vβ linee] *om.* Pθ; aglenee Po; linea Mv crepusculi] crepusculi Mδ et aurore] *om.* Dη Eτ Mλ Mv Pυ Vβ aurore] *add.* capitulum Mo Qβ; *add.* capitulum rubrica Cη; *add.* etc. Rδ; *add.* Rubrica Pθ
- 2 Cum] *add.* vero Bκ vis] volueris Oφ Vχ ponere] *om.* Dγ et aurore] *om.* Mλ Mo describe] *add.* circulum Bγ(*interlin.*) Eα equidistantem] *om.* Bθ Vπ orizontem] orizonte Pλ; orizonti Bγ Bδ Dη Eα Eτ Eυ Mv Mo Oφ(*add. interlin.* a] orizontem) Vπ Vχ Xβ
- 3 eo] *add.* n (= enim?) Wα puncti oppositi] punctum oppositum Rδ; puncti oppositam Bθ cenith *and elsewhere*] cenit *some*; zenith Bε Pρ; zenith Nα capitum] capitis Rδ Vχ cuius] *corr. from* huius Qδ cuius latitudo] *om.* Nε sit] *om.* Bγ Cε Cη Eδ Eτ Mo Pγ Po Pτ; *illeg.* Eη; est Bθ Eυ Mv Nα Pυ Qδ Vπ; *add. interlin.* est Vβ
- 4 graduum] *om.* Nε ad] *om.* Xβ tot] totidem Mv enim] *om.* Mη Qu existente] *om.* Bκ Dγ Eδ Eζ Lζ Mλ Mv Oφ Po Rα Vχ; exeunte Pυ apparet ... solis] *om.* Wβ solis] *add.* notabilis Dη; *add.* in orizonte Cε; *add.* sub orizonte Bθ Cη Dγ Eδ Eζ Eτ Eυ Lζ Mλ Mo Nα Oφ Po Pτ Pυ Rα Sβ Vβ Vπ Vχ; *add.* super orizontem Bγ Mv Pγ Qδ Rε
- 4-5 autem ... modo] quem circulum sic Qδ; sic Eυ
- 5 hoc modo] sic Vπ modo] *om.* Bε Pλ describes] describas Eζ fac] facies Vχ circulum] circulos Mv

[CHAPTER 21.] ON THE PLACING OF THE LINE OF TWILIGHT<sup>1</sup> AND DAYBREAK

When you wish to make the twilight and daybreak line, draw a parallel<sup>2</sup> to the horizon below it to the side of the point opposite the overhead zenith, whose latitude from the horizon should be 18 degrees; for with the appearance of the sun below the horizon at so many degrees, the light of the sun is visible. You will describe this, however, in this way: make the circle of Capricorn, ABCD, and of Aries and Libra, EFGH, on

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<sup>1</sup> *Crepusculum* usually means evening twilight, but it can refer to both morning (*crepusculum matutinum*) and evening (*crepusculum vespertinum*). Here, in its singular form and differentiated from *aurora* (“break of day”) it would be evening twilight.

The captions of many of the diagrams use *linea crepusculorum*, which would cover both times of day. The twilight line functions for both – when the sun is approaching the horizon at daybreak and night fades, and when the sun recedes below the horizon at sunset.

<sup>2</sup> Obviously the twilight/daybreak line or circle is parallel to the horizon in the sphere, but not parallel (or even concentric) when projected on a plane.

- centrum I, quos quadrabis duobus diametris se ortogonaliter abscondentibus super I, sicut AC, DB; et sumes latitudinem regionis ab F versus E in equatore que sit KF; item ab H versus G, que sit HL, et ducantur linee FK, FL, que occurrant diametro AC, quantum expedit in continuum et directum protracte super puncta O, Q; divisaque linea OQ, describatur super punctum medium pars circuli THQFS, qui erit circulus emisperii. Post
- 10
- 6 centrum] *om.* Bγ Bθ Bκ Cε Cη Dγ Eδ Eζ Eτ Ev Lζ Mη Mλ Mo Nα Oφ Pγ Pτ Pv Qμ Rα Sβ Vπ Vχ; *interlin.* Po Vβ; centro Bδ Bε centrum I] *om.* Mv I] A Mv; LI Pv; S Mη quos ... I<sub>2</sub>] *om.* Tδ quadrabis] dactabis Cε duobus] *om.* Cε; duobus *many*; 2 some; *add.* mabus/inabus Vπ se] *om.* Eδ Oφ abscondentibus] incidentibus Xβ
- 7 sicut] sint que Oφ Vχ AC, DB] AB, CD Bθ Cι Dη Eζ Nα Pτ Qδ Sk Vι Vπ; AB, DB Qγ; AD, CB Cη Eτ Mv; AD, CH Pγ Wβ sumes] si acc Nα latitudinem] longitudes Nα regionis] *om.* Cε Mo ab F] ABF Eζ Nα Qμ Sk F] *om.* Bδ E] AC Bθ; AE Ev; C Mv que sit] *add.* que sit Lβ KF] HF Cι item] *om.* Pγ; itemque Oφ Vχ; *add.* *interlin.* aI' et Vβ
- 7-8 que sit ... G] *marg.* Pλ; *om.* Pq Wβ ab H] ABH Qδ Sk
- 8 versus] usque Nα que<sub>1</sub>] *om.* Bθ Cε Ev; quolibet Fβ HL] K Sk; *add.* *interlin.* et FK Pq et ducantur] ducanturque Vχ FK, FL] *corr.* from FH, FL Pλ; FK Wβ; FKL Bδ; FKKL Mo; FKSFL Dη; FLH, FL Vι; FLZ, FL Mφ que<sub>2</sub>] qui Fα Lη Oζ Pμ Qβ Sδ; *add.* ut Mv Mφ AC] AE Cη Dγ Ev Lζ Mλ Po Pv Vπ; aI' AE Oφ; *ms* Vχ ends
- 8-9 quantum ... protracte] *om.* Dη
- 9 in] *add.* diametrum Pv et] *om.* Eζ directum] *add.* quia Oφ protracte] *om.* Cη Eτ Pγ; *marg.* Bγ; *interlin.* Re; protracto Bδ; protracta Cε; protractate Nα; protrahe Bε Eβ Ev Fα Fβ Fζ Lβ Lγ Lε Lζ Lη Mδ Mv Mφ Oζ Oξ Oτ Ou Pα Pλ Pμ Pv Pq Qβ Qγ Qλ Sδ Tδ Vι Wα; *corr.* in *marg.* from protrahe Rα puncta] *om.* Re; punctum *many* divisaque] divisa quia Vπ; *add.* per medium Xβ divisaque ... OQ] *om.* Bκ Eτ Rδ Sk Vψ; *rep.* Ne OQ] *om.* Qμ; *interlin.* Bε; OK Nα; VQ Pγ; *add.* in duo media Bδ Ea
- 10 describatur ... circuli] *erased and corr.* to describes circulum Pq super punctum] per Dη punctum]<sup>3</sup> Bγ Ea Eδ Xβ; p<sup>m</sup> Lζ; primum Bδ Bε Bθ Cε Cη Cι Dγ Eβ Eζ Eη Eτ Fa Fβ Fζ Lβ Lγ Lε Lη Mδ Mη Mλ Mv Mo Mv Mφ Nα Oζ Oξ Oτ Ou Oφ Pα Pγ Pδ Pθ Pλ Pμ Pv Po Pτ Pv Qβ Qγ Qδ Qλ Sδ Tδ Vβ Vι Vπ Vχ Wα Wβ; *add.* eius Ev pars] *om.* Eδ; S P Vψ THQFS] OHGFS Pq; TH et FS Vψ; THOFS Mη; THQFG Oζ Pλ; THQSF Ev Mv Vπ erit] *om.* Mv; erunt Ea

<sup>3</sup> While in some manuscripts it is quite clear whether the scribe wrote *primum* or *punctum*, in others the abbreviation (e.g., *p<sup>m</sup>*) could be interpreted as either word. However, it is clear from the sense of the sentence that whatever was written it should be *punctum*.

centre I, which you will make square by having the two diameters cut each other perpendicularly on I, as AC, DB; and you will assume the latitude of the region along the equator from F towards E, which should be KF; similarly from H towards G, which should be HL, and let lines FK and FL be drawn, which are to meet with diameter AC extended as much as is useful uninterrupted and straight at point O and Q; and after dividing line OQ part of circle THQFS should be drawn on the mid-point, which will be the horizon circle. After this

hoc sumantur ab K versus F et ab L versus G arcus 18 graduum qui sunt KM, LN.  
 Ductisque lineis FM, FN, occurrent lineae AC super puncta P, R; lineam ergo PR dividemus  
 per medium et in puncto medio posito centro describemus partem circuli VRX, qui erit  
 15 circulus equidistans orizonti, cuius ab orizonte latitudo erit 18 graduum et ipsa est linea  
 crepusculi et aurore, cuius hec est figura.

- 11 hoc] *om.* Nε hoc sumantur] sumant arcus 18 Bθ Vπ ab] *add.* puncto Tδ ab  
 K] a K/AK *many*; ABK Cη Nα K] *om.* Pα versus,] *marg.* Rε F ... versus,] *om.*  
 Wβ ab L] ABL Cη Nα Pv Qβ Sκ Vψ arcus 18 graduum] *om.* Cε Mo  
 graduum] *interlin.* Bγ Po; *marg.* Pτ; *om.* Bθ Eδ Eζ Ev Mv Pγ Sβ Vπ; *add.* arcus idem  
 Ev sunt KM, LN] MKMLN Mη KM, LN] KM et LN *some*; KM, HI Sβ; KLMLN Mv Mφ  
 Vι; KLMN Eδ Eη Fζ Nα; KM, M Eτ; KM, IN Pγ; *add.* *interlin.* in una in alia Oτ Ov
- 11-12 KM ... Ductisque] *om.* Nε LN. Ductisque] Inductisque Cη Mv
- 12 Ductisque] Ducatque Fβ; Ductus quod Sκ FM, FN] FM, FU Cη; FM, N Cε Mo  
 occurrent] occurrentque Fβ; securrent Eζ lineae] *om.* Bθ Vπ lineae ... PR<sub>2</sub>] *om.* Oφ  
 AC] NC Mo super] *twice* Bκ P, R<sub>1</sub>] per Mη ergo] *om.* Mv  
 ergo PR<sub>2</sub>] G.O.P.R Nα PR<sub>2</sub>] *corr. from* PMR Eα; PZ Fβ; patet Wα dividemus]  
*repeated* Eδ
- 13 medio posito] *om.* Qδ posito] opposito Nα centro] dentro Mλ circuli]  
*om.* Et Pγ VRX] MS VIS Wβ; MX Bε Eη; URS Cη; VIX Lβ; *corr. from* VIX Rα; vis Pγ; YYX  
 Nα erit] eritit Vπ
- 13-14 qui ... orizonti] *om.* Oξ
- 14 circulus] *om.* Mo equidistans] *om.* Et Pγ orizonti] ab orizonte Bε; *add.* eius Pτ  
 orizonte] *illeg.* Mv; oriente Cη 18] 1r Cε; 10 Eζ est] *om.* Bκ Mv
- 15 cuius ... figura] *om.* Lη Oφ; cuius figura hic supra apparet Dη; et hoc potest describi in  
 precedentibus figuris vel in sequentibus Pδ; et hoc potest describi in precedentibus  
 figuris vel in sequentibus, cuius hec est figura Sκ; quod patet describi in presenti figura  
 vel sequenti Cε; ut patet in figura Nα; ut patet in superscripta figura Pv Vβ; utque in  
 figura Bε; vel in alia [*illeg.*] et hoc potest describi in precedentibus figuris vel in  
 sequentibus cuius hec est figura Nε; *add.* *interlin.* scilicet inmediate ā'r'c'dens Vβ  
 hec] *om.* Mη Pγ Wβ; *add.* precedens Pv figura] *add.* sequens Tδ; *add.* supra Eζ  
 Po Pτ; *add.* superscripta Bγ Cη Mo Wβ; *add.* utque [*illeg.*] patet etc. Rδ; *add.* Explicit  
 compositio astrolabi etc. Amen Rδ<sup>4</sup>; *mss* Dη Mv Oφ Vχ *end*

<sup>4</sup> The explicit appears here in ms Rδ because Cap. 22 is found earlier, and Cap. 17 and 18 which follow have a new title as if a different work. See Cap. 17 line 1 apparatus.



let arcs of 18 degrees be assumed from K towards F and from L towards G, which are KM, and LN. And after you draw lines FM and FN, they will meet with line AC on points P and R; we will therefore divide line PR in half, and having positioned the centre in the midpoint, we will describe a part of the circle VRX, which will be the circle parallel to the horizon, whose latitude from the horizon will be 18 degrees, and this is the line of twilight and daybreak, of which this is the diagram.

[ FIGURA 21 ]

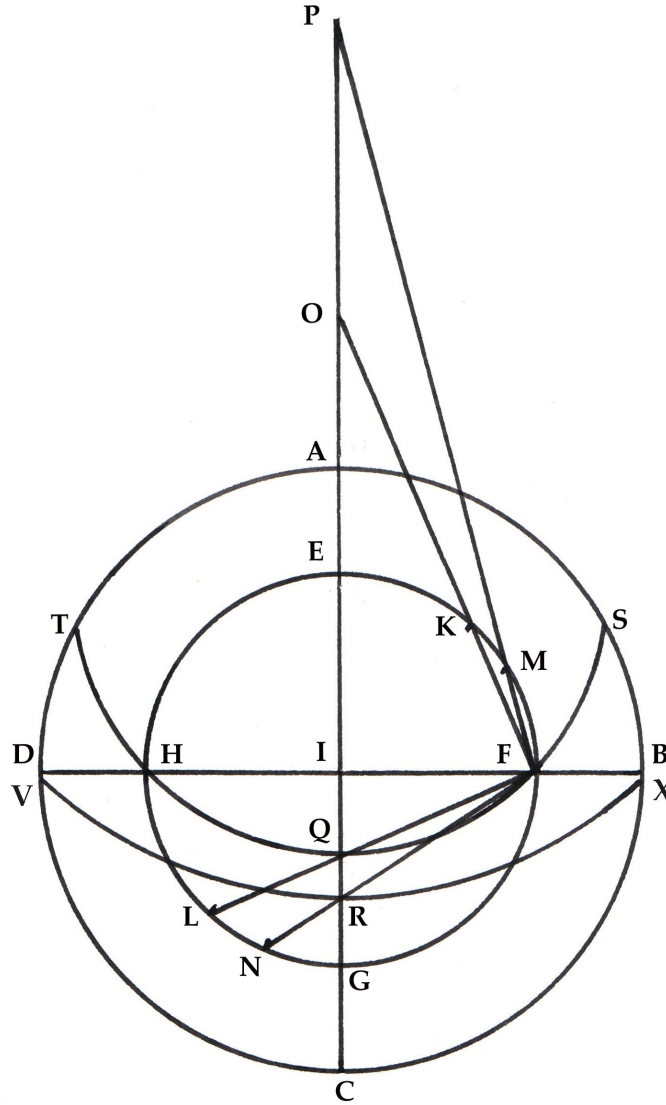


Figura inscriptionis lineae crepusculi et aurore /  
Figure of the inscription of the twilight and daybreak line

[Complete diagram] Bγ Bε Cη Cι Eα Eβ Eη Eτ Fα Fβ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mo<sup>5</sup> Mο  
Mυ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qμ (fol. 156<sup>v</sup>) Rδ Rε Sδ Tδ Vβ Vι (fol.  
333<sup>r</sup>) Xβ

<sup>5</sup> The diagram in ms Mo is a conflation of both Figura 20 and Figura 21. The lettering noted here is only that which relates to Figura 21.

[*Outline, or space only*] Bθ Bκ Cε Dγ Dη Eζ Eu Lβ Mφ Oφ Pv Qδ Qλ Sβ Sk Vπ Vψ Wα Wβ  
 [No space] Bδ Eδ<sup>6</sup> Nα Rα  
 Pθ: “V”

[Caption]

Figura ... aurore] Cι Fβ Mo Oζ Pδ Pμ Pρ Vi; *om.* Lζ Mρ Pλ Re; Inscriptio linee crepusculi et aurore Eα; Inscriptio linee crepusculi Pγ; Inscriptio linee crepusculorum Fα Mδ Nδ; Tercius modus inscribendi azimuth cum inscriptione linee crepusculi et aurore Mo<sup>7</sup>; *add.* Figura capituli 21<sup>mi</sup> Be inscriptionis] *om.* Et Mv Mv Po Vβ linee] *om.* Eβ; linea Mv crepusculi] crepusculiem(!) sive crepusculorum Be; crepusculorum Cη Eβ Fζ Lγ Le Lη Ne Oξ Ot Ou Pα Pρ Pτ Qβ Qγ Sδ Tδ et aurore] *om.* Bγ Cη Eβ Eη Et Lγ Le Lη Mη Mλ Mv Ne Oξ Ot Ou Pα Po Pρ Pτ Pv Qβ Qγ Qμ Sδ Tδ Vβ Xβ; *add.* etc. Rδ

[Lettering on the diagram]

A] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ B] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.*; κ Po; x Pμ C] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Nδ Ne Oζ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi; *om.* Xβ; *cut off* Mu Oξ D] Bγ Be Bκ Cη Cι Eα Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.* Eβ Mδ; v Pμ E] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.* Lγ F] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Po Pρ Pτ Pv Qβ Qγ Qδ Rδ Re Tδ Vβ Vi Xβ; *om.*; Z Pμ; *corr. from* P Sδ G] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mo Mρ Nδ Ne Oζ Oξ Ot Ou Pα Pδ Pλ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.* Mλ Mu Pγ; *illeg.* Mv; γ Pμ H] Bγ Be Bκ Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Xβ; *om.* Cη Mu Pμ Vi I] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mλ Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Re Sδ Tδ Vβ Vi Xβ; *om.* Rδ Pγ; L Mη Mv K] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.* Fβ L] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ M] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fζ Lγ Le Lζ Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.* Fβ N] Bγ Be Bκ Cη Cι Eα Eβ Eη Et Fα Fβ Fζ Lγ Le Lζ Lη Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Tδ Vβ Vi Xβ; *om.* Mδ O] Bγ Be Bκ Cι Eα Eβ Et Fα Fβ Fζ Lγ Le Lζ Lη Mδ Mλ Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rδ Re Sδ Vβ Vi Xβ; *om.* Cη Mη Mv; *illeg.* Eη Tδ P] Bγ Be Bκ Cη Eβ Fα Fβ Fζ Lγ Le Lη Mδ Mη Mλ Mv Mo Mρ Mu Nδ Ne Oζ Oξ Ot Ou Pα Pγ Pδ Pλ Pμ Po Pρ Pτ

<sup>6</sup> The diagrams in ms Eδ are unrelated to the text.

<sup>7</sup> The caption in ms Mo reflects the fact this diagram is a conflation of Figura 20 and Figura 21.

Pυ Qβ Qγ Qμ Rδ Rε Sδ Vβ Vι Xβ; *om.* Eα Tδ; *illeg.* Eη Eτ; *cut off* Cι Lζ Q] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qμ Rδ Rε Sδ Tδ Vβ Vι Xβ R] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Mυ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qμ Rδ Rε Sδ Tδ Vβ Vι Xβ s] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Rδ Rε Vβ Vι; *om.* Mυ Tδ Xβ; *later hand* Sδ T] Bγ Bε Bκ Cη Cι Eα Eβ Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mλ Mν Mο Mρ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qμ Rδ Rε Sδ Vβ Vι Xβ; *om.* Eη; c Mη Pρ Mυ Tδ v] Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pο Pρ Pτ Pυ Qβ Qγ Qμ Rδ Rε Sδ Vβ; *om.* Mυ Tδ Vι Xβ; d Pμ; m Bγ; o Fβ Fζ x Bγ Bε Bκ Cη Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mη Mλ Mν Mο Mρ Nδ Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pο Pρ Pτ Pυ Qβ Qγ Qμ Rδ Rε Sδ Vβ Xβ; *om.* Cι Mυ Tδ Vι; b Pμ

## [Other information]

*arc FM]* *add.* latitudo regionalis Oξ *arc HL]* *add.* latitudo regionis Mδ Nδ Oξ Qγ; *add.* latitudo regionis 48 graduum Lζ *arc LN]* *add.* arcus 18 graduum Oξ Qγ *arc MK]* *add.* arcus 18 graduum Oξ *arc VRX]* *add.* circulus equidistans orizonti Fζ Mο; *add.* circulus equidistans orizonti cuius lat[itudo] ab orizonte 18 g[radius] Qδ; *add.* crespusculum matutinum / crespusculum vespertinum Bε; *add.* linea crespusculi et aurore Pρ *circle ABCD]* *add.* Capricorni Pρ(*twice*); *add.* circulus Capricorni Pρ Qγ *circle EFGH]* *add.* Arietis et Libre Fζ Pρ; *add.* circulus Arietis et Libre Qγ *add. circle of Cancer]* *add.* Cancri Pρ *circle OFQH]* *add.* circulus hemisperii Fζ Oξ Pρ Qγ

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[CAPITULUM 22.] POSITIO STELLARUM FIXARUM IN RETHI PER DISTANCIAM EARUM AB  
ECLIPTICA

5 Cum divideris circulum signorum certissime, oportet te postea describere stellas  
fixas in circulo signorum hoc modo: Ponemus circulum equinoctii diei, id est Arietis et  
Libre ABCD et diametra abscindant se super E, et sint supra circulum signorum AZCH.

- 1-2 Positio ... ecliptica] *om.* Bγ Bδ Bκ Cε Eα Eδ Lζ Nα Pτ Rα Sβ; Aliter(*om.* Bθ Pv Vβ) de  
impositione stellarum (*add.* fixarum Vβ) per latitudinem ab ecliptica Bθ Mη(*marg.*) Pv Vβ;  
Capitulum de impositione stellarum in rethe per distantiam ab ecliptica Rδ; Capitulum  
de inscriptione stellarum fixarum per alium modum Fβ; Capitulum de positione  
stellarum per equidistantiam ab eliptica Bε; De impositione stellarum per latitudinem ab  
ecliptacla(!). Rubrica Vπ; De inscriptione stellarum fixarum capitulum Cη Pμ; Descriptio  
stellarum fixarum per distantiam earum ab ecliptica Wβ; Descriptio stellarum fixarum  
per latitudinem ab ecliptica Rε; Inscriptio stellarum Dγ; Inscriptio stellarum fixarum cum  
latitudinibus et longitudinibus quas habent per circulum euntem per polos [zodiaci]<sup>1</sup> Mλ;  
Inscriptio stellarum per distantiam earum(*om.* Mv) ab ecliptica Eτ Mv; Modus positionis  
stellarum Pδ; Positio stellarum Cι Eζ Mη Nε Po Qμ Sκ; Positio stellarum fixarum Mo;  
Quam quare supra infrancetio conscriptam(?) Ev; *add. in marg.* Capitulum 22<sup>um</sup> Bε; *add.*  
De inscriptio[ne] stellarum fixarum in rethi per distantiam earum Pv; *add. in marg.*  
Impositione stellarum per latitudine ab ecliptica Bθ Positio] *ms* Mζ *begins*; Alius  
modus impositione Dη; Compositio Qδ; Inscriptio Vψ; Modus inscriptionis Mζ in]  
*om.* Mζ Mv Mφ Wα earum] *om.* Eβ ab ecliptica] *om.* Pv; ab ecliptica Mδ Mφ  
Sδ; *add.* Rubrica Qβ
- 3 Cum] *add.* positeris Fα divideris] divisimus Cε Dη oportet] euce Oξ te]  
*om.* Bθ Cε Pγ Vπ; *interlin.* Rδ postea] postmodum Eδ; prius Rδ describere]  
ponere Fβ
- 4 hoc] hic *some* hoc modo] *om.* Sδ equinoctii ... est] *om.* Dη diei] *om.* Mζ;  
*rep.* Cε id est] et Eδ Nε Pq
- 4-6 id est ... circulo] *marg.* Bγ; et Cη; scilicet *add. in marg.* equinoctialem ABCD ... circulo Mζ
- 5 abscindant] abscindet Bθ Vπ se] *om.* Pδ super] *add. interlin.* punctum Po  
E] DC Eζ; ED Eδ sint supra] fac Bγ; fuerit supra Fβ; sicut supra Mη Pα; sint Pq  
supra] super *some* signorum] *om.* Wβ; *om. or zodiaci* Mλ<sup>2</sup> AZCH] A et CH  
Nα; AFCG Rε;<sup>3</sup> AZH Qγ; AZHC Dγ; AZTH Mo Mv
- 5-6 ABCD ... Libre] *om.* Eτ Mv Pγ

<sup>1</sup> It is not possible to tell immediately if “zodiaci” in Mλ is the last word of the rubric or a substitute for “signorum” in line 5.

<sup>2</sup> See note to line 1.

<sup>3</sup> The letters throughout this capitulum in *ms* Rε are confused, perhaps because of the confused diagrams which follow; or perhaps the confused diagrams are a result of the confused lettering in the text.

[CHAPTER 22.] THE PLACING OF THE FIXED STARS IN THE RETE BY THEIR DISTANCE FROM THE ECLIPTIC<sup>4</sup>

When you have divided the circle of signs most accurately, you next ought to describe the fixed stars in the circle of signs in this way: We will take the circle of the celestial equator, that is [through the beginnings] of Aries and Libra ABCD and let the diameters intersect on E, and there should be on the circle of signs [the letters] AZCH.

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<sup>4</sup> This capitulum uses the system of defining star positions vis-à-vis the ecliptic, known in modern astronomy as “celestial latitude” and “celestial longitude”. The latitude is that of a circle parallel to the ecliptic and through the star, and measured from the ecliptic up to the pole of the ecliptic. The longitude is a great circle through the star and passing through the poles of the ecliptic, meeting the ecliptic at right angles and measured along the ecliptic from the beginning of Aries. Although this system is mentioned in Capitulum 10, it is different from the system described there in detail which uses right ascension and mediation to locate the star. See the notes to Capitulum 10. Samsó notes that this method is more or less standard, and is also described in Maslama’s extra-chapter (*On Both Sides*, p. 431).

For a further discussion of this problem, see Thomson, *Jordanus de Nemore*, Proposition 5, and commentary pp. 144-145.

Deinde numerabis in circulo Arietis et Libre ex puncto D versus C declinationem solis, id est 24 gradus, et pones ibi T; et in parte opposita similiter ex B versus A, et pones ibi X. Deinde pone regulam super T, X, id est super terminum numeri 24 graduum utrumque, et duces lineam occultam ex T in X. Postea considerabis in tabula stellarum fixarum  
 10 stellam quam vis ponere in circulo signorum, in quo signorum fuerit, et eius longitudinem et latitudinem, et utrum septentrionalis vel meridionalis sit.

Quod si fuerit septentrionalis numerabis in circulo Arietis et Libre a puncto T

- 6 numerabis] numerata Xβ ex] a Eα Mζ; C corr. to a Sδ; et Nα C] E Cη Sκ  
 declinationem] distanciam Eτ
- 7 id est] om. Pq; maximam scilicet Mζ; scilicet Mη Rε 24] 34 Sκ; ZE Lβ gradus]  
 gradibus Cη Eτ Bγ; graduum Qγ Tδ Xβ et<sub>1</sub> ... T] cum pones T ibi Vπ pones]  
 nonemus Fβ; pone Lβ ibi<sub>1</sub>] add. tibi Pθ ibi<sub>1</sub> T] in C Pq; T I B I Qδ T] C Nα; H  
 Rε T ... ibi<sub>2</sub>] om. Cε T; et] interlin. Pθ; RT et C; S et Tδ; T ex Pv; TEX Cη Eτ Mv  
 et<sub>2</sub>] add. absciderit Pτ et<sub>2</sub> in] om. Pq; ex Mo similiter] om. Eδ Pλ Pq  
 ex] X Bδ B] H Bθ A] om. Wα et<sub>3</sub> pones<sub>2</sub>] repeat Pv ibi] om. Rα  
 X] ex corr. to X Pγ; I Rε; Y Mδ
- 8 pone] pones many; ponas Pv; add. ibi Dη regulam] lineam (marg.) Eη T, X] ex  
 Mv; C, X Nα; I, X Wα; T, S, X Wβ T, X, id est] T X R Nε; punctum C et Rε id est] et  
 Pq; idem Bδ; scilicet Cε Ev super<sub>2</sub>] om. Lγ Wβ; similiter Eα terminum] om. Rε;  
 illeg. Nα; circumulum Rδ; punctum Pq; tantum Cη; utrumque Bθ numeri] om. Dη Vψ;  
 interlin. Lζ; numerum Rδ Rε graduum] g<sup>a</sup>/g<sup>d</sup> Mζ Nα Pθ Pq; grad. Mv Pq; gradus Bγ  
 Bδ Bε Cη Cι Dγ Eα Eδ Eζ Eτ Fβ Pγ Pv Qβ Lγ Lε Lζ Mη Mλ Pα Pδ Pτ Sδ Sκ  
 utrumque] om. Vπ; cot[space] Dη; utrum Lβ; add. numeri(?) Dγ
- 8-9 Deinde ... X] om. Mδ Nδ
- 9 et duces] rep. Lβ ex T in X] ex C M X Nα; ex H C I Rε; ex T Ev; ex T in EX Eζ; ex T, X Pθ  
 Rδ; ex T in EX corr. to ex T in X Pq; in EX Eδ X] V Vπ
- 10 stellam] om. Cε Eα; stellas Vπ circulo signorum] astrolabio Dη signorum<sub>1</sub>]  
 add. scilicet Lε Tδ in quo signorum] om. Lβ Wα; rep. Vπ signorum<sub>2</sub>] interlin.  
 Bγ; om. Cη Eτ Mv Pγ Vβ Wβ; interlin. Bγ; signo Bε Cε Dη Eη Mζ Mλ Pq Rε; add. situ Mq  
 in<sub>2</sub> ... fuerit] om. Mv Mφ Vv; gradu et minuto fuerit secundum Mζ fuerit] sit  
 Mλ et] que Pα; add. etiam Cι
- 11 longitudinem et] om. Mo Pτ Vψ latitudinem] add. et altitudinem Eα et<sub>2</sub>] om. Bθ  
 Cε Eζ Ev Mη Po Vπ et utrum] interlin. Bγ; om. Cη Eτ Mζ Mv Pγ Vβ; et utrumque  
 Qλ; scilicet utrum Dη; Vf7(?) etiam Pv vel] ex Eα sit] om. Mζ; fuerit Bδ Dη  
 Mδδδ; sic Mv
- 12 Quod] Et Pθ Quod ... septentrionalis] repeat Qβ; om. Nα si] om. Nε Pγ Pλ  
 fuerit] sit Mq septentrionalis] add. a zodiaco Vβ numerabis] om. Pλ Sβ  
 in] ex Rε in circulo] rep. Mv T] A Mv; B Pγ; C Bθ Nα Pq Rε Vψ; S Cη Eτ

<sup>5</sup> The abbreviation g<sup>a</sup> or g<sup>d</sup> could stand for any case of *gradus*.



Then you will count off along the circle [through the beginnings] of Aries and Libra from point D towards C the declination of the sun, that is 24 degrees, and you will place there T; and similarly in the opposite part from B towards A, and you will place there X. Then place a ruler on T and X, that is on each end of the number of 24 degrees, and you will draw a faint line from T to X. Next in the table of fixed stars you will take note of the star the star which you wish to place in the circle of signs, in which of the signs it would be, and its longitude and latitude, and whether it is to the north or to the south.

Now if it be to the north, you will count off along the circle [through the beginnings] of Aries and Libra from point T

- 15 versus D tot gradus quota est latitudo illius stelle, et pones ibi V; et in parte opposita similiter scilicet ab X versus A et pones ibi Y. Deinde pone unum caput regule super punctum C, qui est caput Arietis, et aliud caput super finem latitudinis stelle, id est super V, et notabis contactum regule et diametri HB, et pones ibi R. Postea pones similiter unum caput regule super punctum C et super Y, et ubi regula abscindet diametrum HB, pones notam S. Postea fac circulum transeuntem per notas R, S, et in hoc circulo summitas stelle illius esse debet. Tunc considera in tabula stellarum fixarum
- 13 versus D] *om.* Σκ D] *interlin.* Eα; B Rε gradus] *add.* et minuta Mζ quota] *sic* est] *om.* Bθ Vπ latitudo] altitudo Eδ; longitudo Vπ illius] *om.* Eδ; ipsius Mλ V] B Bθ Vπ; BV Qδ; K Rε et<sub>2</sub>] que Pα; ut Eτ Mη Pγ parte] partes Nα opposita] O P posita Nα
- 13-14 v ... ibi] *om.* Eν et<sub>2</sub> ... Y] *marg.* Mv
- 14 similiter] *om.* Bγ Cη Eδ scilicet] *om.* Rδ; C Nα X] A Rε A] D Rε Y] L Rε; v Mv Wβ pone] pones *few*; depone Vι unum] *om.* Lη regule] *om.* Mv Mφ Vι Wα
- 15 punctum C] *om.* Fζ C] *om.* Eν Lγ; *interlin.* Lε; S Pγ; T Pα qui est caput] scilicet ad primum Mζ caput<sub>1</sub>] punctus Eν Arietis] *add.* et Libre Eδ; *add. and del.* et Libre Mζ caput<sub>2</sub>] *om.* Pq; *add. interlin.* regule Bγ super] *om.* Eν super finem] superficiem Pγ latitudinis] *marg.* Σκ
- 15-16 punctum ... et<sub>2</sub>] punctum C et alterum super punctum K et ubi regula abscindet Rε(*marg.*) id est ... V] qui est N Pq
- 15-17 qui ... C] *om.* Fβ Lβ Mδ Mq Nδ Pμ Pv Qλ Wα; *marg.* Oξ Ov Pα
- 16 V] Y Eν Pδ Pv; quinque Ov contractum] reatum Nα et diametri] in dyametro Bε Mζ HB] GB Rε pones<sub>1</sub>] pone Nε Pγ; ponemus Pq ibi R] notam M Rε R] 12 Pq; C Qβ; I Vψ; R vel T Pδ; T Lγ Qδ Postea] ea Oζ pones<sub>2</sub>] pone *some*
- 17 similiter] super Cε Eα Qβ unum] 1 *or* id est [= .i.] Eδ; supra primum Bδ regule] *om.* Mo; linee similiter Eα C] E Cη Mη Qμ; I Eδ Eζ; R Cη; X Eτ et<sub>1</sub>] aliud Bε; *add.* alterum Rε; *add.* aliud Mζ Mv Vι super<sub>2</sub>] *om.* Mλ; similiter Qγ Y] C Qδ; I Po Pv; L Rε; R Mv; T Pγ; V Wα; et v Vι; Y, I Nα ubi] ibi Nα Vι Wα; u ibi Mv Mφ; ut Cε Eδ abscindet] abscindat Qμ Rα
- 18 diametrum] *interlin.* Po; *om.* Eζ Pγ HB] GB Rε notam] nocēs(?) Nε S<sub>1</sub>] C Pq; N Rε Postea] Post hoc Rδ; Post hoc pone et Pθ; *add.* pe Eδ R, S] I, S Pq Qλ Wα; M, N Rε; R, C Nα S<sub>2</sub>] supra Mη in] *om.* Sδ
- 18-19 R, S ... summitas] *om.* Eζ
- 19 illius] illi Nα; unius Rδ esse debet] erit Mλ Tunc] *om.* Eτ in] *om.* Eζ Fζ; et Cε stellarum] *om.* Cη Wβ; *interlin.* Bγ stellarum fixarum] *om.* Mζ Mv fixarum] *om.* Rε
- 19-20 esse ... stelle] *om.* Bθ Vπ

towards D as many degrees as is the latitude of that star, and you will place there V; and similarly on the opposite side that is from X towards A and you will place there Y. Next put one end of a ruler on point C, which is the beginning of Aries, and the other end on the end[-point] of the latitude of the star, that is on V, and you will note the contact of the ruler and diameter HB, and there you will put R. Afterwards, similarly you will place one end of a ruler on point C and [the other end] on Y, and where the ruler cuts diameter HB, you will place the letter S. Afterwards make a circle passing through the letters R and S, and in this circle ought to be the elevation of that star. Then in the table of fixed stars take note of

20 longitudinem dicte stelle in quo gradu cuius signi fuerit, et per totum numerum gradus illius et per totum numerum nadir eius, videlicet ab exteriori circulo zodiaci et per polum zodiaci, id est per punctum K, fac transire unum pedem circini equaliter et ubi circinus abscederit circulum RS, ibi erit summitas illius stelle. Et si cum gradu illius

- 20 dicte] *om.* Eδ; illius Ev Qδ in] prete Eδ gradu] *om.* Ev cuius] *om.* Mλ fuerit] steterit Qμ totum] tot Nα numerum] *om.* Pλ gradus] 6 Bδ; graduum Mζ Pϑ
- 20-21 gradus ... numerum] *om.* Eδ Eζ Fζ Oξ Pv
- 21 illius] istius MvVi et per totum] scilicet Dη numerum] *om.* Bε Nα nadir] Bε Bκ Eα Eη Fζ Lβ Mζ Mϑ Nα Nδ Oξ Pα Pλ Pμ Pϑ Rδ Rε Sβ Wβ Xβ; gadayr Nε; gnadayr Sκ Vψ; gnadir Cε; gradair Pδ; guadair Pθ; guadayr Mη Pτ; nadair Bθ Dγ Dη Eβ Eδ Eζ Eτ Fα Fβ Lγ Lε Lζ Lη Mλ Mv Mo Mv Mφ Oζ Oτ Ov Pv Po Pv Qβ Qγ Rα Sδ Tδ Vβ Vi Vπ; nadair *corr. to* nadir Qμ; nadayr Bγ Cι Ev Qδ; nadayz Cη Pγ; nadyr Mδ; nardir Bδ; vadir Qλ Wα eius] cuius Mv; illius Bδ Bε videlicet] *om.* Mv Mφ Vi Wα; scilicet Eα Eβ Pλ; *add.* ab id est Nε; *add.* in quo est divisio ipsius zodiaci in 360 gradus et ipse est ecliptica Pδ videlicet ... zodiaci] *om.* Mζ ab] A, B Nα; A, B, I Sκ zodiaci] *marg.* Ov; zodyachi Bγ; *add.* in quo est divisio ipsius(*om.* Fβ Mo) zodiaci in 360(260 Wα) gradus et ipse est(*om.* Fβ) ecliptica ab exteriori circulo zodiaci Fβ Lβ Lγ Oξ(*underlined*) Ov(*marg.*) Pμ Pv(*om.* in 360 ... ecliptica) Qλ Sκ Wα per<sub>2</sub>] *om.* Fζ; propter Eδ; *add.* inventum ut in fine huius capituli dicitur Mδ
- 21-22 et<sub>2</sub> ... polum] in quo est divisio ipsius Nε et<sub>2</sub> ... zodiaci] *om.* Mv; *marg.* Rα
- 22 polum] stelle Ev; *add.* signi Eα; *add.* signorum Bθ Cη Eδ Eζ Eτ Ev Mv Nα Pγ Po Pv Qδ Qμ Rα Rε Sβ Vβ; *add. and del.* signorum Pτ zodiaci] *om.* Oξ; circuli signorum Mζ; signorum Mλ; zodyachi Bγ; ydyaci Cη; *add.* HE Rε; *add.* R, C Nα; *add.* signorum Bκ Lζ; *add.* VE Qμ Rα; *add.* vs Sβ id est] et Lη(*add. in marg.* id est) Mϑ; lx id est Pγ; scilicet Mζ; vel Bγ; ve id est Bκ Bθ Cη Dγ Eδ Eζ Eτ Ev Lζ MvPv Vβ Vπ; ve id est *corr. to* id est Pτ; *add. interlin.* vel Vβ per] *om.* Cε Mo Fζ Pδ K ... pedem] *om.* Nε ubi] *om.* Cε; insi(?) Nε
- 22-23 et ubi circinus] donec Bδ Bε Dη Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mϑ Mv Mφ Nδ Oζ Oξ Oτ Ov Pα Pλ Pμ Pv Pϑ Qβ Qγ Qλ Tδ Vi Wα Xβ et ... RS] *del. and add. in marg.* donec abscederit circulum RS Po
- 23 circinus] *marg.* Rα abscederit] *add.* vel intersecat Mζ RS] usque Nα; *add.* stelle et Bδ Bε Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mo Mϑ Mv Mφ Nδ Oζ Oξ Oτ Ov Pα Pλ Pμ Pv Pϑ Qβ Qγ Qλ Sδ Tδ Vi Vψ Wα; VL Rε RS ibi] R.S.I.B.I. Qδ erit] *om.* Nα stelle] *om.* Mη si] sic Dη Fβ Qλ Wα si cum] *om.* Pα illius<sub>2</sub>] *om.* Bθ Bκ Cε Dγ Eα Eζ Ev Mη Mλ Mo Nα Po Pv Qμ Rε Sβ Vπ; *interlin.* Vβ; *add.* stelle Bδ

the longitude of the said star, in which degree of which sign it be, and through the total number of its degrees and through the total number of its nadir,<sup>6</sup> namely outside the circle of the zodiac,<sup>7</sup> and through the pole of the zodiac, that is through point K, see that one arm<sup>8</sup> of a compass passes uniformly and where the compass cuts circle RS, there will be the elevation of that star. And if with the degree of that

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<sup>6</sup> Again, “nadir” means a point 180° across (or around) the sphere.

<sup>7</sup> That is (here and throughout), the ecliptic.

<sup>8</sup> A difference between Latin (a “foot” [or even “leg”] of a compass) and English (an “arm” of a compass) idioms.

25 longitudo et latitudinis fuerint minuta, accipe de gradu sequenti sextam partem, si sint 10 minuta; si 15 quartam partem, si 20 terciam, et sic de aliis, et fac ut supra et hoc in stellis septentrionalibus.

Si vero sit meridionalis, iterum numerabis in circulo Arietis et Libre a nota declinationis solis scilicet a T versus C tot gradus quota est latitudo eius; et in parte opposita similiter ab X versus B, et ibi nota. Et pone regulam super unam illarum

- 24 et latitudinis] *del.* Pτ; *om.* Mv Qλ Vι Wα et ... fuerint] volueris sumere Mζ fuerint] *om.* Nε Pγ minuta, accipe] duc λT(?) idem Nα de gradu] gradum Mo; gradus Rε sequenti] *om.* Cε Mη; scilicet Mv; sequentes Rε sextam] 6 / 6<sup>m</sup> some; vi in Wβ
- 24-25 accipe ... minuta] *om.* Ev
- 25 10] *om.* Eα Mζ Nε; 60 Xβ minuta] m Nα; *add.* vel Bε si<sub>1</sub>] sed si Rε; *add.* sint Pτ; *add. marg.* vero Bγ si 15] 15 et Eα 15] 11 Cη; enim Pγ; ri Lβ; *add.* minuta Bε quartam] 4<sup>m</sup> some partem] *om.* Bδ Cε Cι Eη Fα Fζ Lβ Lγ Lε Lη Mδ Mη Mλ Mo Mq Mv Mφ Nδ Oζ Oξ Oτ Ov Pα Pγ Pδ Pθ Pλ Pμ Pν Qβ Qγ Qλ Sk Tδ Vι Vψ Wα Xβ si<sub>2</sub>] *add.* vero Dη 20] 2 Mv; 30 Fζ Mv terciam] 3<sup>m</sup> some; 2<sup>am</sup> Wα; *add.* partem Bκ Eτ Mζ Pλ Po Pv Vβ et sic de aliis] *rep.* Nα et<sub>2</sub> ... et<sub>3</sub>] et cys Bε sic de aliis] *illeg.* Mζ Rδ; cyo(?) Pλ; sic de ceteris Mq supra] prius Nα et<sub>3</sub>] ex Nα; ut Pγ hoc] in hoc Sk
- 26 in] *om.* Bθ Ev Vπ Vψ stellis] *add.* in Mλ septentrionalibus] *add.* ut in sequenti figura Sβ
- 27 Si] Sit Fβ vero] autem Bε sit] fuerit Bδ Rδ iterum] *om.* Lε Tδ Xβ; *illeg.* Mη; tunc Bγ Bθ Cε Cη Cι Dγ Eα Eδ Eζ Eτ Ev Lζ Mζ Mλ Mv Mo Nα Pδ Pθ Po Pτ Pv Qδ Rδ Rε Sk Vβ Vπ Wβ iterum numerabis] *om.* Pγ; tunc numerabis tunc numerabis Eδ numerabis] *om.* Lγ a] *om.* Bθ Eη Vπ; *marg.* Rα; an Bδ; et Cη Pγ
- 27-28 et Libre ... solis] *om.* Mζ a nota declinationis] et nota declinationem *and add. interlin.* al' a nota declinatione Vβ
- 28 solis] *om.* Po; *del.* Pq scilicet] *om.* Cε; *blank* Fζ a T] AT Cη Mv Rα Sk; a C Cε Mv Pq Qδ Sβ Rε Vβ C] A Bθ Ev Vπ; D Rε; E Po; I Tδ; T Eη Mv Sβ Vβ gradus] graduum Mv quota] *sic* latitudo] altitudo Nα eius] *om.* Dγ Eδ Eζ Eτ Mv Pγ Pτ Rε Qμ; *interlin.* Vβ; *add.* et ibi nota Bδ
- 29 opposita] apposita Sk; *add.* eius Qδ ab X] ab A Rε; ad 4 Wβ nota] *add.* puncta Mζ nota et] *om.* Rε unam] una Vπ illarum] *om.* Mv Mφ Wα; earum Dη
- 29-30] illarum notarum] notam Vι

longitude and latitude there are minutes, take from the following degree one sixth part if there are 10 minutes; if 15, a quarter part [of a degree]; if 20, a third, and so on for the others, and also do this as above for northern stars.

If, on the other hand, it is a southern [star], again you will count along the circle [through the beginnings] of Aries and Libra from the mark of the sun's declination, that is from T towards C as many degrees as is its latitude [and place there a mark]; and similarly in the opposite part from X towards B, and make a mark there. And set the ruler on one of those

- 30 notarum et super capud Arietis, scilicet super C, et ubi absciderit diametrum HB, fac  
notam in diametro. Et super aliam notam similiter pone regulam et super C, et ubi  
absciderit diametrum HB, fac notam. Postea fac circulum secundum longitudinem  
illarum duarum notarum in diametro; et in hoc circulo erit summitas illius stelle.  
Tunc considera in tabula stellarum fixarum in quo gradu cuius signi fuerit. Et fac  
35 transire equaliter unum pedem circini per terminum numeri illius gradus et per
- 30 notarum] *interlin.* Pτ super<sub>1</sub>] *om.* Mζ; *add.* C Mλ Arietis] *add.* et Libre Ev Qδ Vπ  
scilicet] *om.* Qδ; et Vπ scilicet super C] *om.* Mλ; quod est A Pq super<sub>2</sub>] *om.*  
Sβ; similiter Vψ; sit Bε; *add.* punctum Nα C] s Pγ; gradus Nα ubi] ibi Cε Nδ  
Qλ Wα HB] AB Sκ; GB Rε; KB Bδ
- 30-31 ubi ... similiter] ubi absciderit in diametro et super aliam notam pones similiter *del and*  
*add. marg.* Ubi absciderit dyametrum H, notam in dyametrum super aliam notam Po  
diametrum ... notam<sub>1</sub>] *om.* Eδ Et Qμ diametrum ... in] a Mv HB ...  
diametro] *om.* Cη Eζ fac ... diametro] *marg.* Bγ
- 31 notam<sub>1</sub>] *om.* Bθ; *add.* pones Eζ in diametro] *om.* Bε Mζ; in directo Pq Et super<sub>1</sub>] *om.* Ev  
Et super<sub>1</sub> ... regulam] Deinde ponas regulam super aliam notam Mζ  
super<sub>1</sub>] similiter Pv; *corr. in marg. from* similiter Oξ aliam] alteram Rε(*interlin.*);  
illam Rα Sβ notam<sub>2</sub>] *om.* Vπ similiter] *interlin.* Bγ; *om.* Cη Et Mv Wβ  
pone] pones *some* C] s Pγ ubi] ibi Cε
- 31-32 in ... notam] *om.* Ea Eη Nα Nδ Vψ Et super<sub>1</sub> ... notam] *marg.* Bε similiter ...  
notam] *om.* Qμ
- 32 absciderit] abscident Bθ diametrum] *om.* Vι HB] GB Rε fac<sub>1</sub>] *add.* aliam  
Bδ; *add.* iterum Mζ fac<sub>1</sub> ... secundum] *om.* Pq notam] *add.* in diametro Lε  
fac<sub>2</sub>] *om.* Fβ secundum] *om.* Qλ longitudinem] altitudinem Bθ Vπ; *corr.*  
*from* latitudinem Sκ
- 33 illarum] *om.* Mζ; earum Nα Pγ; earum *and add. interlin.* illarum Vβ; stellarum Pδ; *add.*  
stellarum Wα illarum ... summitas] *om.* Ev duarum] *om.* Nδ; 2 *some*  
notarum] *add.* et super caput Arietis similiter super G et ubi abscident Nα; *add.*  
novissimarum Mζ diametro] *add.* HB Mζ et] *add.* ubi Mη hoc] *om.* Oξ  
stelle] *add.* in quo gradu Nε(= line 34)
- 34 Tunc] *om.* Fβ; Et Pq; Et Sβ Tunc considera] *marg.* Bγ Tunc ... fixarum] *om.* Bθ  
Bκ Cη Dγ Eδ Eζ Eτ Ev Lζ Mη Mλ Mv Nα Pγ Po Pτ Pv Qμ Rα Rε Vβ Vπ in<sub>1</sub> ...  
fixarum] *om.* Bγ Sβ fixarum] longitudinem dictae stellae Mζ in<sub>2</sub>] *om.* Cε  
in<sub>2</sub> ... fuerit] *om.* Xβ fuerit] fuit Cη Dγ Ev Mη Pτ; sit Fβ; fuit illius gradus et per  
terminum(punctum Nα) numeri Bθ Nα Vθ; *add. in marg.* in zodiaco Mζ
- 34-35 Et ... circini] *om.* Mζ Et ... numeri] *om.* Bθ Ev
- 35 equaliter] *om.* Cι per<sub>1</sub>] *om.* Rδ; super Sβ per<sub>1</sub> ... gradus] ad 2 notas scilicet Cε  
terminum] totum Eδ Rε; *add.* illius signi Pγ numeri] *om.* Bε illius] *om.* Pγ  
gradus et] *om.* Mo
- 35-36 illius ... terminum] *om.* Bθ Nε Rε Vπ et per terminum] parcium in q<sup>a</sup> Ev



marks and on the beginning of Aries, that is on C, and where it cuts diameter HB, make a mark on the diameter. And similarly place the ruler on the other mark and on C, and where it cuts diameter HB, make a mark. Afterwards make a circle according to the longitude of those two marks on the diameter; and in this circle will be the elevation of that star. Then in the table of fixed stars take note in which degree of which sign it be. And make sure that one arm<sup>9</sup> of a compass passes uniformly through the end of the number of its degree and through

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<sup>9</sup> See note 8 to line 22 above.

terminum nadir eius, scilicet ab exteriori circulo zodiaci, et per polum zodiaci, scilicet per punctum K. Et ubi circinus abscinderit circulum ad duas notas diametri, ibi erit summitas illius stelle. Et similiter pone omnes stellas meridionales.

40 Sic autem invenies polum zodiaci: numera a puncto A in circulo Arietis versus D 12 gradus, et pone ibi notam; et super notam illam et super C pone regulam, et ubi

36 terminum] tantum numeri Rα; totum numeri Eδ; *illeg.* numeri Qμ; *add.* numeri Bγ Dγ Mζ  
 Mλ Mν Nα Pο Pυ Qδ Vβ Vψ Wβ nadir] Bδ Bε Bκ Eα Eη Mδ Mζ Mο Nα Nδ Pλ Pν  
 Pο Rδ Rε Sβ Wβ Xβ; gadayr Sκ; gnadair Pδ; gnadayr Nε Vψ; gnadir Cε; guadair Pθ;  
 guadayr Mη; nadair Dγ Dη Eβ Eδ Eζ Eτ Fα Fβ Lβ Lγ Lε Lζ Lη Mν Mo Mv Mφ Oζ Oξ Oτ  
 Ou Pα Pγ Pμ Pο Pτ Pυ Qγ Rα Sδ Tδ Vβ Vι Vπ; nadayr Bγ Cι Ev Mλ Qβ Qδ; natair Bθ;  
 vadair Qλ Wα; vadayz Cη eius] cuius Nα; illius Tδ cilicet<sub>1</sub>] *om.* Pα Pο  
 scilicet<sub>1</sub> ... zodiaci<sub>1</sub>] *om.* Mζ exteriori] *add.* parte Ev zodiaci<sub>1</sub>] *om.* Cε  
 et ... zodiaci<sub>2</sub>] *om.* Ev Mη Re per] *interlin.* Bγ; *om.* Bθ Bκ Cη Dγ Eα Eζ Fζ Lζ  
 Mλ Mν Nα Pγ Pυ Rα Sβ Vπ Wβ; *add.* polum circuli signorum id est Mζ polum] *add.*  
 24 Cε zodiaci<sub>2</sub>] *add.* et polum zodiaci (= *rep.*) Bθ Vπ

37 per] *om.* Fβ Fζ Mζ Pμ; super Sβ punctum] *om.* Oζ Pλ Pο κ] *interlin.* Bγ Pο; *om.*  
 Bθ Cη Eδ Eζ Ev Mη Pγ Pυ Qμ Vπ Et ubi] Fac transire unam pedem circini et ubi Mζ  
 circinus] *om.* Bθ Nα abscinderit] attinget et abscindet Mδ Nδ abscinderit  
 ... duas] *om.* Eζ circulum] *add.* factum Bγ Bθ Bκ Cη Eα Eδ Eτ Lζ Mζ Mλ Mν Nα Pγ  
 Pυ Qμ Rα Rε Vβ Vπ Vβ; *add.* fah(?) Sβ ad duas] .A.D. et Bθ Vπ; id est ad secundam  
 Cε; et 2<sup>as</sup> Eη duas] 2 *many*; 3 factum Mη; et Ev ibi] et ubi Eζ; ubi Cε Pγ

38 illius] *om.* Mv Qλ Vι Wα; huius Mο Et ... meridionales] *om.* Mζ pone] pones  
 some meridionales] *add.* ut patet in prescripta figura Mv; *add.* <sup>va</sup> latitudo eius in parte  
 opposita similiter <sup>cat</sup> Nε (= *lines* 28-29)

39 before Sic] De inventione poli zodiaci Vβ; Inventio poli zodiaci super mediam  
 declinationem Mλ Sic] Hic Ev; Si Mη; *add.* *in marg.* Polus zodiaci Bε Sic ...  
 zodiaci] Polum autem sic invenies Fβ; Polum autem zodiaci invenies Mζ; *add.* *in marg.*  
 Capitulum de inventione poli Fβ autem] *add.* pones et Pθ Rδ polum] punctum  
 Bθ numera] numerabis Mλ A] *om.* Fβ Nα versus] *twice* Vψ D] DT  
 Mη

40 12] Bγ Bθ Cη Cι Dγ Eδ Eζ Eτ Ev Lζ Mλ Nα Pγ Pτ Pυ Vβ Vπ Wβ; *om.* Mη; 12 *corr.* to 24 Eα  
 Mζ; 24 Bδ Bε (*add.* *interlin.* 12) Cε Eβ Eη Dη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mo Mο Mv Mφ Oζ  
 Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pν Pο Pο Qβ Qγ Qδ Qλ Rδ Rε Sδ Sκ Tδ Vι Vψ Wα Xβ; κ Mv  
 ibi] ubi Ev notam<sub>1</sub>] *add.* O Rε; *add.* similiter Eα et<sub>2</sub> ... notam<sub>2</sub>] *om.* Pμ  
 et<sub>2</sub> ... illam] *om.* Eτ Pγ Mv Wβ et<sub>2</sub> ... regulam] Deinde pone regulam super  
 punctum C et notam istam Mζ super<sub>1</sub>] similiter Ev notam illam] eam Pο  
 illam] *interlin.* Bγ; *om.* Cη

40-41 illam ... in] *illeg.* Pτ

the end of its nadir, that is on the outside of the circle of the zodiac, and through the pole of the zodiac, that is through point K. And where the compass cuts the circle at two marks on the diameter, there will be the elevation of that star. And similarly place all the southern stars.

Moreover, you will find the pole of the zodiac thus: count from point A along the circle [through the beginning] of Aries towards D 12 degrees,<sup>10</sup> and place there a mark;<sup>11</sup> and place a ruler on that mark and on C and where

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<sup>10</sup> When projected on the plane, the pole of the ecliptic is found by using half of its declination (from the celestial pole), i.e., 12 degrees rather than 24. Many scribes, however, did not understand this and accepted the substitution of 24 for the correct number, 12. The diagram (Figura 22A) generally shows the correct use of 12 degrees, and is reflected in the caption. See also Capitulum 9.

<sup>11</sup> In some diagrams (Figura 22A), this point is labelled “F”.

abscinderit diametrum DB, fac notam K; et nota illa erit polus zodiaci, ut patet in hac figura.

Explicit Compositio astrolabii

- 41 DB] AB Eτ Mν notam] *add.* illam Bε Eζ κ] *om.* Bθ Ev Vπ; B Pγ; P Rε; *add.* et notam κ Pδ κ et nota] *om.* Mν Mφ κ ... illa] illam Vι Wα et ... erit] que est Mλ nota] *om.* Dη illa] *om.* Cι Dγ Qβ; *add.* κ Eδ polus] poli Nα ut] *om.* Vι; sicut Bθ Ev Qδ Vπ hac] *om.* Bγ Bε Bθ Cη Eδ Eζ Eτ Ev Mη Mν Nα Pγ Po Pv Qγ Qδ Rδ Rε Vβ Vι Vπ Wβ; subiecta Mλ
- 41-42 ut ... figura] Bδ Eβ Eη Fα Fβ Fζ Lβ Lγ Lε Lη Mδ Mν Oζ Oξ Oτ Ou Pα Pδ Pθ Pλ Pμ Pν Pρ Pτ Qβ Qλ Sδ Tδ Wα Xβ; *om.* Vζ; ut hic patet in illa ultima figura Bκ; ut hoc patet in figura Cε Rα Sκ; ut hic patet Lζ; ut hic patet in figura Cι Mo Vψ; ut in sequenti figura manifestius apparet Dη; ut patet h' Dγ
- 42 figura] *om.* Mφ; *add.* etc. Rδ; *add.* precedente Pv; *add.* sequente Rα; *add.* sequenti Vπ; *add.* supra Eζ Po Qμ Wβ; *add.* subiecta Vι
- 43 Explicit ... astrolabii] Bθ Mφ Pλ Pρ Qβ Vβ Vπ; Et hic de astrolabio dicta suffitiant Pv; Explicit canones de compositione astrolabii. Rε; Explicit compositio Pδ Pv; Explicit scientia compositionis astrolabii Oζ

it cuts diameter DB, make the mark  $\kappa$ ; that mark will be the pole of the zodiac, as is clear in this figure.

*The Construction of an Astrolabe ends.*

[ FIGURA 22 ]

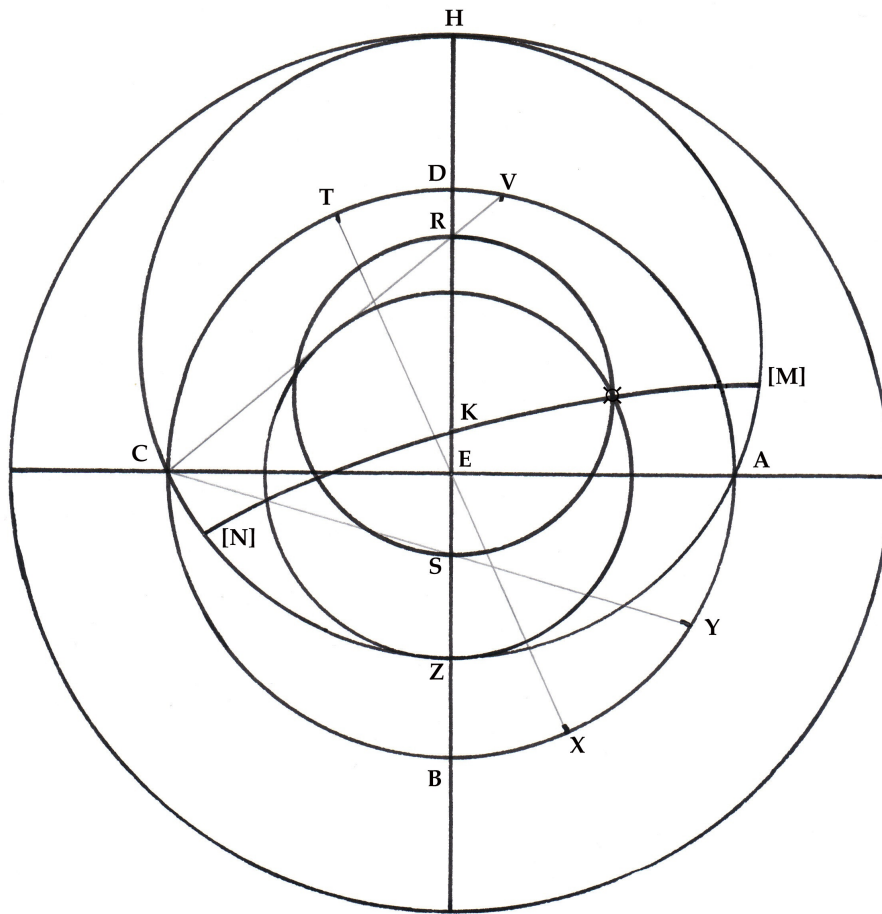


Figura inscriptionis stellarum fixarum in rethi per distanciam earum ab ecliptica<sup>12</sup> /  
Figure of the inscription of the fixed stars in the rete by their distance from the ecliptic

[Complete diagram] Bγ Bε Bκ<sup>13</sup> Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ (sideways) Lη Mδ Mζ  
Mλ Mν Mο Mρ Mυ (f. 408<sup>v</sup>) Nε Oζ Oξ Oτ Oυ Pα Pγ Pδ Pλ Pμ Pο Pρ Pτ Pυ Qβ Qγ Qδ Qμ (fol. 157<sup>r</sup>)  
Rα Rδ Sδ Tδ Vι (fol. 332<sup>v</sup>) Wβ Xβ

[Incomplete diagram] Mη Rε<sup>14</sup> Sκ Vβ

[Outline, or space only] Bθ Cε Dγ Dη Eζ Eυ Lβ Mφ Pν Qλ Sβ Vπ Vψ Wα

<sup>12</sup> This figure shows the positioning of a northern star only.

<sup>13</sup> The figure in ms Bκ is rotated clockwise 90°.

<sup>14</sup> There are two diagrams in ms Rε (fol. 167<sup>v</sup>) which do not fit this Capitulum either in the lines and circles drawn or the lettering.

[No space] Bδ Eδ<sup>15</sup> Nα  
Pθ: “X”

[Caption]

Figura ... ecliptica] Cι Eβ Eη Fα Fβ Fζ Lη Mo Ne Oζ Oξ Oτ Ou Pa Pδ(marg.) Πλ Pμ Pρ Pτ Qβ Qμ Tδ; om. Bκ Eα Lζ Mζ Qδ; Figura impositionis stellarum fixarum secundum longitudes suas veras et altitudines suas ab ecliptica Xβ; Figura inscriptionis poli zodiaci supra medium declinationis Qγ<sup>16</sup>; Figura inscriptionis stellarum Rα; Figura inscriptionis stellarum fixarum Lγ Sδ; Figura inscriptionis stellarum fixarum latitudines suas ab ecliptica super longitudes suas veras Mv; Figura inscriptionis stellarum fixarum per tabulam factam per latitudines ipsarum ab ecliptica super mediam declinationis Mλ; Figura inscriptionis stellarum fixarum secundum longitudes suas veras et latitudines ipsarum Cη; Figura inscriptionis stellarum fixarum secundum latitudines suas ab ecliptica et longitudes suas veras Eτ Po Vi(add. in tabula posita); Figura inscriptionis stellarum secundum latitudines suas ab ecliptica et longitudes suas in tabula posita Mv; Figura inscriptionis stellarum secundum latitudines earum ab orbe signorum Pv; Figura inscriptionis stellarum fixarum secundum longitudes veras et latitudines ipsarum ab ecliptica Wβ; Inscriptio stellarum fixarum secundum latitudines ab ecliptica Pγ

in rethi] om. Bγ Rδ; per rety Mδ earum] om. Lε Mρ; earundem Bε add. Figura capituli 22<sup>i</sup> Bε; add. ex vide aliam figura loco hoc Fβ

[Lettering on the diagram]

A] Bγ Bε Bκ Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Cη Mv Qδ B] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Qδ C] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Qδ D] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Qδ E] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Πλ Qδ; s Pμ H] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qγ Qμ Rα Rδ Sδ Tδ Vi Xβ; om. Qβ Qδ Wβ K] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Qδ R] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Pμ Po Pρ Pτ Pv Qβ Qγ Qμ Rα Sδ Tδ Vi Wβ Xβ; om. Fβ Fζ Qδ Rδ S] Bγ Bε Bκ Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Πλ Po Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi Wβ Xβ; om. Pμ Qδ; illeg. Pρ; P Cη T] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mv Mo Mρ Mv Ne Oζ Oξ Oτ Ou Pa Pγ Pδ Pμ Po Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vi

<sup>15</sup> The diagrams in ms Eδ are unrelated to the text.

<sup>16</sup> Ms Qγ copies the caption from Figura 22A.

Wβ Xβ; *om.* Pq Qδ; *illeg.* Pλ v] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ  
 Mλ Mν Mo Mq Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pμ Po Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vι Wβ Xβ; *om.* Pλ  
 Pq Qδ; x Mu x] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mν Mo Mq  
 Mu Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pτ Pv Qβ Qμ Rα Rδ Sδ Tδ Vι Wβ Xβ; *om.* Pq Qγ Qδ  
 γ] Bγ Bε Bκ Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mδ Mζ Mλ Mν Mo Mq Mu Nε Oζ Oξ  
 Oτ Ou Pα Pγ Pδ Pλ Pμ Po Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vι Wβ Xβ; *om.* Pq Qδ z] Bγ Bε Bκ  
 Cη Cι Eα Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mλ Mν Mo Mq Mu Nε Oζ Oξ Oτ Ou Pα Pγ Pδ Pλ Pμ Po  
 Pq Pτ Pv Qβ Qγ Qμ Rα Rδ Sδ Tδ Vι Wβ Xβ; *om.* Mδ Mζ Qδ *add.* M Bγ Cη Eτ Mλ Mν Po Pv  
 Vι Wβ; N Rα *add.* N Cη Eτ Mλ Mν Po Pv Vι Wβ; M Rα *add.* \*/O<sup>17</sup> Bγ Eτ Mλ Mν Po Pv  
 Vι

## [Circle of signs of the zodiac]

*Divided into 12, with names, and 10 | 20 | 30] Bε Eβ Fα Lγ Lε Lη Mδ Mo Oζ Ou Pα Pδ Pμ Pq Qδ Qμ  
 Sδ Tδ *Divided into 12, with names] Bκ Cη Cι Eα Eη Eτ Fβ Lζ Mν Mq Nε Oτ Pγ Pλ Po Pτ Pv  
 Qβ Qγ Rδ Wβ Xβ *Divided into 12, add.* Taurus | Cancer | Virgo | Scorpius | Capricornus |  
 Pisces] Fζ Mλ *Divided into 12] Bγ Mζ Vι *Not divided] Mu Oξ Rα(add.* Capricornus |  
 Aquarius)***

## [Other information]

K] *add.* polus zodiaci Eα SR] *add.* latitudo septentrionalis Bκ Lζ *arc DT] add.* 34 g<sup>r</sup> Rα  
*arc AM] add.* 13 g<sup>r</sup> merid. declinatio Rα *add.* Vult' Bε<sup>18</sup>; *add.* Vlt<sup>u</sup> Volans Eη *add.*  
 Aldebaran<sup>19</sup> Bε Eη *add.* Delfin<sup>20</sup> Cι Fα Fζ Lγ Lη Mδ Oζ Oτ Pμ Pq Qγ; *add.* Del Mo; *add.* Delf'  
 Lε; *add.* Delf' Fβ Ou Qβ *add.* Elfeta<sup>21</sup> Rα *add.* Arietis et Libre | equinoctii Pq *add.*  
 Cancri Pq *add.* Capricorni Pq *add.* meridies Pq *add.* occidentis Pq *add.* oriens  
 Pq *add.* septentrio Pq *add.* tasum(?) stelle Mζ

*arc [M][N] runs from upper left quadrant down into lower right quadrant: Rδ*

<sup>17</sup> Where O appears in the diagram, it actually represents the position of the star itself and is not meant to be part of the lettering system.

<sup>18</sup> See Lists of Fixed Stars – Appendix I, α Aquilae (α Aql).

<sup>19</sup> See Lists of Fixed Stars – Appendix I, α Tauri (α Tau).

<sup>20</sup> See Lists of Fixed Stars – Appendix I, ε Delphini (ε Del).

<sup>21</sup> See Lists of Fixed Stars – Appendix I, α Coronae Borealis (α CrB). This identification is not certain.



[ FIGURA 22A ]

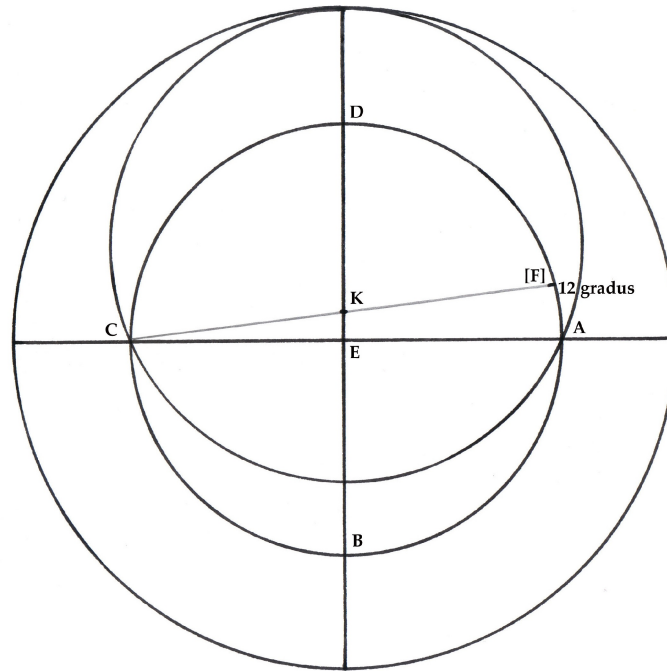


Figura inscriptionis poli zodiaci super medium declinationis /  
Figure of the inscription of the pole of the zodiac on half of its declination

[Complete diagram] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mλ Mν Mo Mρ  
Mυ(f. 408<sup>r</sup>) Nε Oζ Oτ Oυ Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ(fol. 157<sup>v</sup>) Sδ Tδ Vβ Vι(fol. 332<sup>v</sup>)  
Wβ Xβ

[Outline, or space only] Bθ Cε Dγ Dη Eυ Lβ Mζ Mφ Oξ Pν Qλ Vπ Vψ Wα

[No space] Bδ Eα Eδ<sup>22</sup> Eζ Mδ Nα Pγ Rα Rδ Re Sβ

Pθ: "Υ"

[Caption]

Figura ... declinationis] Bγ Bε Cη Eβ Eη Eτ Fβ(twice) Fζ Lγ Lε Mν Mo Mρ Mυ Nε Oζ Oτ Oυ Pα Pλ  
Pμ Po Pρ Qβ Qγ Qδ Qμ Sδ Tδ Xβ; om. Bκ Lζ Vβ; Figura inventionis cenith zodiaci super medium  
declinationem Mη Pυ

Figura inscriptionis] Inscriptio Fα Lη inscriptionis] descriptionis Wβ super] supra Cι  
Pτ medium declinationis] declinationem totam Cι Pδ; mediam declinationem Mλ Vι Wβ  
add. Figura per fine capituli 22<sup>i</sup> Bε add. Secundus est finis figurarum astrolabii. Deo

<sup>22</sup> The diagrams in ms Eδ are unrelated to the text.

gratias Qμ

[*Lettering on the diagram*]

A] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mλ Mν Mo Mρ Mυ Nε Oζ Oτ Ou Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vβ Vι Wβ Xβ      B] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mλ Mν Mo Mρ Mυ Nε Oζ Oτ Ou Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vβ Vι Wβ Xβ; *om.* Mη      C] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mλ Mν Mo Mρ Mυ Nε Oζ Oτ Ou Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vβ Vι Wβ Xβ      D] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mλ Mν Mo Mρ Mυ Nε Oζ Oτ Ou Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vβ Vι Wβ Xβ      E] Bε Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lη Mη Mλ Mν Mo Mρ Nε Oζ Oτ Ou Pα Pδ Pλ Pμ Po Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vι Wβ Xβ; *om.* Bγ Bκ Cη Lζ Mυ Pρ Vβ      K] Bγ Bε Bκ Cη Cι Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mλ Mν Mo Mρ Nε Oζ Oτ Ou Pα Pδ Pλ Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vι Wβ Xβ; *om.* Mυ Vβ      *add.* F] Bγ Mη Mλ Mν Po Pυ Vι

[*Other information*]

K] *add.* polus zodiaci Lζ Pρ      F] 12 Mυ Pλ; *add.* 12 gradus Bε Bκ Cη Eβ Eη Eτ Fα Fβ Fζ Lγ Lε Lζ Lη Mη Mλ Mν Mo Mρ Nε Oζ Oτ Ou Pα Pμ Po Pρ Pτ Pυ Qβ Qγ Qδ Qμ Sδ Tδ Vι Wβ Xβ; *om.* Bγ Cι Pδ Vβ      *add.* 24 Bκ Lζ; *add.* 24 gradus Eτ Mη Mν Mρ Mυ Po Pυ Vι      *add.* circulus Arietis et Libre Pρ      *add.* circulus Arietis et Libre sive equinoctio diei Pρ      *add.* circulus Cancri Pρ      *add.* circulus Capricorni Pρ      *add.* meridies Pρ      *add.* occidentis Pρ      *add.* oriens Pρ