



Notes upon Some Medieval Latin Astronomical, Astrological and Mathematical Manuscripts at the Vatican: Part I

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Notes upon Some Medieval Latin Astronomical, Astrological and Mathematical Manuscripts at the Vatican

By Lynn Thorndike *

PART I

THIS present survey of a few medieval astronomical, astrological and mathematical manuscripts at the Vatican is supplementary to previous more general articles on "Vatican Latin Manuscripts in the History of Science and Medicine,"¹ and "Some Little Known Astronomical and Mathematical Manuscripts."² The manuscripts will be taken up usually in numerical order under the collections to which they belong, and are all Latin, unless otherwise stated. Since the contents of any particular codex are likely to be miscellaneous, indices are added of authors and subjects, manuscripts, and incipits. The text is divided into sections, which are numbered for purposes of ready reference in the indices. The manuscripts here considered are of the later middle ages, none being earlier than the twelfth century. Subsequent articles will deal with astronomical and mathematical manuscripts in several other Italian libraries, and at the Bibliothèque Nationale in Paris.

VATICAN 3098

I. VATICAN 3098 is a double-columned paper folio of the fourteenth century, in which the first item is the Latin translation of the astronomy of Leo de Balneolis.

George Sarton speaks of this work³ as divided into 136 chapters, whose titles are "given by Neubauer and Renan in Hebrew and Latin (p. 624-41, 1893)."⁴ Our manuscript likewise gives these in Latin in the Introduction to Leo's work at fols. 11ra-2vb, but describes them as being merely the chapter headings of Tractatus I, and goes on to give nine more chapter headings for Tractatus II,

* Columbia University.

¹ *Isis*, 1929, 8: 53-102.

² *Osiris*, 1949, 8: 41-72.

³ *Introduction to the History of Science*, 1947, 3: 599, 606.

⁴ This cryptic reference appears to apply to the article, "Les écrivains juifs français du XIV^e siècle," *Histoire littéraire de la France*, 1893, 31:

351-802, where only 136 titles are given, although our MS, as well as Vatican 3380 and Milan, Ambros. D.327 (Inf. or Sup.?), was used for the Latin translation, and although Leo is quoted at page 633 as saying: "Et propter hoc pars ista in 3 tractatus dividitur. Primum tractatum in 136 capitula dividimus."

and fourteen others for Tractatus III, making 159 chapters in all. In the ensuing text, however, these other tractates and chapters do not appear, since it breaks off in the midst of the first tractate at fol. 108ra.⁵

The headings, however, give us some idea of the argument in the other tractates. In the first chapter of the second tractate Leo excused his presumption in writing, when little or nothing upon the subject had come down from the ancient doctors. In the third chapter and again in the sixth he affirmed the influence of the stars upon inferior bodies. In the fourth he stated that there was no mobile body above the eighth sphere of the fixed stars. The opening chapter of the third tractate reviewed the opinion of the ancients "concerning the mean Intelligence, giver of forms (*circa mediam intelligentiam datricem formarum*). In the sixth chapter he held that the celestial bodies have an intellectual Mover, moving them by the motion of appetite and desire, but do not have a soul with material knowledge (*animam materialiter cognoscentem*). Of other captions in the third tractate we may note:

In 7 inquiremus utrum intelligentie intelligant suam causam et suum officium; et si sic, per quem modum eam intelligant.

In 8 declarabimus quod motores celestium corporum non se habent adinvicem sicut causa et causatum effective eo modo quo posuerunt aliqui antiquorum.

In 9 declarabimus quod intelligentie moventes corpora celestia intelligant suas proprias influentias quas influunt mediantibus corporibus quibus appropriantur, et non illas que influuntur ex concursu plurium planetarum vel aliorum corporum celestium.

In 11 declarabimus quod motor octave spere non est prima intelligentia sive deus, ut aliqui crediderunt.

2. VATICAN 3098 further contains a brief treatise by, or extract from, Campanus of Novara, which is here entitled, "Expositio magistri Campani in figura sectore,"⁶ and Plato of Tivoli's twelfth century translation of the astronomical work of Albategni, which Nallino published from an Escorial Arabic manuscript with a modern Latin version.⁷ In Vatican 3098 it is written in a different and seemingly earlier fourteenth-century hand (with alternating red and blue paragraph initials) than the work of Leo de Balneolis.⁸

⁵ At fol. 103r, with Chapter 110, the writing becomes much larger and coarser.

⁶ At fol. 109ra–va, opening, "Cum aliquis semicirculus dividitur in duos arcus, quolibet modo contingat, erit corda dupli unius equalis corde dupli alterius. Hoc enim patet protesta perpendiculari a puncto divisionis supra diametrum . . ." The work has been noted by A. A. Björnbo, *Bibliotheca mathematica*, 1912, 12: 220, from another MS: Florence, Bibl. Nazionale, Conv. Soppr. J.V.18. A third MS is Thorn R. 4°.2, 14th century, fols. 36–39 (79–82?). The work was printed without name of author, and without listing it in the Table of Contents, in both Venice, 1518, editions, *Sphera cum commentis*, and *Sphera mundi noviter recognita*, at fol. 139ra–va.

⁷ *Al-Battani sive Albatanii opus astrono-*

micum. Ad fidem codicis escorialensis arabice editum, latine versum, adnotationibus instructum a Carolo Alphonso Nallino, 1899–1907. Pubblicazione del R. Osservatorio di Brera in Milano, No. XL.

⁸ Fol. 110ra, incipit, "Inter universa liberarium artium que grecos quam et prius invenisse constat egyptios . . ." (the opening words of Nallino's Latin translation are, "Inter scientias omnium nobilissimas . . ."); at fol. 142ra, "Capitulum 57m in libri perfectione et in faciendo instrumentum ad celi similitudinem quod ovum appellatur necnon in constitutione duorum instrumentorum aspectus per que fiunt observationes"; at fol. 144va, ". . . ab horizonte versus meridiem elongabitur, et hic est figura subscripta. Explicit liber Albategni." On the opposite page is a figure of the sphere, and there-with the MS ends.

VATICAN 3099

3. VATICAN 3099. The contents of this manuscript have already been indicated in sufficient detail by Fritz Saxl,⁹ except that he does not note that the opening treatise on the Solid Sphere or Spherical Astrolabe, which is dated in the year 1312 in this manuscript,¹⁰ is assigned to the year 1303 in earlier manuscripts,¹¹ is sometimes ascribed in the manuscripts to Accursius of Parma¹² or to Johannes de Harlebeke,¹³ and, besides being extant in numerous manuscripts,¹⁴ was printed twice at Venice in 1518.¹⁵

VATICAN 3126

4. VATICAN 3126. This manuscript of the fifteenth century is primarily astronomical and astrological. Its opening treatise on the astrolabe has an unfamiliar incipit, "Pro declaratione presentis operis astralabi realis sciendum est quod duplex est in eodem. . . ." This work seems to end at fol. 6v, of which the lower two-thirds are left blank. Astronomical Tables occupy fols. 7r-13v, and on fol. 14r are two paragraphs of text. On fol. 14v is an astrological figure for the fourth day of creation, when the sun and moon and stars "are believed to have been made."¹⁶ After fol. 15 r-v, which is left blank, the next leaf is numbered 24 and doubtless introduces an independent insert taken from another manuscript. It is in a different handwriting. It opens with the unfamiliar incipit, "Saturnus in ascendente . . ." and closes on fol. 29v. Fol. 30 is blank,

⁹ *Verzeichnis astrologischer und mythologischer illustrierter Handschriften des lateinischen Mittelalters: I, In Römischen Bibliotheken*, Heidelberg, 1915, pp. 80-82.

¹⁰ Saxl's notice is as follows: "Bl. 1r-9r. In Nomine domini nostri Jesu Christi Incipit Tractatus de Spera Solida sive de Astrolabio Spérico Compositus Anno domini M^oCCC^oXIJ^o (vgl. Cod. Palat.lat. 1369, Bl. 70r-79r und Cod. Catin. ext. 87, int. 85). *Inc.*: Totius Astrologice rat(del.) speculationis radix. *Des.* non est presentis intentionis. Hunc tractatum sub dei Laude finiemus. *Finis.* (es folgen getilgte Worte: Cum autem uolueris scire arcum diurnum Solis). *Explicit* Tractatus De Spera Solida Seu de Astrolabio Spérico."

¹¹ Florence, Laurentian Library, Plut. 29, Cod. 45, 14th century, fols. 36-44; Erfurt, Amplon. Q.359, 14th century, fols. 112-120v; whereas VA 3099 is 15th century.

¹² In the Florentine MS mentioned in note 11.

¹³ London, British Museum, Arundel 268, 13-14th century, fols. 67rb-74vb, neatly written with circular spaces left blank for the insertion of figures, "Incipit tractatus de spera solida sive de astrolabio sperico compositus a magistro Johanne de Harlebeke medico anno Domini 1303 Parisius" (imperf.).

Cambrai 922, 15th century, fols. 38-50, "Explicit tractatus de spera solida, compilatus a magistro Johanne de Halebeke Flandrensi experto."

¹⁴ Ernst Zinner, *Verzeichnis der astrono-*

mischen Handschriften des deutschen Kulturgebietes, 1925, lists nearly a dozen in German libraries alone: see his Nos. 4530-4537, 4540, and perhaps 4538-4539, and 4541-4542. Other MSS are: at Oxford, Bodleian, Ashmole 1522, 14th century, fols. 132-148, and Digby 215, 15th century, fol. 5r *et seq.*, and at Florence, Biblioteca Nazionale Centrale II, iii, 24, 14th century, fols. 182va-189ra, "Prohemium in compositionem et utilitates sperre solide quod astrolabium spericum et generale nuncupatur."

I own a rotograph of the work as it appears in Utrecht 725, fols. 206v-211r, but in this MS of the late 15th and early 16th century, the work is anonymous and without mention of the date of original composition.

¹⁵ At fols. 139vb-143ra, in both *Spera cum Commentis*, Venetiis impensa heredum quondam Domini octaviani Scoti MODOETIENSIS ac sociorum 19 Ianuarii 1518, and *Spera mundi noviter recognita cum commentariis et authoribus*, Venetiis impensis nobiliss viri domini Luce antonii de giunta Florentini die ultimo Iunii 1518. The printed version consists of a prologue and two parts of 9 and 13 chapters. It opens as usual, "Totius astrologie speculationis radix." and closes, ". . . Et quoniam de mensuris tractare non est presentis intentionis, ideo hunc tractatum sub laude Dei finiemus." As in most MSS, no author is named.

¹⁶ "Figura seu facies celi ad initium mundi pro 4a die qua sol et luna et stelle facte esse creduntur et hoc secundum hebreos et eorum sequentes in qua concordat Albumasar."

as are the unnumbered leaves after it, until, at leaves numbered 35r-53r, we come to another independent insert in a third hand with yet a third unfamiliar incipit, "Sequitur modus et ordo . . ." With it seems to go a Table on fol. 54r, above which is written, "Hec tabula composita fuit anno domini 1431, die 28 Octobris, et est calculatio eius ad nonam speram," and below it, "Tabula 28 mansionum lune secundum nonam speram, sed alia prevalet que est secundum octavam speram id est firmamentum."

After a page left blank (fol. 54v) we have at fols. 55r-73v, in yet another handwriting, a work of astrological medicine on observing the celestial signs in medicinal and other human actions, which opens with instructions for hair-cutting ("In tondendis capillis," incipit, "Melior electio pro hoc ut sit luna in libra . . ."), followed by instructions when to cut one's nails, etc. At the bottom of fol. 64v is the caption, "Sequitur Capitulum 100m Haly," but then on fol. 67v we read, "Capitulum 100m partis 7e Haly Abenragel in electionibus Yndorum per motum lune in mansiones."¹⁷ At fol. 74r is a "Tabula 28 mansionum lune concordans cum dictis capitulis et est calculacio eius ad octavam speram id est stellarum fixarum." After two paragraphs of text on fol. 74v, Arnald of Villanova, on retarding old age by five kinds of *mirabolani*, concludes the manuscript.¹⁸

VATICAN 4082 AND 4085

5. Prince Baldassare Boncompagni included in his "Catalogo de' lavori di Andalò di Negro"¹⁹ a brief tract, extract, or fragment, "De infusione spermatiss,"²⁰ which he found ascribed to Andalò in two manuscripts at the Vatican,²¹ and which is also attributed to Andalò in a third manuscript at Vienna,²² where it follows the Tables of Giovanni Bianchini on the closely related subject of the period of gestation.²³

6. In a Madrid manuscript of the thirteenth century, and hence too early for Andalò, is a tract or perhaps only a paragraph with a similar subject and incipit, but an ending which does not occur anywhere in our text.²⁴ What would seem to be a very similar text occurs anonymously in two manuscripts of the Bibliothèque Nationale at Paris, Latin MSS 7307²⁵ and 7316.²⁶ In all three

¹⁷ The lower half of fol. 67r is left blank.

¹⁸ At fol. 75r; fol. 75v is left blank. See the "Sermo super electuario vite de mirabolanis," in Arnald's *De conservanda iuventute et retardanda senectute*, Opera, 1504, fol. 88ra-b.

¹⁹ *Bullettino di Bibliografia e di Storia delle Scienze matematiche e fisiche*, 1874, 7: 339-76.

²⁰ *Ibid.*, pp. 360-62.

²¹ Vatic. lat. 4082, fol. 209va-210ra; 4085, fol. 28r-v.

²² Vienna 5503, fol. 115.

²³ *Ibid.*, fol. 111r-v, "Tabula more infantis in utero matris, mora occidentalis luna (sic) super terram"; 112r-v, "Tabula more infantis in utero matris, Mora orientalis Luna infra terram"; 113r, "Tabula mediorum montuum infra tempus more"; 113v-114v, "Tabula mediorum motuum in horis et minutis hore infra tempus more."

²⁴ Madrid 10015 (formerly in the Cathedral

Library at Toledo), described as follows by Millás Vallicrosa, *Las traducciones orientales en los manuscritos de la Biblioteca Catedral de Toledo*, 1942, pp. 152-54: "Letra del siglo XIII, de una sola mano . . . fol. 19va, aparece un texto truncado; por estar el papel bastante deteriorado, no puede leerse fácilmente, si bien en las dos líneas que quedan del capitulo truncado se trata de las condiciones de la esperma en la generación. Según hemos podido comprobar, se trata de la obra de Andalò di Negro, *De infusione spermatiss*; cf. Thorndike-Kibre, op. cit., col. 207 . . . 'De infusioni (sic) spermatiss et nativitatiss. Dixerunt Ptholomeus et Hermes quod locus lune in hora . . . ' Explicit: ' . . . in veneris erit ascendentis id est nativitatiss.'"

²⁵ BN 7307, 13-14th century, fol. 1r. In the upper margin, in a somewhat later hand, "Liber centiloqui Ptholomei scilicet centum verba exposita per Heli" (i.e. Haly); the text opens,

Madrid and Paris manuscripts then follows a paragraph on the same theme by master Abraham.²⁷ This is not the case in any of the three Vatican and Vienna manuscripts.²⁸

7. In order that this tract attributed to Andalò di Negro of Genoa may henceforth be readily distinguished from other texts with similar incipits, I append an edition of it from the aforesaid three manuscripts, which are in substantial agreement. It will be seen that, while it opens with consideration of the so-called *Trutina* of Hermes, according to which the place of the moon at the moment of conception became the ascendent at the moment of birth, it soon turns to the other problem, how the duration of the period of gestation can be determined from the position of the moon. On this theme it distinguishes the doctrine of Ester or Hester from that of Ptolemy and Hermes.

8. Tractatus de infusione spermatis secundum dominum Andelonem de Nigro de Ianua. Super verbo Centiloquii 51.^a

Hester^b Ptholomeus et Hermes dixerunt quod locus seu gradus signi in quo est luna tempore infusionis spermatis est gradus ascendens in nativitate et quod gradus qui est ascendens in infusione spermatis, in dicto gradu illius signi erit luna in tempore nativitatis.

Dixerunt^c etiam Ptholomeus et Hermes quod cum luna tempore infusionis spermatis est in ascendente, tunc mora nati in ventre matris est spatium 273 dierum et hec dicitur mora media. Tunc circuli revolutionum lune perfecti sunt videlicet quod in illo signo et gradu in quo fuerunt luna et ascendens in infusione spermatis, in simili signo et gradu erit in nativitate. Si vero luna^d in infusione spermatis erit in horizonte occidentali sub terra, erit mora maior quam media diebus 15, videlicet erunt dies 288. Et cum invenitur^e in conceptione spermatis longe ab horizonte occidentali vadens versus orientem per unum gradum, tunc mora minuit per duas horas. Et quando invenitur in conceptione elongata per 12 gradus, tunc mora est dies 287. Et sic vadit minuendo^f pro quibuslibet 12 gradibus quod^g elongatur ab occidente diem unam^h donec invenitur in horizonte orientali. Ibi est mora dies 273, que est mora media. Simili modo quando luna invenitur tempore conceptionis super terram vadens versus occidentem, vadit minuendo

"Dixerunt Ptholomeus et Hermes quod locus lune in hora qua infunditur sperma est gradus ascendens nativitatis. Et in loco qui erat gradus ascendens in hora infusionis spermatis erit luna in nativitate . . ." and ends, ". . . et ubi inveneris erit ascendens nativitatis."

²⁷ BN 7316, fol. 145r: "De hora conceptionis et nativitatis. Dixerunt Ptholomeus et Hermes quod locus lune in hora qua infunditur sperma est gradus ascendens nativitatis . . ."

²⁸ Madrid 10015, "Dixit magister Abraham et Ibendeut, gradus infusionis spermatis non erit ex toto locus lune in nativitate . . . / . . . et hoc expertus fuit multociens." BN 7316, "De conceptione secundum Abraham. Dixit magister Abraham Isbendeuth, Gradus infusionis spermatis non erit ex toto locus lune in nativitate . . ." From BN 7307 I give the paragraph *in toto*: "Dixit magister Abraamus Bendeur, Gradus infusionis spermatis non erit ex toto lune locus in nativitate, vel ipse erit ei oppositus, et similiter erit de ascendente nati, id est, non erit locus lune in spermatis infusione. vel ipse erit aut ei oppositus, et hoc expertus fuit multociens."

²⁸ In VA 4082, *De infusione spermatis*, is followed by *De urina non visa*, here also ascribed to Andalò but really by William of England and Marseilles. In VA 4085, it is followed by another brief tract, *Ratio diversitatis partus*, which is also ascribed to Andalò, while in Vienna 5503, it is followed by "Petrus de Aretio, Ordo et regula iudicandi super nativitatibus hominum," at fols. 116r-117r.

^a VI 5503, "Andeolus de Nigro Ianuensis de infusione spermatis Super verbo Centiloquii 51"; VA 4085, "Andeolus de infusione spermatis." In VA 4082 five lines are left blank between ". . . Ianua" and "s. (scilicet?) verbo centiloquii 51," which is in smaller letters.

^b Ester in VA 4082. VI 5503 omits this first paragraph.

^c In VI 5503, "Dixerunt Hester Ptholomeus et Hermes . . .", but elsewhere has Hester.

^d si autem luna et in VI 5503.

^e inveneris in VI 5503.

^f in minuendo in VA 4085.

^g quibus in VI 5503.

^h unum in VI 5503.

moram a mora media pro quibuslibet 12 gradibus quodⁱ elongata invenitur^j luna ab horizonte orientali diem unam^k usque dum venit in horizonte occidentali super terram. Et tunc est mora dies 258 que est mora minor et tunc est differentia a mora minore ad maiorem per 30 dies videlicet quando luna invenitur super terram in occidente est mora 258 dies, et quando invenitur sub terra est 288 dies.

Ester^l Catayus habuit aliquam differentiam a Ptholomeo et Hermete.^m Ipse enim posuit quod mora media erat ex revolutionibus lune decem, videlicet a discessioneⁿ ab uno gradu usque dum revertatur^o ad eundem gradum. Si vero in una revolutione, que contingit fieri in diebus 27, hore 7, minuta 21 fere, quas multiplicavimus per 10, provenient dies 273, hora 1, minuta 30^p. Istos dixit quod erat mora media. Etiam dixit quod maior mora superabat mediam per medietatem unius revolutionis que est dies 13, hore 15, minuta 40, secunda 30. Et sicut mora maior superat mediam per dictam quantitatem, per eandem quantitatem mora media superat minorem.

Sed Ptholomeus et Hermes dixerunt quod mora maior superabat mediam per dies 15. Causa^q quare Ester dixit quod inter moram mediam et maiorem vel minorem sunt dies 13, hore 15, minuta 40, secunda 30, hec^a est. Quia si in^b conceptione luna esset in horizonte occidentali, ubi est mora maior et minor, necessarium est quod sit in opposito ascendentis. Ideo constat quod media revolutio est inter ascendentem et lunam. Et quia media^c revolutio constat ex diebus 13, horis 15, minutis 40, secundis 30, ideo dixit quod tanta erat differentia inter moram mediam et maiorem vel minorem. Dixit etiam Ester quod mora media erat recta et^d completa et perfecta^e, mora autem maior erat^f superflua a media et non perfecta, mora vera minor erat diminuta a media et non perfecta. Et quamvis ipse dixerit quod una revolutio lune constabat ex diebus 27, hore 7, minuta 21 fere, hoc^g dixit secundum medium motum, quia secundum verum est magis et minus, et ideo necessarium est ut mora media quandoque sit maior, quandoque minor, et per consequens est mora maior et minor.

Dixerunt etiam quod planete qui dominabantur a conceptione usque ad navitatem, videlicet quilibet planeta mensem unum solarem, qui constat ex diebus 30, hore 10, minuta 30 fere secundum medium motum sed secundum verum quandoque plus quandoque minus. Et dixerunt quod Saturnus dominatur^h inⁱ primo mense, Iupiter in^j secundo^k, Mars in tertio, sol in quarto, Venus in quinto, Mercurius in sexto, luna in septimo. In octavo redibat dominium ad Saturnum et nonum dominabatur Iupiter, tunc perfecta erat mora media et quod superfluum est a mora media usque ad maiorem dominatur Mars.

Dixit Ester^l quod in omni conceptione necessaria sunt yles et^m alcocodeus actazir sicut fit in nativitatibus, quamvis alcocodeus fieriⁿ debeat, tamen luna in conceptione est principaliter alcocodeus, cum ipsa sit datrix more ut supradictum est, et cum ipsa est alcocodeus secundum inventionem alcocodei ut in nativitatibus invenitur, et ipsa sit bene fortunata, tunc sunt more precise sicut supradictum^o

¹ quibus in VI 5503.

² est in VI 5503.

³ unum in VI 5503.

⁴ Hester Catynerius in VI 5503.

⁵ Hermes in VA 4085 and VI 5503.

⁶ descensione in VA 4082.

⁷ revertebatur in VA 4082.

⁸ VA 4085 and VI 5503 omit to "Et sicut."

⁹ causam in VA 4082 and 4085.

¹⁰ hoc in VA 4085 and VI 5503.

¹¹ si signum conceptionis in VI 5503.

¹² VA 4085 and VI 5503 omit media.

¹³ VA 4085 and VI 5503 omit et.

¹⁴ VA 4085 and VI 5503 omit the rest of the

sentence.

¹⁵ erit in VI 5503.

¹⁶ hec in VI 5503.

¹⁷ dominabitur in VI 5503.

¹⁸ VI 5503 omits.

¹⁹ VI 5503 omits.

²⁰ In place of the rest of the paragraph, VA 4085 and VI 5503 have, "et sic per ordinem, ex quo sequitur quod in maiori mora in nativitate dominatur Mars."

²¹ Hester in VA 4085 and VI 5503.

²² VA 4085 omits; VI 5503 has, Hyleg (?) Alchocoden.

²³ VI 5503 adds, habeat vel.

²⁴ dictum in VA 4082.

est, sicut quando aliquis planeta est alcocodeus mutatur mora^p ut capitulo^q alcocodei more dicitur.

VATICAN 4082

9. Boncompagni reproduced the table of contents of Vatican 4082 from the old longhand *Inventarium*. In this, eleven out of twenty-two items were represented as anonymous, but some of these are recognizable from their incipits as works by well known authors: the *Communis perspectiva* of John Peckham,²⁹ the treatise of Henry of Hesse against the Ptolemaic hypothesis of epicycles and eccentrics,³⁰ the *Isagoge* or *Epitome* of John of Seville,³¹ and a treatise by John Paul de Fundis.³²

10. I have pointed out elsewhere³³ that a theory of the planets which is anonymous in our manuscript³⁴ has been incorrectly ascribed to Georg Peurbach.³⁵ Among the other anonymous tracts are two questions which I do not remember having encountered elsewhere separately, but which may be taken from some commentary on the *Meteorology* of Aristotle. One asks whether all

^p nure in VA 4082.

^q VA 4082 adds, de. VI 5503 ends, "Ut capitulo Alchocoden dicitur," beneath which is written the date of copying, "A doctore Laur. Behem anno 1506 in septembri."

²⁹ VA 4082, fols. 12-21v; it was so identified in *Isis*, 1929, 13: 86. On Vatican 5963 see "A John Peckham Manuscript," *Archivum Franciscanum Historicum*, 1952, 45: 451-61.

³⁰ VA 4082, fols. 87ra-97rb: "Cum inferiorum cognitio (not *agnitio*, as in Boncompagni) ad celestium conducit inquisitionem . . . / . . . in generali tetigisse modum. Explicit tractatus de reprobatione eccentricorum et epiciclorum Parisius deo gratias et per me Petrum de Fita Padue scriptum annis 1401 imperfectis deo gratias Amen."

With these readings may be compared those of Hubert Pruckner, *Studien zu den astrologischen Schriften des Heinrich von Langenstein*, 1933, p. 8, from what he calls the oldest MS of the treatise, Metropolitankapitel Prag 1272, a.d. 1374-1376, fols. 45r-54r. Incipit, "Cum inferiorum consideratio ad celestem ducat inquisitionem . . ."; colophon, "Explicit de reprobationibus textus epicyclorum et concentricorum magistri Heinrichi de Hassia editus Parisius." Pruckner further gave the title as "Tractatus de improbatione concentricorum et epicyclorum," in which he was followed by Thorndike and Kibre, *A Catalogue of Incipits*, col. 143. But obviously it should be "eccentricorum et epicyclorum," as in VA 4082, since epicycles and concentrics are a contradiction in terms.

Pruckner mentioned two other MSS of the treatise, Melk 51, a.1393, fols. 210-218, and Vienna 5203, 15th century, fols. 100r-117r. but not our Vatican MS, nor BN 1640r, late 14th century on paper, fols. 55r-67v, where it is entitled *De sphaera*, and opens and closes: "Cum inferiorum cognitio . . . / . . . est finis contra eccentricos et epiciclos a venerabili magistro Henrico de Hassia Parisius ordinate."

In yet another MS at Princeton, Robert

Garrett 95, 15th century, fols. 146r-167v, it is called "Tractatus contra theoreticam planetarum," and has the usual incipit, but closes about 16 lines before VA 4082 does: ". . . Illa (*Alia* in VA 4082) vero que de luna recitantur (VA 4082 adds, *in theorica*) impertinentia sunt isti ymaginationi quare abiciantur. Explicit tractatus contra Theorica planetarum."

I own a microfilm of the work in VA 4082 and rotographs of it in the Robert Garrett MS and in Utrecht 725, late 15th-early 16th century, fols. 218r-246r, where it is anonymous but not curtailed as in the Garrett MS. Sometime I may edit the work.

³¹ VA 4082, fols. 121-139. Besides his numerous translations from the Arabic, John of Seville in 1142 composed an *Epitome* of the Art of Astrology, or, *Quadripartite Judgments of the Stars*. It consisted of an introductory *Isagoge in astrologiam*, followed by four books on the main branches of judicial astrology: namely, conjunctions and revolutions, nativities, interrogations, and elections. The incipit in VA 4082, "Zodiacus dividitur in . . .," is that of the preface to the *Isagoge*. For other MSS and incipits see *A History of Magic and Experimental Science*, 2: 75, note 1, and *A Catalogue of Incipits*, cols. 55, 116, 164, 594, 784. Yet another MS is Catania 85, 15th century, fols. 38-71v. For the character of the work, see *A History of Magic*, 2: 77-78.

³² VA 4082, fols. 223-246, opening, "Postquam novisti introductorium ad astrorum iudicia . . ." On John de Fundis, see *A History of Magic*, 4: 232 et seq.

³³ *The Sphere of Sacrobosco and its Commentators* (1949), p. 476, note 1.

³⁴ VA 4082, fols. 61ra-65vb, opening, "Moveatur sol sub circulo signorum qui dicitur zodiacus . . ."

³⁵ By Valentinelli, *Bibliotheca manuscripta ad. S. Marci Venetiarum*, 4: 280, in describing a work with the same incipit in MS fondo antico 344, 14th century, fols. 224-233.

meteorological phenomena in the upper region of the air are of the same species.³⁶ It further inquires whether all impressions of which the material is hot and dry exhalations are of the same species, whether all have the same *causa agens*, whether all have the same final cause — which is answered in the affirmative, that cause being man, and whether they have the same heat and the same motion — which are both answered negatively.

The other question is whether comets are of celestial or elemental nature.³⁷ Five arguments are advanced that comets are heavenly bodies. They move circularly with the daily motion of the heavens. Aristotle says that planets, too, sometimes have tails. The future can be predicted from comets: therefore they are superiors governing inferiors. If they were elemental, they would be heavier than air or fire, and not remain aloft in the spheres of those two light elements. And, if they were hot and dry exhalations, they would be unable to pass through the cold middle region of the air and ascend aloft.³⁸ The further suggestion is made that the body of the comet might be celestial, and the tail elemental. But the anonymous author ultimately concludes, in agreement with Aristotle and all the philosophers, that comets are entirely elemental, and answers the arguments for their being celestial.

Boncompagni gave the incipit of an anonymous treatise entitled, "Introductio de naturis signorum et esse eorum, et quae imagines cum suis faciebus oriuntur," incorrectly as "Ariis (*sic*) natura est ignita . . ." ^{38a} Actually in this manuscript it is "Aries natura est ignea colerica, gustus eius amarus. . . ." In another manuscript the wording is, "Aries natura igneus gustu amarus . . ." ^{38b}

11. Among the works by named authors in Vatican 4082 are *De iudiciis infirmitatum* by Andalò di Negro and Oresme's *De incommensurabilitate motuum celestium*,³⁹ which the aforesaid Petrus de Fita finished copying on 11 November 1401, the same year in which he transcribed Henry of Hesse against eccentrics and epicycles. Our manuscript also contains a copy which he made in 1405 of Blasius of Parma on the Theory of the Planets, while Blasius, who did not die until 1416, was still living.⁴⁰ This work consists in a discussion of the following problems:⁴¹

³⁶ VA 4082, fols. 82vb–83va, "Utrum omnes impressiones que sunt in parte superiori aeris regionis sint eiusdem speciei vel ad invicem differant." Compare Duns Scotus, *Opera omnia*, 1891–1892, 4: 75, *Lib. I Meteor., Quaestio xv*, "Utrum omnes impressiones ignitae sint eiusdem speciei specialissimae."

³⁷ VA 4082, fols. 83va–85va, "Consequenter queritur utrum natura cometarum sit celestis vel elemental." Compare Oresme's commentary on the *Meteorology* in BN 15156, fol. 247r, "Utrum cometa sit de natura celi vel elementari."

³⁸ Of seven arguments for comets being celestial given in the commentary on the *Meteorology* which is printed with the works of Scotus (4: 83–84, 1: *quaest.* xvii, only two correspond to any of these five: namely, the first in both, and the seventh to the third.

^{38a} VA 4082, fol. 215rb *et seq.* He was followed in *A Catalogue of Incipits*, except that Ariis was corrected to Aries.

^{38b} Princeton University, Garrett 95, fols. 135r–140.

³⁹ This MS was used for these two works in *A History of Magic and Experimental Science*, 3: 404 *et seq.*, 692–94.

⁴⁰ VA 4082, fols. 47ra–60va, opening and closing: "Super theoricam planetarum aliquas demonstrationes et dubia circa materiam gratiarum largitor pulsando ostendebat quibus visis postulare patefecit iuxta illud, Pulsate et aperietur . . . / . . . et centrum defferentis augem supra centrum parvi circuli patet quomodo respondere ad demonstrationem contra istam. Et sic sit finis per me Petrum de Fita 1405. Explete sunt theorice planetarum per magistrum Blasium de Pelacanis de Parma edite."

⁴¹ They stand out from the text in larger letters. I have collated another MS at Venice, S. Marco VIII, 69 (Valentinelli, XI, 86), fols. 175r–216v, with VA 4082, and have standardized

Tres orbes mundo ⁴² eccentricos et difformes per applicationem speram solis concentricam fabricare (47ra, 175r)

Fateri orbes fluere aut vacua et corporum penetraciones concedere per motum solis et augium est erroribus ⁴³ se prebere (47va, 176r)

Unam et eandem lineam per centrum terre per augem et oppositum augis transire, quare a puncto augis dato oppositum augis reperire et econtra (47vb, 177v)

Sole eccentricum peragrante uniformiter signiferum ab ipso difformiter circui, quare dies naturales necessario inequales (48ra-b, 178v)

Centrorum zodiaci et solis eccentrici distantiam indagare (48va, 179v)

Augem solis per distantiam KH ⁴⁴ geminatum opposito augis altiozem invenire (49ra, 182r)

In longitudinibus mediis super lineam a centro terre exeuntem equationem solis maximam reperire, quare nulla in auge nec in opposito (49rb, 182r)

Equationem solis per totum zodiacum quanta sit ostendere (49vb, 184r)

Angulo supra centrum eccentrici dato medium motum solis per equidistantem lineam datum esse. Quare ab eo subtracta equatione vel addita centrum notum esse. In oppositum (*sic*) tamen ⁴⁵ augis et auge medium pro vero sufficere (50rb-va, 186r)

Theoria Lune.⁴⁶ Ultra tres orbes eccentricos et difformes speram lune epicicli constituere, quare nusquam naturalibus obviare apparentias quidem per predicta penitus observare (50vb, 187v)

Lunam sex motibus moveri quibus datis est omni mense lunam bis eccentricum peragrare et in omni coniunctione cum sole centrum epicicli in auge deferentis invenire. Quare in medio inter augem et centrum epicicli Phebium consistere in aliam ⁴⁷ consequenter ostendere (51rb, 189r)⁴⁸

Cum equales angulos in equalibus temporibus supra centrum mundi lune epicicli describat circa centrum eccentricum ⁴⁹ necessario inequales. Quare epiciclium uniformiter, signiferum eccentricum vero difformiter peragrare, corpus autem lune utrobique difformiter (51vb-52ra, 191r)

Luna in longitudinibus mediis epicicli existente pro tunc in opposito augis eccentrici equationem argumenti maximam concludere, in auge vero minimam demonstrare (52rb, 192r)

Equationem centri super lineam a puncto centro eccentrici opposito maximam invenire, in auge quidem oppositoque ⁵⁰ augis eccentrici nullam concludere. Quare tunc augem mediam et veram unum esse (52va, 193r)

Dato argumento equationem eius quanta sit ubicumque comprehendere (52vb, 194r)

Dato centro quadrata proportionalia correspondentia demonstrare et econverso (53v)⁵¹

Super polos zodiaci epiciclium lune non moveri (54va, 199r)

Epiciclium lune deferentem super polos mundi non revolvi (54va, 199v)

Super diversos polos moveri epiciclium lune deferentem (54vb, 200r)

Polos eccentrici super quos ad orientem in die se appropinquat per 6 gradus

their variant spellings. The foliation for the two MSS is given in parentheses, and they are cited in the notes by the sigla VA and VE. G. Boffito and U. Mazzia published from yet a third MS in *Bibliofilia*, 1907, 8: 372-83, only the first three and last problems, and were under the misapprehension that the work was by Peter of Modena.

⁴² *mutuo*, Boffito and Mazzia.

⁴³ *exterioribus*, Boffito and Mazzia.

⁴⁴ HK in VE.

⁴⁵ VE omits *tamen*.

⁴⁶ VA omits *Theoria Lune*.

⁴⁷ A blank space in the line follows this word in VA.

⁴⁸ VE adds, Hanc questionem non intendo demonstrare.

⁴⁹ *eccentricum* in VE, *centrum* in VA.

⁵⁰ *opposito* in VA.

⁵¹ VE has a longer, Dato centro minuta proportionalia correspondentia demonstrare et econverso, primo tamen quot partes de partibus diametri 60 minuta comprehendant (197r-v).

a polis ecliptici removeri. Quare in una parte intra polos mundi et zodiaci et ex alia inter polum zodiaci et yemalem tropicum predictos polos invenire (54vb)⁵²

Polos eccentrici super quos ad occidentem appropinquat caput ad caudam genzaar non p. gradum a polis eisdem super ad orientem per gradus 13 tendet distare necesse est (54vb)⁵³

Per subtractionem medii cursus solis a medio motu lune geminato verum motum lune argumento dato faciliter⁵⁴ reperire. In coniunctione aut^{54a} oppositione cum sole datum locum facilius concludere et consequenter motum genzahar indagare (55rb, 201r)

Pro tribus superioribus unam theoricam sufficere spere lune omnino similem^{54b} equante forte pretermisso. Quare contra naturalem parum vel nihil concludere unamque et eandem lineam per centrum mundi eccentrici per augem et oppositum augis transire (55vb, 203r)

Cuiuslibet istorum Saturni et Martis motus et motuum velocitates sine demonstratione narrare, quare in tanto tempore a quolibet istorum epiciclum circui in quanto sol redit ad coniunctionem cum eis. Quare epiciclum Saturni minorem, Martis autem maximum (56rb, 204v)

Equationem centri maximam in epiciclo et consequenter in zodiaco super et minus quarta sui equantis peragravit (59ra, 212v)

Equationem centri maximam in epiciclo et consequenter in zodiaco super lineam a centro mundi ad eius circumferentiam finitam lineam super quam semi-diameter mundi erecta est (56vb, 205v)

In his superioribus argumento vero⁵⁵ existente in opposito augis equationem argumenti⁵⁶ maximam et in auge minimam concludere (57ra, 206v)

Argumentum equationis centri in epiciclo et similiter in zodiaco demonstrative cognoscere (57ra, 206v)

Verum locum cuiusvis trium superiorum per multa ostendere, coniunctionem solis cum quovis⁵⁷ eorum in paucis cognoscere (57v, 208r)

Mercurii et Veneris motus et velocitates figuraliter non tacere (58rb, 210v)

Cum centrum deferentis⁵⁸ Mercurii⁵⁹ quartam partem parvi circuli pertransivit et minus quarta sui equantis peragravit (59ra, 212v)

Existente centro deferentis Mercurii in aliqua linearum a centro orbis signorum exeuntium que parvum circulum contingunt quem idem centrum deferentis motu suo^{59a} describit, centro orbis signorum centrum epicicli Mercurii maxime propinquum fieri necesse est (59ra-b, 212v-213r)

In nona spera Mercurii et Veneris centra practice invenire (60ra, 215r)

Per latera trigoni tetragoni exagonii et circuli diametri aspectum sextilem quadratum trinum et perfecte oppositionis cognoscere (60rb)⁶⁰

12. *Demonstrationes geometricae in theorica planetarum*, which are ascribed to Blasius in another manuscript at the Vatican⁶¹ and occur anonymously in yet another at Vienna,⁶² have a different incipit and are a quite different treatment. They were printed without name of author in the Venice, 1518,

⁵² VE, fol. 200r, Polos eccentrici super quos ad orientem per 13° in die se appropinquat . . .

⁵³ *Ibid.*, Polos eccentrici super quos ad occidentem.

⁵⁴ VE omits.

^{54a} VE, autem et.

^{54b} VE, similiter.

⁵⁵ uno in VA.

⁵⁶ VA omits.

⁵⁷ VE, coniunctionem tam solis quam cuiusvis.

⁵⁸ VA omits.

⁵⁹ VE adds *quod*.

^{59a} VA omits.

⁶⁰ I did not see this problem in VE.

⁶¹ Vatican Latin MS 3379, 15th century, paper, fols. 52r-61r: "Blasii Parmensis demonstrationes geometricae in theorica planetarum"; opening, "Centrum solis equaliter distat a centro eccentrici solis et a centro terre . . ."; closing, ". . . existente plus sex signis. Finis theorie lune." I examined this part of the MS only briefly in 1931.

⁶² Vienna 5303, 15-16th century, fols. 51r-83v, opening, "Centrum solis . . ." I have not seen this MS.

edition of *Sphaera cum commentis* issued by Octavian Scot at fols. 143ra-152vb, "Centrum solis equaliter distat a centro eccentrici . . ./. . . Complete sunt quedam demonstrationes super theorica planetarum que admodum utiles sunt." Also in the Venice, 1518 edition of the same by Giunti at fols. 143ra-152vb. There are 22 numbered *Conclusiones* as to the sun, and those for the moon are numbered up to 17.⁶³ We proceed to the three superior planets, then Mercury, and then Venus.⁶⁴

VATICAN 9410

13. VATICAN 9410, a membrane folio dating from the late fourteenth or the fifteenth century, is an anonymous manuscript devoted to measures and the art of measuring. The bulk of its seventy-nine leaves consists of eleven chapters which at their close are called the Practice of Demonstrated Geometry.⁶⁵ In opening, the author states that, although there are many treatises on the art of measuring, some are too long, some too difficult, and none treats of the measurement of all things. The first chapter deals with units or minutiae (*minuciebus* ?) by whose multiplication, division and extraction of roots are found the lines used in measuring. The second is on the invention of chords. The third is on the knowledge of lines and of the right-angled triangle, "which is the first rectilinear figure and into which all others are resolved"⁶⁶ "ex cognitione angulorum eiusdem et e converso." Chapter 4 is on the art of measuring by line, that is, by length, height and depth. Chapter five is on measuring rectilinear surfaces; six, on the distinction of bodies and how many regular solids there are.⁶⁷ Chapter seven is on the measurement of regular bodies of this sort; eight, on the relation of diameter to circumference, etc.; nine, on the measurement of a circular surface and that it is the most capacious; ten, on the measurement of the sphere and its surface; eleven and last, on the measurement of irregular bodies.

14. The remaining contents of the manuscript may be roughly indicated as follows:

⁶³ At fol. 147ra begin unnumbered conclusions as to the moon and head of the dragon. It will be noted that VA 3379 ended with the theory of the moon.

⁶⁴ The conclusions are still unnumbered, and for proof of them one is often referred back to previous conclusions. After fol. 152ra no more Conclusions are distinguished by the use of large letters, but three paragraphs in the smaller type used for previous proofs open: "Ad habendum verum motum precise cuiuslibet planetæ habentis epiciclum per tabulas Alphonsii oportet quatuor invenire minuta proportionalia . . ."; fol. 152va, "Ad habendum verum motum solis si in argumento ipsius . . ."; fol. 152vb, "In omnibus circulis equales anguli supra centrum capiunt equales arcus . . ." and the text soon ends, ". . . Et sic est finis theorie Veneris et aliorum planetarum Dei gratias amen. Complete sunt quedam demonstrationes super theorica

planetarum que admodum utiles sunt."

⁶⁵ VA 9410, fols. 11-67r, "Quamvis plures de arte mensurandi inveniantur tractatus, quia tamen quidam sunt prolixo, quidam nimis difficiles, nec eorum aliquis ad omnium mensuras se extendit, ideo ego . . . / . . . Expliciant 11 capitula practice geometrice demonstrate." Another MS with the same incipit is Utrecht 725, 15th century, fols. 12-98.

⁶⁶ The same view is found in the *Practica geometrie* of Hugo in BN 15362. fol. 201va.

⁶⁷ The chapters are made up of numbered propositions: fol. 38v, "explicit 5m caplm 3 habens partes. In prima parte sunt conclusiones 17, in 2a vero 53, in 3a 32. Summa omnium 102. Et post hoc incipit 6m capitulum"; fol. 40r, "Explicit 6m capitulum quod 39 theoremata comprehendit"; fol. 52v, "Explicit 7 caplm in quo 24 theoremata."

fol. 67v-72v, "Divisiones linearum proponere. Linearum alie sunt communicantes . . . / . . . Explicit Ars de binomiis." fol. 72v, "Sequitur de datis proportionibus quantitatam. Data recta linea et alia in proporcione statuta subiungere . . ." fol. 74v, "Sequitur de corporibus ad instar superficierum. Dato solido pall'ino et aliud simile in proporcione statuta depingere"; fol. 76v, on measuring cone and pyramid; fol. 77r, "Prismatis circularis mensuram comprehendere"; 77v, "Chilindri circularis quantitatem concludere"; "Chilindri non visi visa portione basim extrahere"; "Plenum dolii contra vacuum comparare;" fol. 78r-79v, "Quantitates sperarum elementorum metiri."

15. Of this last item, an attempt to calculate the extent of the spheres of the four elements, we may speak further. According to the demonstration of Ptolemy in the fifth distinction, thirteenth chapter, of the *Almagest*, if the radius of the earth is taken as one part, a line from the center of the earth to the nearer longitude of the moon in its eccentric is 39 parts and 22 minutes. If we subtract from this the semi-diameter of the moon's epicycle, which is five parts and 10 minutes, and the semi-diameter of the moon itself, which is 17 minutes and 33 seconds, there are 33 parts, 54 minutes and 27 seconds left for the total distance from the earth's center to the concave of the orb of the moon or to the outer edge of the spheres of the four elements, or, roughly speaking, 34 parts. Or, if we take the cubic content of the earth as one part, that of the entire elementary region will be 39304 parts. Accepting the doctrine of Plato in the *Timaeus* and Macrobius in the *Dream of Scipio*, that the elements were fabricated by God according to the proportion of four proportional numbers, our author tries 1 for the earth, 33 for water, 1089 for air, and 35937 for fire. This gives a total of 37060, which is too small, whereas the proportion of 1, 34, 1156 and 39304 yields the excessive sum of 40495. The truth therefore lies between them, and our author calculates that 1 for earth, 33.39.30 for water, 1132.53.0 for air, and 39124.49.53 for fire will give 39292, which is close enough to the total of 39304. But the total was 39304, while the estimates for the four elements add up to 40292 rather than 39292. Evidently the figures have been miscopied, and the 39124.49.53 for fire should be 38124.49.53 (these fractions being sexagesimal) and the sum totals 39292 and 39304. In an accompanying table the 34 parts of the line from the center of the earth to the convex surface of the sphere of fire are divided thus: earth 1, water 2 parts, 15 minutes, air, 7 parts, 15 minutes, fire 23 parts, 30 minutes.

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Editorial Note: A second part of this Catalogue is scheduled for a later issue of *Isis* and will be followed by Notes on Some Medieval Astronomical, Astrological and Mathematical Manuscripts at Florence, Milan, Bologna and Venice.