Some little known astronomical and mathematical manuscripts

The purpose of this paper is to call attention to some anonymous and otherwise unfamiliar works in medieval Latin manuscripts in astronomy, mathematics and related fields from the Palatine collection at the Vatican, the Ambrosian library of Milan, the Stadtbibliothek of Bern, the Zentralbibliothek of Zurich, the Staatsbibliothek at Munich, and the National and University library of Prag. To facilitate use by readers the paper has been divided into numbered sections, with indices of authors and subjects, manuscripts and incipits which refer to these.

1. VATICAN PALATINE LATIN MS. 1049.—THOMAS BRADWARDINE is so prominent a name in the history of mathematics as well as theology in the first half of the fourteenth century that we may call attention to a work by him—or at least ascribed to him—that does not seem to have been hitherto noticed, although it is logical rather than scientific in content. The work consists of *Consequences* and *Questions of the Consequences of Thomas Bradwardine*, whose name is incorrectly given in the old long-hand catalogue as " Thomas Prag ". Vatic. Palat. lat. 1049, fol. 117*v*, col. 2, " Expliciunt questiones consequentiarum THOME BRAGWARDINI natione Anglicus complete in civitate Paderbornensi "; fol. 127*r*, col. 2, " Explicit textus consequenciarum magistri THOME BRAGWARDINI nacione Anglicus completus Paderborne a CONRADO DE FUREMELDE dyocesis Wormaciensis."

2. VATIC. PALAT. LAT. 1212.—A work ascribed to IORDANUS or JORDANUS on the composition of the astrolabe has a different incipit in Vatic. Palat. lat. 1212 from his *De planisphaerii figuratione* as printed in 1536 in the volume of VALDERUS, *Sphaerae atque astrorum coelestium ratio* etc., pp. 275-294. Other editions

of Basel, 1507 and 1558; Venice, 1558; in which the work of JORDANUS is also entitled *Demonstratio astrolabii et planisphaerii*, or merely *Planisphaerium*, I have not been able to examine. The incipit in the edition of 1536 is "Sphaeram in plano describere est singula puncta..." and the text is illustrated only by geometrical figures. Vatic. Palat. lat. 1212, 15th century, paper, fols. 82*r* (80 in old numbering)—102*r*, also has astronomical figures and two of instruments, but opens and closes : "Nunc videndum de hiis que circa eclipsim solis.../... Et in hoc terminatur compositio astrolabi, deo gratias." Our manuscript then seems to refer to the text, *De planisphaerii figuratione*, of which we have mentioned the printed editions : *ibid.*, fol. 102*r-v*, "Quia dubitari posset... in premissa descriptione astrolabii... ideo ad presens demonstrationem IORDANI inducere decrevimus... suntque 5 propositiones IORDANI quas de hoc negotio scilicet planisperii figuratione edidit et probavit." The text in the edition of 1536 comprises five such propositions, although they are there not numbered. Our manuscript also contains something else by IORDANUS on the sphere, but I could not make out the title.

3. VATIC. PALAT. LAT. 1377.—A brief anonymous commentary on the work of JORDANUS NEMORARIUS on weights is found in Vatic. Palat. lat. 1377, fols. 19*r*, col. 2-20*v*, col. 1 : "Iordani de ponderibus. Prima suppositio omnis ponderosi motum esse ad medium.../...brachio unde habetur que situm. Explicit tractatus JORDANI de ponderibus cum commento." BJÖRNBO has described this a little differently in *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, XXVI (1912), 135.

4. VATIC. PALAT. LAT. 1340.—An anonymous treatise on two astronomical instruments occurs in Vatic. Palat. lat. 1340, fols. 60*v*, col. 1-73*r*, col. 2 : rubric, "Incipit prefacio in compositionem instrumentorum sequentium de eclipsi"; incipit, "Pro faciliori modo habendo et multiplici labore..." In the preface it is explained that each instrument has two faces or parts which are drawn for the most part from Albion—presumably RICHARD OF WALLINGFORD's astronomical instrument of that name—"and other utilities recently invented pertaining to the same practice." Thus the first *facies* of the first instrument is for the true place

of sun and moon, the time of their mean conjunction, and their true conjunction with days equated and not equated. The second face is for most certain examination of their true conjunction and opposition. The composition of the two instruments is first considered, and then thirty utilities are specified for them. After our treatise on fol. 73*v*, col. 1, is added the " twenty-eighth chapter of Albion concerning the figure of a solar eclipse, useful for the preceding."

5. VATIC. PALAT. LAT. 1354.—Several anonymous astronomical treatises with incipits that I have not encountered elsewhere occur in a single manuscript of the fifteenth century, Vatic. Palat. lat. 1354. An anonymous treatise in two or more tractates on the *Ars visorandi*, or measurement of the cubic contents of vessels, occurs in Vatic. Palat. lat. 1354, fols. 2*v*, col. 1-24*v*, col. 1 (or perhaps to fol. 31). At fol. 2*v*, col. 1, " De arte visorandi cubica," opening, " Virgam visoriam planam ad vasorum calumpneccium(?)... "; at fols. 10*v*-11*v*, figures and tables; fol. 13*r*, col. 1, " Secunda pars tractatus de virga visoria cubica que est de usu eius. Officia lateris virge quibus sit usus... "; fols. 14*r*, col. 2-18*r*, more tables; fol. 21*v*, col. 2 is mostly blank; fol. 22*r*, col. 1, " Virga alia cubica visoria (?) sic fit"; at fol. 24*v*, col. 1, the text seems to end and pages of tables follow, but then at fol. 31*r*, col. 1, " Ars visorandi quarte (?)." I have not been able to find the words *visoro*, *visoria* and *calumpneccium* used in these senses in Latin dictionaries and wordlists, classical or medieval. At fol. 60*r*, col. 1-60*v*, col. 2 : " Canon super tabulam ostendendam distantiam vel coniunctionis vel oppositionis a media. Omnis utriusque sexus armoniam celestem adeo contemplatur ut iam de coniunctionibus et oppositionibus luminarium.../...Expliciunt canones permanentium." Tables follow from fol. 61*v* to 77*r*. Then the text either begins anew or resumes at fol. 77*v*, col. 1 : " Si verum locum lune volueris invenire per illas que extenduntur usque ad 30 dies... " More tables, in which the year is given as 1440 (fol. 79*r*, " anno 1440 completo"), alternate with occasional text without clear indication of the beginning of a new or distinct treatise. Some pages in German also occur. Finally at fol. 108*v*, col. 1, is a definite indication of the end of a treatise : " ...patet ex hys que dicta sunt in 2° notabili huius. Explicit practica exemplarium circa canonem

magistri Io. DANCO de coniunctione et oppositione veris super tabulas regis ALFONCII illustris." Whether this *Practica* based on the canons of JOHN OF SAXONY may be dated about 1440 remains, however, doubtful.

In the same manuscript is an anonymous commentary on the *Isagoge* to astrology of ALCABITIUS : fols. 126*v*, col. 1-160*r*, col. 2, " PTOLOMEUS in primo propositione Centilogii dicit.../... Explicit excerptum de lectura super ALKABICIUM finitum 1464 quo anno 27 omnes notabiles ceciderunt et omnes magistri permanserunt usque in " (This last word I could not read and I am not wholly certain as to some of those before it.)

The next item in the manuscript at fols. 160*v*-166*r* is given as ARNALD OF VILLANOVA's *Opusculum de astrologia*, or, *De iudiciis infirmitatum secundum motum planetarum.* But its opening words, " Sciendum zodiacus est animalium circulus... " is not the usual incipit for that treatise.

At fols. 233*v*, col. 2-237*r*, col. 2, a " Tractatus de magno anno PLATONIS," opens, " Ad pauca respicienda de facili enunciatur...," which TANNER gave as the incipit of NICOLAS ORESME, De motibus spherarum : see A. G. LITTLE, *Initia operum Latinorum quae saeculis xiii, xiv, xv. attribuuntur*, Manchester, 1904, p. 10.

Towards the end of the manuscript occur canons dated 1414 and apparently reckoned for the meridian of Magdeburg. They are seven in number : fols. 246*v*, col. 1-249*v*, col. 2, opening, " In firmamento celi sunt sol et luna et dividunt diem et noctem... " Tables follow them at fols. 249*r*-250*v*.

6. VATIC. PALAT. LAT. 1363.—It has not been customary to include a *Theory of the Planets* among the works of MICHAEL SCOT, and the following may well be spurious since it seems a kind of florilegium or derivative work. However, it is found in a parchment manuscript of the 13th-14th century, Vatic. Palat. lat. 1363, fols. 90*r*, col. 1-94*r*, col. 2 : rubric, " Incipit collectio floris rethorice (*sic*) planetarum "; incipit, " Theorica planetarum est scientia utilis omni astrologo..."; ending, " ... nec in circulo altitudinis nota. Explicit recollectio rationum de tractatu theorice planetarum secundum opinionem MYCHAHELIS SCOTI et deficit hic de hoc capitulo propter defectum exemplaris."

Nor is it usual to attribute an astrological work to CAMPANUS OF

NOVARA, but this is the case with the previous treatise in the same manuscript, at fols. 66*r*-88*v*, opening, "Postulata a domino artis signorum veritate..." It deals with the influence of the twelve astrological houses upon those born under them. In Vienna 5327, 15th century, fols. 14*r*-51*r*, however, this treatise is anonymous : see SAXL, *Verzeichnis astrologischer... Handschriften*, II (1927), 142; ZINNER, *Verzeichnis der astronomischer Handschriften*, 1925, No. 3342.

We perhaps have an unprinted Latin translation of *Judgments of the Moon* by the Arabic astrologer, OMAR. Or they may be an extract from one of his printed works. Vatic. Palat. lat. 1363, fols. 101*r*, col. 2-101*v*, col. 2 : "Iudicia lune secundum philosophum qui dicitur OMAUMAR super significatum(?) rerum que solent omni anno devenire in toto vel in parte sicut de ventis karistia istius et illius et de grano vino oleo et de infirmitate sanitate mortalitate et coeli ipsi salubritate." It opens, "OMAUMAR philosophus dixit quedam iudicia universalia cuiuslibet anni..."

7. VATIC. PALAT. LAT. 1377.—The following manuscript of the *Liber horologii regis Ptolomei* does not seem to have been noted by VAN DE VYVER (1) or BUBNOV (2), although they employed other Vatican manuscripts. Vatic. Palat. lat. 1377, parchment, fol. 95*r*, "Incipiunt capitula libri horologii regis PTOLOMEI..." The headings of eleven chapters are then listed which correspond to the first eleven of the twenty-four listed by BUBNOV from Latin MS. 11248 of the Bibliothèque Nationale, Paris, but after chapter eleven begins at fol. 96*r* of our MS., other questions follow to fol. 98*r*. The first chapter opens, "Iste titulus est quomodo debes inprimis laborare per astrolapsum..." as in BN 11248. Our manuscript appears to be fifteenth century, too late to be of much consequence for this text.

8. VATIC. PALAT. LAT. 1416.—Several anonymous treatises in astronomy and astrology, or perhaps to some extent

(1) Or A. VAN DE VIJVER, "Les premières traductions latines (X^{e}-XI^{e} siècles) de traités arabes sur l'astrolabe," *Congrès International de Géographie Historique*, Tome II, *Mémoires*, Bruxelles, 1931, pp. 266-290.

(2) NICOLAUS BUBNOV, *Gerberti postea Silvestri II papae Opera Mathematica*, Berlin, 1899, see especially pp. LIX-LX.

detached portions of longer works that may be better known, are found in the single manuscript of the fifteenth century, Vatic. Palat. lat. 1416. At fol. 70*v*, following the *Epistle on Conjunctions* of MESSAHALA, comes a tract on the weaknesses and strength of the planets opening, " Quedam sunt debilitates et fortitudines planetarum quas accipiunt..." At fol. 72*r* a new section or tract on weather prediction opens, " Cum ergo dispositionem temporis ad quemlibet certum terminum pronosticare volueris..." At fol. 79*r* what seems a distinct treatise on astrological interrogations opens : " Ihesus Christus Maria. Nota hic aliqua secreta astronomie in quibusdam questionibus secundum horas planetarum et primo de saturno (the symbol given is probably meant for this planet). Si quis venit ad te causa postulandi de aliquo..." A paragraph is devoted to each planet. At fols. 86*v*-87*v*, is a section of some work or separate tract " De significationibus 12 domorum," opening, " Prima domus significat vitam nati..." Later on in the same manuscript, after the close of the *Mathematica Alexandri*, at fol. 122*v* is the heading, " De caristia et bono foro rerum," and at fol. 124*v* " De elevatione unius planete super alium," opening, " Quando planeta elevatur unus super alium..." The subject of elevations is continued to fol. 135*v*, where it changes to conjunctions. After the intervention of some treatises by named and known authors, at fols. 168*r*-169*v* is an anonymous " Compositio equatorii," opening, " Recipe tabulam ligneam pergameno correctam..." At fols. 171*v*-172*r* what appears to be a tract on divination from thunder opens, " Cum luna fuerit in ariete et tonitruum auditur..." It considers the moon in the twelve signs in turn. Among the works from the library of the astrologer, SIMON DE PHARES, which were condemned by the faculty of theology of the university of Paris in 1494 was one called " alius tractatus de signis," opening, " Cum luna fuerit in ariete..." (3) But this may not have been our work, since treatments of the moon in the signs are legion. Thus at Florence in the Laurentian library, Plut. 89, sup., cod. 35, fol. 77, we find the incipit, " Quum luna fuerit in ariete bonum est minuere sanguinem de brachio et balneum

(3) CHARLES DU PLESSIS D'ARGENTRÉ, *Collectio judiciorum de novis erroribus*, 1755, I, ii, 327. LYNN THORNDIKE, *A History of Magic and Experimental Science*, IV (1934), 549.

intrare..." A text opening at fol. 182*r*, "Zodiacus est quidam circulus latus vel zona..." ends only at fol. 197*r*. At fol. 198*r* begins a work based upon the writings of CAMPANUS OF NOVARA or extracts from them, "Hic incipiunt equatoria de veris motibus septem planetarum ipsius CAMPANI et etiam aliqua communia extracta de theorica planetarum secundum ipsum. Sol habet unum circulum super cuius circumferentiam..." Finally, at fols. 222*r*-227*r*, is an anonymous discussion of elections and astrological medicine or "secrets of magic art"; rubric, "Amice carissime nolite declinare a dextris vel sinistris quia maiora secreta sunt tocius artis magice cum omnes fere philosophi deficiunt in eorum electionibus quia ista ignorant que subscribuntur. Et sint vobis multum secreta." Opening and close, "Ad habendum zenith solis.../...si fortuna aspexit eam vivet si non moriat."

9. VATIC. PALAT. LAT. 1892.—An astrological work on the *Judgments of Parts*, such as the *Pars fortunae* or Place of Fortune, is contained in another manuscript, Vatic. Palat. lat. 1892, fols. 99*r*-103*v* (older numbering, 51-55): "Incipit liber de Iudiciis partium PTOLOMEI et primo de parte fortune hic accipitur in die a Sole in lunam in nocte e converso et proicitur ab ascendente." The treatise does not seem to be complete in this codex, since it opens with a reference to what has been done "in the first book," "Quoniam in primo libro partium terminos et loca posuimus..." It devotes a paragraph to the place of fortune in each of the twelve astrological houses, and next turns to the *Pars absentis*, *Pars pecunie*, and so on for brothers, parents, sons, disease, marriage, death, travel, friends and enemies, and *De parte regni*. I did not examine the text sufficiently to determine how close a relation it might bear to the *Quadripartitum* of PTOLEMY. It evidently is a different work from the *Iudicia* sometimes ascribed to PTOLEMY in the manuscripts which opens, "Signorum alia sunt masculina alia feminina..." (4), and which deals with the planets, mansions,

(4) Of the following manuscripts of it I have seen the first two named. Wolfenbüttel 3549, 13th century, fols. 69*r*-91*r*, ending, "... in signo mensium menses in signo annorum annos."

BM Cotton Appendix VI, fol. 23*v*, "Expositio ad litteram superioris tractatus. PTOLOMEUS summus philosophus et excellentissimus egyptiorum rex... filium unumque instruens ARISTONEM cuius causa hoc opus incepit ad litteram huius

nativities and interrogations, but not with the theme of parts or places, at least not primarily.

10. MILAN, AMBROS. A.183.Inf.—A manuscript of the Latin translation of the *Planisphere* of PTOLEMY by HERMANN OF DALMATIA and ROBERT OF CHESTER which does not seem to have been listed by HEIBERG, BJÖRNBO, STEINSCHNEIDER or HASKINS is Milan, Ambros. A.183.Inf., 14th century, vellum, fols. 14*r*-19*v*, which includes HERMANN's preface naming ROBERT OF CHESTER but not himself. The date of the translation is in this manuscript given as June 1, 1144, not 1143 as stated by HASKINS, *Studies in Medieval Science*, 1924, p. 47 : " Explicit liber translatus tolose " (altered by a later hand to *Tholeti*) " anno domini 1144 kl. iunii." In this it agrees with the edition of 1536, VALDERUS, *Sphaerae atque astrorum coelestium ratio, natura, et motus : ad totius mundi fabricationis cognitionem fundamenta*, where the *Planisphere* occupies pp. 227-274, and the translator's preface is incorrectly ascribed to RODULPHUS OF BRUGES but ends (p. 232), " Facta est translatio haec Tholosae Calendis Iunii anno domini MCXLIIII."

The only manuscript of the work of THEBIT BEN CORAT on astrological images in which I have found the preface of the Latin translator is the same Milan, Ambros. A.183.Inf., a folio volume on vellum of the fourteenth century ornamented with colors and illuminations. Earlier in the volume is the translation of the *Planisphere* of PTOLEMY by HERMANN OF CARINTHIA and ROBERT OF CHESTER. This is preceded by a *Computus*, the *Sphere* of SACROBOSCO and JORDANUS on triangles, and is followed by Latin versions of treatises by the Arabic astrologers, ZAHEL and MESSAHALLA, and the pseudo-HIPPOCRATES on astrological medicine. At fol. 73*v*, col. 2 begins the introduction of the Latin translator

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artis accedens hanc divisionem facit. Signorum alia sunt masculina et alia feminina..."

FL S. Marco 194, 14th century, fols. 87*v*-95*v*, " Iudiciorum PTOLOMEI ad ARISTONEM filium suum liber incipit. Signorum alia sunt masculina alia feminina..., ... quia medicari non potest nisi in plura congruo marti. Sic et de ceteris intellige pluris." Noted by BJÖRNBO, *Bibliotheca mathematica*, VI (1905), 235.

Chartres 213, 12th century, fols. 41-63.

Oxford, Bodleian, Digby 38, 14th century, fols. 78-82.

See also STEINSCHNEIDER, " Die europäischen Uebersetzungen aus dem Arabischen," 177*b*, Vienna *Sitzungsberichte* 151 (1906), 45.

to the work of THEBIT. He tells of being lonely among strangers in Spain and discouraged in his pursuit of astronomy and astrology, until his master cheered him up by the gift of this precious volume of THEBIT which no one of the Latins has had before except a certain ANTHOCEUS who had a part of it. The introduction further argues that some persons can never make a success of astronomy or astrology, that the attack upon astrological images under the guise of religion is not valid, and that their use for evil ends does not prove them evil any more than does the use of an ax to commit murder instead of to chop wood indicate that all employment of axes should be abolished. The introduction finished, the text of THEBIT on images opens with its usual incipit and is divided into four parts. Ambros. A.183.Inf., fol. 73*v*, col. 2, " Incipit liber ymaginum a thebit boncorat. Cum cernerim(?) planetarum cursus libris perlectis aliisque astronomicis que ad hanc artem pertinere videbantur..."; incipit of text, " Dixit THEBIT boncorat quod ARISTOTILES ait Qui philosophiam geumetriam omnesque scientias..."; the second, third, and fourth parts begin respectively at fols. 74*v*, col. 1, 74*v*, col. 2, and 75*v*, col. 1; fol. 76*r*, col. 1, closing words, " ...intellige exposita voluptate divina, amen." Rubric, " Explicit liber ymaginum a tebit bon corat."

There then follows in the same manuscript the fairly well known work of THEBIT on those things which are necessary before reading the *Almagest* but with a rather unusual opening : " Incipit astrologia thesbit boncorat super almagesti. Tesbit bencorat radiosa mentis speculacione astrologie..." which may possibly be the first words of a translator's preface. This ends at fol. 77*v*, col. 2, and then succeeds in a different hand the even better known work of THEBIT on the motion of the eighth sphere. Fols. 81-114, which are now missing from the manuscript, according to a table of contents contained a work by ROBERT STICFORD, a monk, on shadows to which I can recall no other reference, and, beginning at fol. 108, an anonymous " De signis aquarum et ventorum, " which without its incipit can hardly be identified. The celebrated algebra of ALKHWARISMI and arithmetic of SACROBOSCO complete the manuscript.

11. MILAN, AMBROS. A.203.Inf., 15-16th century, folio paper, fols. 5*r*-9*v*, is one of two manuscripts known to me of an

arithmetic concerning fractions ascribed to GIOVANNI MARLIANI, who lectured at Pavia in the fifteenth century : " Incipit Algorismus de minutiis JOANNIS MARLIANI. Quandocunque fuerit aliquid divisum in duas partes equales.../... Et sic est finis huius Algorismi ad laudem omnipotentis dei eiusque intemerate virginis gloriose Marie matris. Deo gratias, Amen. Finis." Another MS is Paris, Bibliothèque Nationale, nouv. acq. lat. 761, fols. 1-47, Minutie et Algebra.

12. MILAN, AMBROS. D.28.Inf.—Canons of astronomical tables by a master JOHANNES DE SANCTO ARCHANGELO were copied at Naples on November 16, 1470, for ARNOLD OF BRUSSELS. Milan, Ambros. D.28.Inf., fols. 86*r*-97*r* : " Canones tabularum Magistri IOHANNIS DE SANCTO ARCHANGELO. De inveniendis veris augibus quorumlibet planetarum. Augibus planetarum ad eram Cristi adde motum octave spere.../... erit locus verus eiusdem planete in illa hora. Expliciunt Canones tabularum Magistri IOHANNIS DE SANCTO ARCHANGELO de gentili Neapoli. 1470 die 16 Novembris Neapoli." This JOHN is not listed in CHEVALIER's *Bio-Bibliographie*, and the only other thing that I know about him is that SIMON DE PHARES, writing at the close of the fifteenth century, states that some say that he made an *Equatorium* of the planets in 1360 which is a very useful work and cheap (5).

13. MILAN, AMBROS. E.114.Sup.—An astronomical work by MAINO DE' MAINERI which seems not to have been hitherto noticed in accounts of him is found in a manuscript of the Ambrosian library in his native city of Milan. At the close of the treatise, which is a *Theory of the Celestial Bodies*, the date of its completion is given as January 12, 1358, two years before the composition of his pest tract. Its closing words allude to astrological interrogations. Milan, Ambros. E.114.Sup., 15th century, paper, fols. 45 or 46*r*-64 or 65*v* : " Nota quod sunt novem orbes. Primus orbis est firmamentum in quo nulla est stella apparens.../...et nati in figuris interrogationum. Et sic habet finem theorica corporum celestium ordinata et ad finem reducta anno domini 1358 12 Ianuarii sole existente in fine capricorni et luna in principio piscium

(5) SIMON PHARES, *Recueil des plus célèbres astrologues*, ed. E. WICKERSHEIMER, Paris, 1929, p. 227.

prope Iovem. Ad honorem dei altissimi cui grates sint infinite secundum quod sui ordinis exigit celsitudo et beneficiorum ipsius multitudo meretur. Explicit theorica corporum celestium ordinata per peritissimum artium doctorem magistrum MAYNUM DE MAYNERIIS civem Mediolani."

14. MILAN, AMBROS. M.28.Sup.—Along with works by well known authors like EUCLID, SACROBOSCO and ANDALÒ DI NEGRO in MS Ambros. M.28. Sup. occur two unfamiliar anonymous works, a compilation of music which begins on fol. 114*r*, " Nota quod tresdecim sunt species cantus..." and an abbreviated *computus* beginning at fol. 119*r*, " Incipit abbreviatio compoti a magistro compilata. Nota materia compoti versatur precipue..."

15. MILAN, AMBROS. N.9.Sup.—There seem to be various tracts on the cylinder as a scientific instrument in medieval manuscripts (6). An unfamiliar anonymous one occurs twice in a manuscript of the fourteenth century, Ambros. N.9.Sup. At fols. 1*r*-4*r* is the complete text : " Cilindrus est quoddam instrumentum oblongum et crossum (for *grossum*) .../... super quo cadit margarita. Explicit tractatus cilindri." At fol. 164*v* is the same incipit, " Celindrus est quoddam instrumentum oblongum et crossum signis et mensibus lineis et gradibus... " but at fol. 167*v* the text breaks off incomplete.

16. BERN 483.—DROGO is named both by STEINSCHNEIDER *Europäische Uebersetzungen*, No. 36, and by HASKINS, *Studies in Medieval Science*, 1924, p. 77, as the translator from the Arabic into Latin of the *Epistle* of MESSAHALA on weather prediction, but they do not mention the following manuscript. Bern 483, 15th century, fols. 69*r*-70*v* : " In nomine dei pii et misericordis incipit epistola MESSEHALAHU *(sic)* in pluviis et ventis a magistro DROGONE translata de arabico in latinum. Dixit MESSEHEL' Inspice planetas inferiores et partes... " It has been suggested

(6) See my note, " Of the Cylinder Called the Horologe of Travelers," *Isis*, XIII (1929), 51-52; or *A History of Magic and Experimental Science*, III (1934), 211-212; also JOSEPH DRECKER, *Die Theorie der Sonnenuhren*, 1925, pp. 84-85. On Nov. 10, 1929, Professor DRECKER wrote me, " Die Bezeichnung *horologium viatorum* ist aber unpassend, denn der Cylinder gilt immer nur für eine Breite." I meant to have noted this in my book of 1934 but forgot to do so.

that " Drogo " may be a corruption for HUGO or HUGH OF SANTALLA.

The first item in the same manuscript is an anonymous commentary upon a metrical *computus*. The commentator cites AUGUSTINE, BEDE, HELPERICUS and ALEXANDER OF VILLA DEI. He comments on a verse or two at a time, accompanied by a figure. After fol. 13*r* the blank spaces left for the verses have not been filled in but the figures continue. At fol. 21*v* the commentary seems to break off rather than end.

Bern 483, 15th century, fols. 1*r*-21*v* : " Ad cunctipotentis laudem ac novellorum clericorum aliqualem profectum in presenti tractatulo quo adiutore deo altissimo tradetur ars computistica metrice et per figuras .../... bis causatur equinoxium in anno sequitur de nominibus."

Later in the same manuscript besides works by various well known authors is anonymous astrological matter which may be sections of or extracts from some long astrological work. What HAGEN has catalogued as " De planetis " (Bern 483, fols. 104*r*-111*v*) does not seem a distinct treatise. At fols. 112*r*-116*v* is a treatise on weather prediction : " Si autem de pluviis aerisque mutacionibus et de nubibus .../... ymbres multiplices inducit. Explicit tractatulus de mutacione aeris." Then comes, " De revolutionibus annorum mundi et quomodo inveniatur dominus anni," opening, " Est autem revolutio anni circularia cursus solis... " It perhaps ends at fol. 118*v*, where the caption, " Epilogus," occurs. But at fol. 119*r* we have, " De saturno ascendente hora revolucionis quid significet in aere... "; at fol. 120*r*, " De scientia accidentium qui ventura sunt in anno et in quibus partibus evenire debeant." At fols. 120*v*-121*r* are captions concerning divisions of the earth's surface; at fol. 122*r*, " De divisione circuli per domos." At fols. 122*r*-129*v* : " Incipit tractatus de hys que accidunt planetis... " opening and closing, " In ista secunda parte tercii tractatus dicendum est .../... fortunii et tempore. Explicit," is a portion of the astrological work of GUIDO BONATTI (7), but I have not identified the preceding astrological matter.

17. BERN 524A.—Most of Bern 524A is occupied by an

(7) Compare the edition of Venice, 1506, *Liber introductorius*, fols. (E5)-(F4).

illuminated Breviary (fols. 20*r*, col. 1-452*r*, col. 1). But this is preceded by a treatise on astrological elections in which allusion is made to the Calendar of PETRUS DE DACIA, and which is followed by a Canon on that calendar and the Calendar itself. More astrological matter then immediately precedes the breviary. Illuminations in gold accompany the treatise on elections.

Bern 524A, 14th century, fols. 1*r*, col. 1-9*v*, col. 1 : " Omnis creatura et universa que sunt in mundo efficiuntur motu planetarum .../... sive breves dies et nox. Expliciunt electiones de horis planetarum "; fol. 10*r*-10*v*, " Ad locum lune habendum quolibet die. Videas igitur quantum est coniunctionis dies .../... ad coniunctiones solis et lune usque in infinitum. Explicit canon super kalendarium magistri PETRI DE DATIA compositum ad meridianum Parysiensem "; fols. 11*r*-16*v* are occupied by the Calendar with each month occupying a page; fol. 17*r*, " Ad sciendum quandoque festa mobilia per numerum aureum et per litteram dominicalem "; fol. 18*r*, " Tabula de electionibus communibus "; fol. 19*r*, illuminated figure of a " Spera ad inveniendum quis planetarum regnet in qualibet hora diei et noctis; Versus qui planete boni qui malivoli "; fol. 19*v* is blank.

The opening treatise on elections, although prefaced to a Breviary, cites the Arabic astrologers MESSAHALLA, HALY ABEN RAGEL, ALBUMASAR, ALCHABITIUS, and ZACHEL (i.e. ZAHEL or ZAEL) as well as PTOLEMY, GUIDO BONATTI and PETRUS DE DACIA.

18. OTHER BERN MSS.—Some other works in Bern manuscripts in mathematics, astronomy and related fields with strange incipits, for which I follow HAGEN's catalogue (not always reliable) without having seen the manuscripts themselves, are :

Bern 224, 10th century membrane, fols. 181*v*-182*r*, " Solstitium cum sol restat et aut dies..."

Bern 234, 9th-10th century, fols. 44*v*-45*v*, " Nunc cerne ut media mundi corpora de quatuor elementis..."

Bern 266, 12th century, fols. 1-14*v*, a commentary on MACROBIUS opening, " PLATO philosophorum doctissimus decem volumina..."

Bern 196, 9th-10th century, membrane, fols. 1*r*-8*v*, " Quicumque desiderat scire certas horas noctium..."

Bern B 56, 11th century, membrane, fol. 2*r*, De simplici divisione, opening, " Oportet si per singularem decenum ac centenum..."

Bern AA 90, 29, 10th-11th century, fol. 6*r-v*, " Atomus dicitur sine incisione..."

Bern AA 91, 20, 12th-13th century, De minutiis abaci, opening, " Uncia ablata de asse remanet..."

Bern 441, 9th century, membrane, 16 fols., Computus cum calendario, opening, " Grecorum mensis eiydyneos signum in capricorni..."

19. PRAG 433 (III.C.2).—This fifteenth century codex is primarily devoted to astronomical and astrological treatises, although it also contains some works of alchemy and medicine. It opens with a work on the solid sphere which a table of contents pasted in on the back cover ascribes to " SIGISMUNDI REGINO HRADECENSIS." But this is probably an unwarranted inference from a statement on the inside of the front cover where is written, " Liber SIGISMUNDI DE GRADECZ REGINE." Evidently this SIGISMUND of St. Mähren, Hungary was once the owner of the entire volume and not the author of its initial treatise, whose opening words, " Totius astrologie speculationis radix et fundamentum..." are those of the work on the solid sphere or spherical astrolabe composed in 1330 by JOHN OF HARLEBEKE, a Flemish astronomer, as we know from another manuscript of it, Cambrai 922, 15th century, fols. 38-50. It occurs again anonymously in Vatican Palatine Latin 1369, 14th-15th century, fols. 70*r*, col. 1-79*r*, col. 2.

Other works on astronomical instruments follow in the Prag manuscript. At fol. 9*r*, col. 2 opens that of FRANCO DE POLONIA on the *Turquetum*, printed by ROBERT GUNTHER in his *Early Science in Oxford*, II (1923), 370-375. At fol. 11*r*, where the writing changes to single column, opens a less familiar work on the composition of an astrolabe : " Ad componendum astrolabium primo fac quam magnum vis..." Unfamiliar too is the incipit of a tract on the virtue of the magnet at fols. 12*r*-13*r* : " Cognoscitur magnes quatuor differentiis colore vigore pondere et virtute .../... Quomodo autem ferrum stet in aere per virtutem lapidis in libro de operibus speculorum narratur." At fol. 13*r* with the words, " Ad componendum horalegium fac semicirculum et dividatur in 90 partes sive gradus equales..." open anonymous instructions for a sun dial which seem the same as those in a manuscript at the Laurentian library, Florence, Plut. 29, cod. 43, 15th century,

fol. 62, and perhaps as some of those listed in ZINNER's *Verzeichnis der astronomischen Handschriften des deutschen Kulturgebietes*, 1925, Nos. 9233, 9690-9693. This horologe is called " for travelers " *(viatorum)* only in TRUHLÁR's catalogue and on the aforesaid flyleaf of the manuscript itself. In the latter case, however, the word *viatorum* has been deleted and the words *in pariete locari* substituted. At fol. 14*r* begins a *Compositio instrumentorum tabularum theorice*, with the incipit, " In nomine domini amen. Incipiam compositionem declarationem instrumenti theorice..." This text seems to end at fol. 18*r*, unless subsequent figures and tables belong with it. At fols. 21*r*-22*r* are 69 colored figures of eclipses during the years, 1406-1462. At fol. 26*r* is a large figure of an *Instrumentum Saturni*, at fol. 27*r*, another for Jupiter and so on for the other planets.

TRUHLÁR catalogues fols. 22*v*-25*r* as " Incensiones " (Ascensiones ?) " Mag. CRISTANI (DE PRACHATIC)." This master CHRISTIAN OF PRACHATITZ or of Prag is known for a number of works in the fields both of astronomy and medicine. ZINNER, *op. cit.*, Nos. 885, 8551-89, lists no fewer than forty manuscripts of his tract on the composition of the astrolabe, and single manuscripts of other on computus, the Alfonsine Tables, and the new moon (Nos. 8590-92). SUDHOFF noted his pest tract : *Archiv für Geschichte der Medizin*, VII, 100-101. Various astronomical tracts by him are together in a manuscript at the Vatican : Rossianae 1106 (XI, 245). A work on bleeding by him appears to be astrological : Plagens 102 Cpl. (822) 215, 15th century, paper, fols. 157-170*v* : " In nomine domini amen. Quia multitudo hominum utriusque sexus .../... sufficiant pro presenti. Finis anno etc. XXX° iii "; at fol. 162 a figure of the aspects of the planets. For an herbal by him see *Ephemerid. Vestnik*, IX (1900), 246-48. RANZOVIUS, writing in 1580 (*Catalogus virorum excellentium in arte astrologica*, p. 47), tells that CHRISTIAN, an astrologer of Prag, warned LADISLAS IAGELLO, king of Poland, of his imminent death which occurred in that same year, 1434 (i.e. 1444), at the age of forty-nine.

At fols. 38*r*-39*r* critical days are discussed with reference to the moon : rubric, " Hic ponitur aspectus lune quantum luceat. De diebus creticorum "; incipit, " Sufficientia et numerus dierum creticorum habetur per hunc modum... "; ending, " ...per sep-

timanas et menses et annos et etates et hic est finis istorum." After this unfamiliar treatise comes the better known work of PROSDOCIMO DE' BELDOMANDI on the astrolabe, (8) opening here, " Quamvis de conposicione astrolabii tam modernorum..." After it is a brief tract or an extract from some longer work on the signs of the zodiac : fol. 43*r*-*v*, " Nota secundum astrologos quod sunt xii signa (9) celestia .../... et si hec prescripta servabis salvis eris."

Passing over a brief discussion of human anatomy (" Quomodo homo dividitur sequitur ") opening, " Dividitur capud secundum primam divisionem..." we come to astrological elections or rules concerning the moon : fols. 45*r*-49*r*, rubric, " Canones iudiciales de motu lune "; incipit, " Cum ellectio et optacio signorum..."; ending, " ...secundum successionem signorum et sic est liber electionum completus." Then come the *Flores* of ALBUMASAR, the work on weather prediction opening, " Cum multa et varia ... " with which the name of HERMANN OF CARINTHIA is associated as translator into Latin (10), and that usually entitled " De tempestatum presagiis " (11) but here called " De aura " (fols. 57*v*-58*v*). The treatise of ALKINDI on rains occurs twice in this manuscript : incompletely at fol. 63 and more fully at fols. 167*r*-169*v*. TRUHLÁR's catalogue makes several items of what seemed to me a single treatise at fols. 98*r*-118*v*, opening, " Signa autem sunt hec : Aries, Taurus... " Then follows the *De luminaribus* of ABRAHAM AVENEZRA.

After the alchemical work of JOHN OF RUPESCISSA on the fifth essence and a *Regimen sanitatis* (with the unfamiliar incipit, fol. 144*v*, " Exercitium prohibet ne repletionis nimia congregat...") we have beginning at fol. 148*v*, col. 1, " Celum sydereum id est firmamentum...", what are perhaps miscellaneous astronomical and astrological notes rather than a unified treatise, followed at fols. 155*r*, col. 1-166*v*, col. 2 by *Imagines celi*, opening, " Omnes

(8) See BONCOMPAGNI's *Bullettino de Bibliografia e di Storia delle Scienze matematiche e fisiche*, XVIII (1885), 413. Another MS. of it is at the Laurentian library in Florence, Ashburnham 134 (208-140), 15th century, pp. 256-283.

(9) This word is commonly spelled *singna* throughout the manuscript.

(10) HASKINS, *Studies in the History of Mediaeval Science*, 1924, p. 49; THORNDIKE, *History of Magic and Experimental Science*, I, 652, II, 84; G. HELLMANN, *Die Wettervorhersage im ausgehenden Mittelalter*, 1917, p. 199.

(11) This text is identical with the last part of the eighteenth book of Pliny's *Natural History*.

ymagines in numero 28..." and closing, " ...ac plus et pauper quam dives."

At fol. 170*r* begins the *Rudiments of Astronomy* of ALFRAGANUS in the translation of JOHN OF SEVILLE, as is shown by the incipit, " Numerus mensium Arabum et Latinorum est duodecim... " the incipit of the other translation by GERARD OF CREMONA being, " Numerus mensium anni Arabum et aliorum omnium..." (12). An anonymous treatise, *De pluviis*, at fols. 184*v*-188*v*, has, like the work of ALKINDI on the same subject, already occurred in our manuscript, which appears to be a composite one, at fols. 54*v*-57*v*. From its opening words, " Cum multa et varia de ymbrium cognitione... " it is recognizable as the *Liber ymbrium quem edidit Hermannus* (13). Then come less known predictions of crops : fol. 188*v*, col. 2, *Pronostica segetum*, opening, " Cum velis segetum prenoscere eventum in singulis annis... " and at fol. 189*v*, col. 1, a further bit of weather prediction opening, " Apertio portarum dicitur cum coniungitur planeta inferior... " which SAXL has already noted in a Vienna manuscript (14). After a brief tract or note, *De impressionibus multis*, opening, " Nota experimenta ALBUMAZAR enim dicit quod cum Saturno...," an anonymous work on comets begins in a different handwriting. It opens, " Cometa est vapor terrenus habens partes grossas...", takes up the significance of comets in the different signs of the zodiac, and is extant in at least three other manuscripts (15). A treatise, *De mutatione aeris*, at fols. 191*v*-198*v*, opening, " De mutatione aeris prescire intendens multa philosophorum volumina perquesivi... " proves to be the sixth tractate of astrological compilation of LEOPOLD OF AUSTRIA. It also occurs separately in Wolfenbüttel

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(12) See BJÖRNBO, A. A. " Die mathematischen S. Marco Handschriften in Florenz," *Bibliotheca mathematica*, XII (1912), 207; " ALKINDI, TIDEUS und Pseudo-EUKLID," *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, XXVI (1912), 125, note 1. Recent editions by Campani (1910); Carmody (1943).

(13) See note 10 *supra*.

(14) FRITZ SAXL, *Verzeichnis astrologischer und mythologischer illustrierter Handschriften des lateinischen Mittelalters*. II, *Die Handschriften der National-Bibliothek in Wien*, Heidelberg, 1927, p. 130, cataloguing Vienna 3162, 1442 A.D., fols. 233*r*-234*v*. And see item 23 below.

(15) E. ZINNER, *Verzeichnis der astronomischen Handschriften des deutschen Kulturgebietes*, München, 1925, Nos. 6203-6204; Venice, S. Marco VIII, 33 (Valentinelli, XI, 106), 15th century, fols. 2-4.

2816, fols. 178*r*-181*v*. Thus the subject of weather prediction receives much attention in the treatises composing our manuscript.

We return to astronomical instruments. At fols. 197*r*, col. 1-200*v*, col. 2 is a work on an instrument called *Coralumen* which was composed in 1395, not 1394 as stated by TRUHLÁR, who misread the old Arabic figure : see fol. 199*v*, col. 1, " Registracione alia quam sicud dictum est non indigent omnia predicta nisi post 30 annos ab isto anno quo hec sunt conscripta scilicet anno domini 1395 in die sancti Gregorii." The work opens : " Coralumen est instrumentum motus celi in quo..."

At fols. 201*r*-203*v*, what is catalogued by TRUHLÁR as " PTOLOMAEI CL propositiones in astronomia," and described in the rubric of the manuscript as " Centum quinquaginta propositiones in astronomia domini PTHOLOMEI," is really, as its incipit and colophon show, the *Capitula Almansoris* translated in 1136 by PLATO OF TIVOLI and often printed. The present copy was made by IOHANNES DE NOVA DOMO (NEUHAUS?) in 1450.

Following this at fols. 206*r*, col. 1-208*r*, col. 2, is the translation of the *Centiloquium* of HERMES made by STEPHEN OF MESSINA for MANFRED. The initial rubric informs us that the initials of the one hundred chapters show by what author, translator and at whose command the work was produced : " Astrologie centum capitula quorum quis auctor cuius iussu ostendit quis transtulit prime littere ipsorum capitulorum ostendunt, Domino MANFRIDO inclito regi Sicilie STEPHANUS DE MESSINA hos flores de secretis astronomie domini HERMETIS transtulit." But this key to the anagram is incorrect since it makes 103 initials. But if we read *Stefanus* instead of *Stephanus*, *Messana* instead of *Messina*, *astrologie* instead of *astronomie*, and *divi* instead of *domini*, the passage would exactly correspond to the hundred initials.

Next at fols. 208*r*, col. 2-210*v*, col. 2, comes an anonymous " Tractatulus revolutionum in tribus superioribus. Primo de Saturno." It opens, " Tractatulus in partibus planetarum in 12 signis et eorum latitudine..." and closes, " ...nec errabis et sic est finis, deo gratias." A treatise on the revolution of the year, " De revolutione anni," immediately follows, opening, " Revolutio anni mundi est introitus solis in capud arietis..." ZINNER, *Verzeichnis der astronomischen Handschriften des deutschen Kultur-*

gebietes, 1926, No. 3362, notes another manuscript of this in Salzburg, St. Peter-Stiftsbibl. a. VI. 17, fols. 83*v*-86*v*.

20. PRAG 1144 (VI.F.7), a manuscript of the fifteenth century, offers works that seem unfamiliar in a treatise on weather prediction by a master GUIDO, and an anonymous arithmetic dealing with proportion : fols. 103*v*-112*r*, " Tractatus de dispositione aeris magistri GWIDONIS," opening, " Ne te in astrorum iudiciis decipi pertimescas..."; fol. 149*r*-*v*, " Algorismus de proportionibus," opening, " Proportio ut notat EUCLIDES quinto elementorum..." It also presents a text copied with omissions from a work called *Height of Mundane Glory* or *Top of the World* which would seem to have been the same as the encyclopedia printed under the title, *Lumen animae* (16). Our text was copied in 1446 at the University of Cracow by a bachelor of the same named ANDREAS COSTEN who says that he omitted the mystical or theological sense. Prag 1144, fols. 53*r*-98*v* : " Incipit liber intitulatus Altitudo mundane glorie. AVICEBRON libro fortis (sortis ?) vite. In altiori interstitio aeris est sempiternum frigus et sempiterna tenebra .../... et sic est finis huius materie que quidem materia scripta ac collecta est per me ANDREAM DE COSTEN baccalaureum Cracoviensem in eodem studio in bursa pauperum ex quodam libro qui intitulatur liber de altitudine mundi obmittenda ibidem sensum misticum sive theologicalem. Anno M CCCC xlvi." This is not the first such instance I have noted of medieval preference for facts concerning nature to allegorical or theological analogies or lessons from them.

21. PRAG 1609 (VIII.G.27).—A *Recommendatio astronomiae* in this manuscript is made up chiefly of citations in favor of astronomy and astrology. The moving intelligences of ARISTOTLE are reconciled with the Christian faith, and astrological images are held to be wrongly called nigromantic. A provocative citation is that of a REGIMUNDUS in a prologue of LEUPOLDUS, presumably the well known astrological work of LEOPOLD OF AUSTRIA. But a prologue to it by REGIMUNDUS is more novel. Other citations include the chief Arabic astrologers, such Latins as WILLIAM OF

(16) LYNN THORNDIKE, *A History of Magic and Experimental Science*, III, 546 *et seq.*

ENGLAND and GUIDO BONATTI, and such an unfamiliar name as BURGARIUS. Prag 1609 (VIII.G.27), 15th century, paper, fols. 40*r*-43*v* : " Astronomia est scientia ad sciendum deum .../... verba loco thematis assumpta. Et sic est finis huius."

Later on in the same manuscript, at the close of the *Isagoge* to astrology of ALCABITIUS, an interesting note states that the following books are not to be had in Bohemia : the *Planisphere* of PTOLEMY, " libri pol. maxime de venenis,"—which I think is a reference to the work on poisons by PETER OF ABANO which is sometimes entitled in the manuscripts *Pollex de venenis* or *Pollex venenorum*—ALPETRAGIUS, the mathematical treatises of ARCHIMEDES especially the *Conics*, the astrology of ABRACHIS—a corruption for HIPPARCHUS but called elsewhere the astronomer of NEBUCHADNEZZAR, and ARZACHEL, author of the astronomical tables of Toledo (*ibid.*, fol. 110*r*).

Finally in this manuscript may be noticed an astrological work on projections of rays and directions of significators which in its title resembles the treatise of GUARIMBERTUS OF PARMA (17). But the work seems quite different and is divided into a great many numbered paragraphs instead of eight chapters as in the work of GUARIMBERTUS. Prag 1609, fols. 111*r*-143*v* : " In Christi nomine amen. Vidimus nonnullos artium scolares liberalium valentissimos..."

22. OTHER PRAG MSS.—Astronomical tables are well represented in the Prag manucripts. In a manuscript of the fourteenth century, Prag 1826 (X.A.23) we have first on parchment the Alphonsine tables and then some by JOHN DE LINERIIS; fols. 1*r*-22*r*, " Incipiunt tabule regis ALPHONSI et primo tabule differentiarum unius regni ad aliud .../... tabula equationum Mercurii "; fols. 22*v*-40*v*, " Tabula sinus .../... in latitudine 52 graduum,"—probably the second book of JOHN DE LINERIIS' canons of 1322 on the Alphonsine tables, of which the more usual incipit is, " Cuiuslibet arcus propositi sinum rectum per tabulas invenire..." Later in the same manuscript come the canons of 1327 of JOHN OF SAXONY : fols. 69*v*-90*v* (the numbering jumps

(17) LYNN THORNDIKE, *A History of Magic and Experimental Science*, III, 598-9, 768-9.

from 69 to 80, omitting the 70's), " Tempus est mensura motus .../... secundum doctrinam mag. IOHANNIS DE LINERIIS. Expliciunt canones mag. IOHANNIS DE SAX. super tabulas ALFONCII et eclipsium etc." In Prag 1832 (X.B.31), 15th century, these canons of JOHN OF SAXONY have prefaced to them a later introduction, opening at fol. 1*r*, col. 1, " In principio huius ardui operis ALPHONTII..." in which ALPHONSO THE WISE is highly eulogized. Having promised to consider the material cause of the Alphonsine tables, the formal cause, their author, end and title, and having referred to such astronomical instruments as the Torquetum and Albion, this preface asserts that the Alphonsine tables excel all others in applying to all kingdoms of the whole world, in facility of use, and in verity, " and from them as from a pure spring all other tables proceed." ALPHONSO X is then lauded for his noble and illustrious genius, for having sought science from the ends of the earth among all tongues and peoples, as lord of all virtues and sciences, as having rescued many books for posterity, as of liberal munificence, comprehensive intellect, and divine rather than human foresight, and the fountain of every virtue. All the most favorable aspects of the sky and influences of the planets must have united to produce such a man, and the writer of our preface — or HALI whom he professes to quote—does not believe that nature could have made a more perfect man. The writer of the preface then repeats the same idea in other words. Then it is announced :

" Here begins the book of astronomy concerning the movements of the planets and their oppositions by practice and tables of ALPHONSO, king of Castile and king of the Romans. This is the general prohemium of the tables of ALPHONSO to his entire work which JOHN DANCO, the disciple of JOHN DE LINERIIS, made, in which are set forth four things needful to know for the following canons : first, knowledge of time; second, how the astronomer uses time in a different way than the natural philosopher; third, practical operation which is performed in only two ways in the Alphonsine tables namely by collecting and by dividing; fourth," concerning different eras such as those of CHRIST, MOHAMMED, ALEXANDER THE GREAT and DIOCLETIAN. Then the first part of this prohemium concerning knowledge of time opens with JOHN OF SAXONY's familiar incipit, " Tempus est mensura motus..."

The early fifteenth-century canons of PROSDOCIMO DE' BELDO-

MANDI to the fourteenth-century tables of JACOPO DE' DONDI of Padua are contained in Prag. 2436 (XIV.B.3) of 1454 A.D., and the tables of ARZARCHEL in Prag 691 (IV.E.11), 13th-14th century, and 2431 (XIV.A.18), early 14th century. In the latter are perhaps other tables of Toledo and a brief table for the years 1322-1333. Prag 629 (IV.C.2) has anonymous canons on the Alphonsine tables : fols. 105*r*, col. 1-120*r*, col. 1, " Vult ARISTOTELES 4° phisicorum Cum igitur motum scire desideramus .../... sicud in coniunctionibus planetarum dictum est. Expliciunt Canones super tabulas ALPHONCII regis et cetera." The previous contents of this last mentioned manuscript had been primarily astrological.

23. CLM 2841.—An astrological manuscript in the Staatsbibliothek, Munich, CLM 2841, which the printed catalogue dates as sixteenth century but I should say was fifteenth, comprises a number of apparently unfamiliar texts. It opens with a brief book on conjunctions of the planets ascribed to ALCABITIUS and which possibly is an extract from his *Isagoge* or Introduction to astrology : fols. 1*r*-3*r*, opening, " Quando luna coniungitur Saturno in uno signo, tunc dies est mala in omnibus rebus..." After some pages of miscellaneous astronomical and astrological notes, a brief tract or extract on weather prediction (which we have already noted under item 19) begins at fols. 12*v*-13*r* : " Iudicium particulare de mutationibus aeris," with the subhead, " De appertione portarum," and the incipit, " Appertio portarum dicitur cum coniungitur planeta inferior planete superiori et fuerint cum hoc domus eorum opposite..." At fol. 13*v* is the caption, " Ad sciendum naturam aeris singulis annis." Fols. 15*r*-30*r* are occupied by a *Book of Judgments* which we are told is said by ALBERT in his *Speculum* to be by ARISTOTLE. But not only do I fail to find any such attribution in the *Speculum astronomiae* as printed by BORGNET : further the incipit of our *Liber de iudiciis*, " Nota quod omnia que dicimus in nativitate alicuius ita eadem dicuntur in questione sed non ita proprie..." is not the same as that of another text in an Erfurt manuscript which also is represented as attributed by ALBERT in his *Speculum* to ARISTOTLE. There therefore appears to be some mystery about the matter. Our text is primarily occupied with astrological interrogations such as concerning

war with some city, the time of the interrogation, whether one's associate is friendly or not, and how to tell another's thoughts.

At fols. 31*r*-33*r* of our manuscript is a text headed in huge lettering, " Ad sciendum aminodar secundum ordinem antiquorum de Tholeto editum," and opens, " Et hoc est apertius quod invenerunt ad sciendum moram foetus..." Astronomical tables fill fols. 34-35. Fol. 36 is occupied by " Qualitas diei a festo Lucie usque ad festum Viti crescentis." At fol. 37*r* an astronomical collection especially from ALCABITIUS has the unfamiliar incipit, " Est itaque astronomia astrorum lex que cursus..." None of these items thus far seems noted in ZINNER's *Verzeichnis* of astronomical manuscripts in German libraries, the reason probably being that " ALCABITII liber de coniunctionibus planetarum " is the sole entry in the printed catalogue for the first 52 leaves of our manuscript. " Experimenta de aeris mutatione " occupy fol. 52*r-v*.

Next comes a *Book of Judgments of the Stars* " translated from Arabic into Latin by master JOHN," but its incipit does not correspond to that of any known translation by JOHN OF SEVILLE. Its titulus, incipit, chief headings, and explicit are as follows :

Fol.

53*r* Incipit liber iudiciorum astrorum translatus per magistrum Iohannem de arabico in latinum.
Scito quod tempora excitant motus. Sit igitur initium motus qui fit in circulo usque in finem temporis...
53*v* Cognitio temporum precipua
54*r* De inventione temporis significatoris
54*v* Scientia cognitionis temporum
55*r* Capitulum de vita hominis
55*v* Tempus vero interrogationis
56*r* Capitulum domus filiorum
Caput de infirmitatibus
Caput de tempore belli
57*r* Caput de peregrinationibus
57*v* Caput reversionis peregrinationis
Caput de epistola et rumoribus
58*r* ... cui iungitur tempore adventus epistole.

We then attain familiar ground with the Latin translation by

PETER OF ABANO of the pseudo-HIPPOCRATES on astrological medicine at fols. 58*r*-65*v*, the work of ABRAHAM JUDAEUS on nativities at fols. 66*r*-94*v*, and, after miscellaneous astrological notes, JOHN OF SEVILLE's translation, although it is not so designated in our manuscript, of ALBOHALI's *Liber florum astronomie*, at fols. 121*r*-130*r*. But then follow two long, anonymous, unfamiliar texts on nativities and weather prediction, the first in twenty-two, the second in six chapters. Fols. 132*r*-176*r* : " Tractatus de scientia nativitatum ex configuratione orbium sive spherarum superiorum siderum et planetarum," opening, " Scientia ipsa me ostendente nativitatum est que ex..." Fols. 197*r*-222*v* : opening, " Et quia astrorum domini et magistri de pluviis necnon de ceteris similibus aeris alterationibus..." The author goes on to say that he has tried to expound the matter of weather prediction more clearly than previous authors. He explains the plan of his treatise thus : " Ponam quedam antequam dictam meam aggrediar que inferius dicendis multum consona et veluti necessaria esse videntur. Deinde hunc presentem tractaculum in 6 capitula sum divisurus. Erit itaque primum capitulum de huiusmodi temporum qualitatibus sub modo et forma communi sive generali sub quo particularia in temporibus originem sortientur. Secundum namque capitulum erit de dictis (?) aeris alterationibus in anno contingentibus. Tertium de eisdem contingentibus in mense. Quartum de hys que in die contingere visa sunt. Quintum vero erit de similibus contingentibus in hora, In sexto vero et ultimo ponam mansiones lune in hac arte etiam observandas a quibus pluvie imbres et alie aeris impressiones causari ac predici apte sunt." Our author apparently wrote after 1300 since he cites the *Conciliator* of PETER OF ABANO. In another passage (at fol. 222*r*) citing ALBERTUS MAGNUS concerning two kinds of dolphins, our text adds, " Which kinds I master Martin Rex saw," so that perhaps MARTINUS REX is the author's name. In a Prag manuscript, 1144, a MARTINUS REX is named as the author of an *Ars metrificandi*. Or Martin, king of Aragon, may be meant.

The last few leaves of our manuscript are filled with divining spheres of PYTHAGORAS, which are common enough in medieval manuscripts.

24. ZURICH C.53.—In this manuscript of the fourteenth

or fifteenth century, at fols. 22*r*-27*r*, is a treatise on the planets by a RAYMUNDUS which does not appear in the list of the various works, genuine and supposititious, attributed to RAYMOND LULL in the *Histoire littéraire de la France*, vol. 29. It is, however, in the style of the Lullian art and deals among other matters with the properties of the planets and signs of the zodiac. Possibly it is a fragment of one of LULL's longer works. It is certainly not the *Liber cursuum planetarum* of RAYMOND OF MARSEILLES written in 1140. (18) It opens and closes as follows : fol. 22*r*, in the top margin is written, "Ihesus Maria Raymundus," (19) incipit, "Quia omne quod est aut est deus aut creatura aut operatio... "; fol. 27*r*, " ...tamquam cum finali sua materia ut sit lux. Explicit tractatus egregii Raymundi super planetas. Est (et?) de distinctionibus graduum chaos, deo gratias." I have recently procured a rotograph of it and shall perhaps be able to deal with it more fully in some later paper. (20)

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(18) C. H. HASKINS, *Studies in the History of Medieval Science*, 1924, pp. 96-98.

(19) In section 8 we have noted a treatise on astrological interrogations similarly headed, " Ihesus Christus Maria. " Ernst Zinner, *Leben und Wirken des Johannes Müller von Königsberg genannt Regiomontanus*, 1938, p. 210, remarks that Regiomontanus was wont to put such words as Jesus and Maria at the head of his works. I believe, however. that the practice was fairly common and cannot be used as a means of identification of works as either by Regiomontanus or Raymundus.

(20) Add to sections 11 and 13.

11. The Milan MS of Marliani's arithmetic was noted by Argellati, *Bibl. script. mediol.*, Milan, 1750, II, i, 868. The arithmetic is analyzed by Marshall Clagett, *Giovanni Marliani and late medieval physics*, 1941, pp. 151-67.

13. The Milan MS of Maino's *Theorica* was noted by Pio Rajna, *Giornale storico d. lett. ital.*, X (1887), 96. At fols. 65*r*-74*v* an anonymous commentary on the *Sphere* of John of Sacrobosco has the same incipit, "Volentibus habere cognitionem...", as in a Florentine MS described by Björnbo, *Bibliotheca mathematica*, XII (1912), 223.

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