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Astronomical Observations at Paris from 1312 to 1315

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the passage in Pappus (which strangely enough seems never to have been used in this connection) gives us the optimum curriculum of architectural studies, and shows us that what we should call the profession of architecture was known as *mêchanikê*. Architectural studies seem, thus, to have grown out of the study of "mechanics," a development which seems quite natural in view of what we know of the development of Greek science. Even when architecture became a specialized branch of mechanics, it kept the name of the academic discipline in which it had originally developed, and the architect was given a name which referred more to the academic discipline in which he had been trained than to his actual professional function.¹⁵

The Byzantine empire must almost certainly have had treatises on architecture comparable to Vitruvius', but none has happened to survive; like text-books at all times, they would be thrown away when worn out or no longer needed by the owner. It is therefore of great interest to find in Pappus' *Collectio* a clear statement of the disciplines which were considered necessary for proficiency in architecture, a statement which incidentally makes it possible for us to assign due professional rank to *mêchanikoi* when we encounter them in literary texts and inscriptions.

Harvard University, Dumbarton Oaks Research Library and Collection, Washington, D. C.

¹⁵ Hultsch, in his detailed study of the passage ("De Heronis Mechanicorum reliquiis in Pappi Collectionis servatis," in *Commentationes philologae in honorem Th. Mommseni* [Berlin, 1878], p. 117), considers the words *kai architektona* (see above, note 7) to be an interpolation made by a later scribe or editor who did not understand the passage. Hultsch's words, however, show that he did not perceive that the passage actually has to do with architectural studies, and limited his ideas to the implications of the text for the aspects of mechanics (military machines, etc.) which were not concerned with architectural work. Thus he naturally concluded that a reference to an "architect" was out of place. Since, however, we have seen that the text

actually deals with the optimum architectural curriculum, Hultsch's objection to the words is without foundation. If the words are indeed interpolated, all that the interpolation shows is that the person who added them did not (any more than Hultsch) understand that "inventor of mechanical devices" actually meant what we should call an architect, and so (seeing that the passage was an account of the architectural curriculum) thought it necessary to add *kai architektona*, using *architekton* in the literary sense, in which it often equals our "architect" (as Hultsch understood it) rather than in the technical sense in which it means a master-builder, in the literal sense of the Greek (see further in my forthcoming paper cited above).

Astronomical Observations at Paris from 1312 to 1315

BY LYNN THORNDIKE

OBSERVATIONS of the positions of planets and fixed stars at various dates through the years 1312 to 1315 for the meridian of Paris are preserved in a membrane manuscript of the fourteenth and fifteenth centuries now found in the library of Corpus Christi College, Oxford.¹ The manuscript once belonged to the monastery of St Mary and St Oswy king and martyr at Tynemouth, to which

¹ Oxford, Corpus Christi College, cod. 144, I have not examined the MS itself and follow Coxe's *Catalogue of the MSS in Oxford colleges* (II, iv, 56-57) for its other items. I do not

give his foliation, since I found it incorrect for the item in which we are here particularly interested and so had to order a second photostat.

it had been given by John Bamburgh, once subprior, at dates variously stated in notes made in it as 1438, 1447 and 1450. Perhaps John added other items to the original manuscript or perhaps he simply confirmed his previous donation. The manuscript includes a commentary by him on the poem of Geoffrey Vinsauf, *De nova poetria*. Later the manuscript came into the possession of the Elizabethan antiquary, Brian Twyne. Its contents are partly literary, including a fragment of Alanus, *De planctu naturae*, as well as the *De nova poetria*, which is also incomplete; partly mathematical and astronomical. It contains Richard of Wallingford's *Canones in Albion* and *Rectangulum*, both illustrated with figures and the latter dated at its close in 1326 as usual. It also includes astronomical tables, especially the Alfonsine, the *Theory of the Planets* of Gerard of Cremona,² and a portion of the arithmetic of John of Sacrobosco.

The incomplete and fragmentary state of other items in the manuscript is true also of the astronomical observations in which we are interested and which seem originally to have included those for one or more years before 1312, since there are five lines of such observations at the top of fol. 97r before those for the year 1312 begin.³ The first line opens in the middle of a word as well as sentence, ". . . (me)dio celi et Aldibaran posito . . ." but the catchwords, "-bus confectis" at the bottom of fol. 96v evidently do not fit this. One or more previous leaves, containing observations presumably for the year 1311 and perhaps preceding years, therefore appear to be missing. Since, however, our text begins the observations for each year with March, the only completely stated and dated observation at the top of fol. 97r, for the night following 13 January at evening twilight, appears to be intended for January, 1312. It found Mars in conjunction with the middle star of Pleiades in longitude. The incomplete and undated observation preceding this evidently saw something in mid-sky, Aldebaran in zero degrees and fifty minutes of Gemini, Mars in $21^{\circ} 15'$ of Taurus and two degrees north latitude, Jupiter in the sixteenth degree of Aries and $1^{\circ} 20'$ south latitude. The form and character of these observations is similar to those which follow for the years 1312 to 1315, so that there can be no doubt that they belong together.

It would seem that numerals have been rather frequently miscopied in our text, since in the case of the fixed stars the position of Aldebaran is given once as $50'$ Gemini, thrice as $30'$ Gemini, and thrice as $20'$ Gemini, while Alabor is once placed in $15^{\circ} 20'$ Cancer, once in $11^{\circ} 20'$ Taurus,⁴ and four times in $5^{\circ} 20'$ Cancer. Similarly Altayr is put once in $21^{\circ} 40'$ Capricorn, three times in $21^{\circ} 30'$ of the same sign, and three times in $21^{\circ} 20'$. Cor leonis is located once in $20^{\circ} 30'$ of Leo but thirteen times in $20^{\circ} 10'$ of that sign. Also the figures which we are about to give for the time elapsed between the vernal and autumn equinoxes appear to be incorrect.

The observations for the year 1312 begin with that of the vernal equinox on 12 March at fifty minutes after noon. The autumnal equinox occurred on 14 September at thirteen hours and thirty-five minutes after noon. The time elapsed between the equinoxes is stated as 186 days, 13 hours and 44 minutes; the mean motion of the sun as $183^{\circ} 53' 39''$; the distance of the center of the deferent from the center of the earth as $2^{\circ} 2' 18''$. This last figure was obtained by reckoning the excess motion of the sun as $3^{\circ} 53' 39''$, its *corda recta* as $4^{\circ} 4' 36''$, and the half of this as the distance between the centers of the earth and the deferent. The major equation of the difference between the mean and the true motion of the sun was $1^{\circ} 56' 49'' 30'''$, half of the above figure for the excess movement of the sun.

² The incipit, "Circulus eccentricus vel egressus cuspis . . ." shows that it is the tract usually ascribed to Gerard and not by Sacrobosco, as Coxe tentatively suggested. Some vandal has cut out the illuminated initial C, thereby removing the closing words of five lines of the text for the observations at Paris in 1315 on the preceding page, fol. 98r.

³ They do not begin at fol. 98, as stated by Coxe, and end on fol. 98v, where the *Theoria planetarum* of Gerard immediately follows, not on 99v, as Coxe says.

⁴ Presumably *Cancri* has been miscopied as *Tauri*, the c being mistaken for a t, and the n misread as a u.

These observations of the equinoxes were repeated in 1314, when the vernal equinox came on 12 March six hours after noon, and the autumnal equinox on 15 September at two hours and thirty minutes after noon. The time intervening between the equinoxes is given as 186 days, 10 hours and 30 minutes; the mean motion of the sun as $183^{\circ} 45' 43'' 20'''$; the obliquity of the ecliptic as $23^{\circ} 31' 30''$; the distance of the center of the deferent from that of the earth as $1^{\circ} 58' 9''$. Our text gives no observations of the equinoxes in 1313 and 1315, but in a manuscript at Florence the vernal equinox for 1315 is calculated for the sixth hour before noon on 14 March.⁵ Jean de Murs observed it for Evreux, not far from Paris, on 12 March 1318.⁶

The only planet which was observed in the year which followed the vernal equinox of 1312 was Jupiter. In the night following 17 August it was found at dawn in conjunction with Aldebaran in longitude. Towards the close of the night following 8 November, at the moment when the twenty-fifth degree of Aries was in mid-sky, Jupiter was in the 25th degree of Taurus. On the night following 14 January (1313) it was in the 21st degree of Taurus.

During the next year observations are more frequently recorded, some seventeen as against only five for 1312. On the night following 20 March eight hours after sunset, Jupiter was again found in conjunction with Aldebaran according to longitude. The next two observations are of Saturn in June. On the night after the fourth it was in $18^{\circ} 10'$ Capricorn; late in the night following the 29th, in $18^{\circ} 30'$ Capricorn. Both observations were made when the 16th degree of Sagittarius was in mid-sky. Saturn was to be observed again twice in 1314: late in the night of 16 July, with 23° Gemini in mid-sky and Saturn in $29^{\circ} 30'$ Capricorn; on 20 July with 25° Gemini in mid-sky and Saturn in 29° Capricorn. In 1315 there were three more observations of Saturn: in the night following 23 July with 5° Capricorn in mid-sky, Saturn was in $10^{\circ} 55'$ Aquarius; in the night following 30 September with 27° Capricorn in mid-sky, it was in $7^{\circ} 50'$ Aquarius; and in the night following 27 October with 10° Cancer in mid-sky, in 8° Aquarius. The position of the fixed star Altair is always noted in connection with the observations of Saturn and only then. The other observations in 1313 were all of Jupiter and Mars, which were seen four times in conjunction: on 7 October in $5^{\circ} 12'$ Cancer; in the night following 8 December at midnight in no degrees and twenty minutes of Cancer; on the tenth in $15'$ Cancer; on the night following 18 February in $25^{\circ} 30'$ Gemini. On 9 November, in addition to the positions of Jupiter and Mars in Cancer, that of Venus is given in the fifteenth degree of Libra. This is the only record of Venus until 1315. The remaining 1313 observations of Jupiter and Mars were all in its closing months of December, January and February.

In 1314 observations again became fewer, perhaps because the conjunctions of Jupiter and Mars were past. Besides the observations of the equinoxes and of Saturn already noted, there are but two others: one on the night following 5 March of Mars in conjunction in longitude with the head of Gemini with 19° Leo in mid-sky; the other in the late night following 13 January of Jupiter in $2^{\circ} 20'$ Leo with 21° Taurus in mid-sky.

For 1315 observations are the most numerous, numbering nineteen from 1 March into the following January. Three, as we have seen, were of Saturn. The others are chiefly of Mars and Jupiter in Leo and Virgo respectively, but Venus was observed five times with them, once alone, and once with Jupiter. On 30 April and 2 May Venus was in Gemini; from 30 Oct. to 9 Nov., in Libra; on 25 November in Scorpio. Two observations of Jupiter alone were made with Alabor at the beginning of March

⁵ *Bibliotheca mathematica*, 12 (1912), 198. No place is mentioned, but the fact that the date is first given in Arabic years, months and days suggests that the calculation may be based upon the tables of Arzachel and that the meridian is Toledo, which would also be the case, if the Alfonsine Tables were used. The passage

runs: "Annis Arabum 713 mensis 10 diebus 25 anno Christi 1315 sol intrabit Arietem die 14a Martis 6a hora ante meridiem ascendens Arietem 10° motus 8e spere $9^{\circ} 33' 30'' 48'''$."

⁶ See my *History of Magic and Experimental Science*, 3 (1934), 294-96.

in Cancer, but Cor Leonis was used as the fixed star of reference in the later observations of Mars in Leo and Jupiter in Virgo. No observation of Mercury is recorded.

It is probably idle to speculate as to who the author of these observations was. Two works by Richard of Wallingford precede them in our manuscript as at present constituted, but he was not in Paris then. They might be an early work of either Geoffrey of Meaux or John de Lineriis. But more important than conjecture as to their authorship is it to recognize that they were not especially unusual but in accord with the astronomical activities of the time. If, for example, we run rapidly over the preceding years of the century, we find that in 1301 Stephanus Arlandi or Arnaldi translated the *Practica sphaera solide*, Profatius Judaeus revised his treatise on the quadrant, and an anonymous writer attempted to explain the Alfonsine Tables. In 1302 the positions of the stars were corrected by observations made at Barcelona with two great armillaries. The year 1303 saw the *De sphaera solida* of Accursius of Parma or John of Harlebeke. A Florentine manuscript preserves the record of an observation there of the altitude of the sun in 1304, and another manuscript gives observations at Bologna in 1305 of the altitude of the sun and of the fixed stars, while for 1306 it presents astronomical observations at Montpellier. In 1309 Peter of St Omer revised the *New Quadrant* of Profatius. In 1310 date the astronomical *Lucidator* and the work on the movement of the eighth sphere by Peter of Abano at Padua, while at Oxford John Mandith or Maudith published astronomical tables. In 1311 there were astronomical observations at Genoa and a calendar down to 1386 for the meridian of Milan.

There follows the Latin text of our manuscript from the top of fol. 97 recto to the place on fol. 98 verso where it ends and the Theory of the Planets ascribed to Gerard of Cremona begins.⁷

(97r)-dio celi et Aldibaran posito in 0 et 50 minuto Geminorum invenimus Martem 21 gradu et 15 minuto Tauri et latitudo eius tunc erat septentrionalis 2 gradus. Invenimus etiam tunc Iovem in 16 gradu Arietis et latitudo eius erat meridionalis primus gradus et 20 minuto. Item in nocte sequente 13 diem Ianuarii in crepusculo vespertino noctis invenimus Martem coniunctum cum media stella Piladum secundum longitudinem.

Consideratio facta de locis planetarum anno Christi 1312 ad civitatem Parisius.

Anno incarnationis domini 1312 12 die Martii per 50 minuta unius hore post meridiem Parisius fuit equinoctium vernale. Et 14 die Septembris per 13 horas 35 minuta post meridiem invenimus ibidem equinoctium autumpnale. Et per hoc tempus ab equinoctio vernali ad equinoctium autumpnale fuerunt dies 186, 13 hore, 44 minuta. Medius autem motus solis in tempore fuit 183 gradus et 53 minuta et 39 secunda. Superfluum igitur super medietatem circuli orbis solis fuit 3 gradus, 53 minuta et 39 secunda; in corda eius recta 4 partes 4 minuta et 36 secunda. Medietas autem arcus corde eiusdem superflui 2 partes, 2 minuta et 18 secunda, et hec est prope quantitas distantie centri deferentis a centro terre, quia aux deferentis erat in medio fere inter duo puncta equinoctii scilicet in puncto solstitii in fine Geminorum. Et maior

equatio diversitatis medii motus solis ad verum est 1 gradus, 56 minuta et 49 secunda et 30 tertia. Item in nocte sequente 17 diem Augusti in aurora invenimus Iovem coniunctum cum Aldebaran secundum longitudinem. Item nocte sequente 9 diem Novembris 25 gradu Arietis existente in medio celi et Aldebaran posito in 30 minuto Geminorum invenimus Iovem 25 gradu Tauri in extremitate noctis. Item in nocte sequente 14 diem Ianuarii Aldebaran posito in 30 minuto Geminorum invenimus Iovem in 21(31?) gradu Tauri.

Consideratio facta de locis planetarum et stellarum fixarum ad meridiem Parisius anno Christi 1313.

Anno incarnationis 1313 in nocte sequente 29 diem Martii per 8 horas post occasum solis invenimus Iovem coniunctum (cum) Aldebaran secundum longitudinem. Item in nocte sequente 4 diem Iunii Altayr posito in 21 gradu et 40 minuto Capricorni et 16 gradu Sagittarii existente in medio celi invenimus Saturnum in 18 et 10 minuto Capricorni. Item in nocte sequente 29 diem Iunii Altayr posito in 21 gradu et 30 minuto Capricorni 16 gradu Sagittarii existente in medio celi invenimus Saturnum in 18 gradu et 30 minuto Capricorni apud extremitatem noctis. Item 7 die Octobris fuit coniunctio Iovis et Martis in 5 gradu et 12 minuto Cancr. Item 9 die Novembris 5 gradu Virginis existente

⁷ Claw hammer brackets are used to enclose words omitted in our MS which should be supplied, square brackets to enclose words found

in our MS but which should be omitted. Parentheses are used for suggested corrections and to enclose the numbers of the leaves of the MS.

in medio celi et Corde Leonis posito in 20 gradu et 30 minuto Leonis invenimus Iovem in 3 gradu et 30 minuto Cancri. Et Martem eadem hora invenimus in 8 gradu et 30 minuto Cancri, Venerem vero in 15 gradu Libre. Item 6 die Decembris 20 gradu Arietis existente in medio celi et Aldebaran posito in 0 et 30 minuto Geminorum invenimus Iovem in 0 et 35 minuto Cancri et Martem in primo gradu Cancri. Item in nocte sequente 8 diem Decembris per 12 horas post meridiem facta fuit coniunctio Iovis et Martis in 0 et 20 minuto Cancri et in 10 die Decembris (97v) bris fuit coniunctio Iovis et Martis in 0 et 15 minuto Cancri. Item in nocte sequente 14 diem Decembris 10 gradu Arietis existente in medio celi et Aldebaran posito in 0 et 20 minuto Geminorum invenimus Iovem in 0 Cancri in principio et Martem in 28 gradu et 30 minuto Geminorum ad extremitatem noctis. Item in nocte sequente 18 diem Decembris 22 gradu Arietis existente in medio celi et Aldebaran posito in 0 et 20 minuto Geminorum invenimus Iovem 29 gradu et 30 minuto Geminorum et Martem habere in latitudine septentrionali 4 gradu(s) et 46 minuta.

Item in nocte sequente 21 diem Ianuarii 15 gradu Tauri existente in medio celi invenimus Martem in 20 gradu et 30 minuto Geminorum. Item in nocte sequente 31 diem Ianuarii 12 gradu Tauri existente in medio celi invenimus Martem in 21 gradu Geminorum et Iovem in 25 gradu Geminorum. Item in nocte sequente secundum diem (Februarii) 24 gradu Arietis existente in medio celi invenimus Martem in 22 gradu et 20 minuto Geminorum et Iovem in 27 gradu et 20 minuto Geminorum. Item in nocte sequente 4 diem Februarii 3 gradu Tauri existente in medio celi invenimus Martem in 22 gradu et 30 minuto Geminorum et Iovem in 27 gradu Geminorum. Item in nocte sequente 6 diem Februarii 30 gradu Arietis existente in medio celi invenimus Martem in 21 gradu et 30 minuto Geminorum. Item in nocte sequente 10 diem Februarii 8 gradu Geminorum existente in medio celi invenimus Martem in 23 gradu Geminorum et Iovem in 25 gradu Geminorum. Item in nocte sequente 18 diem Februarii 16 gradu Geminorum existente in medio celi et Alabor posito in 15 gradu et 20 minuto Cancri, nam sic fuerat positum per considerationem utriusque armille in predicta observatione, fuit coniunctio Iovis et Martis in 25 gradu et 30 minuto Geminorum.

Consideratio facta de locis planetarum et stellarum fixarum ad meridiem Parisius anno Christi 1314.

Anno incarnationis 1314 in nocte sequente 5 diem Martii 19 gradu Leonis existente in medio celi et Alabor posito in 11 gradu et 20 minuto Tauri invenimus Martem secundum longitudinem cum capite Geminorum sequenti. Item eodem anno 1314 imperfecto 12 die [die] Martii per 6 horas post meridiem fuit equinoctium vernale prout verius deprehendere potuimus per altitudinem solis in meridie et declinationem eius

ab equinoctiali et per calculationem motus solis diversi. Et eodem anno in eodem loco 15 die Septembris sequentis per 2 horas et 30 minuta unius hore post eandem meridiem fuit equinoctium autumpnale. Et sic tempus ab equinoctio vernali ad autumpnale fuit 186 dies, 10 hore et 30 minuta. Medius autem motus solis in tempore predicto 183 gradus, 45 minuta, 43 secunda et 20 tertia. Et sic residuum medietatis circuli 3 gradus, 45 minuta, 43 secunda et 20 tertia. Corda recta eiusdem arcus 3 gradus, 59 minuta, 19 secunda. Medietas autem eius 1 gradus, 58 minuta, 9 secunda. Item altitudo capitis Cancri ad eandem meridiem 63 gradus, 33 minuta et 10 secunda. Altitudo vero capitis Capricorni 15 gradus, 30 minuta. Altitudo vero capitis Arietis et Libre 39 gradus, 2 minuta et 30 secunda. Et sic duplum declinationis 47 gradus et 31 minuta. Declinatio vero simplex 23 gradus, 31 minuta et 30 secunda. Item 16 die Iulii 23 gradu Geminorum existente in medio celi et Altayr posito in 21 gradu et 20 minuto Capricorni (98r) invenimus Saturnum in 29 gradu et 30 minuto Capricorni apud extremitatem noctis. Item 20 die Iulii 25 gradu Geminorum existente in medio celi et Altayr posito in 21 gradu et 20 minuto Capricorni invenimus Saturnum in 29 gradu Capricorni. Item in nocte sequente 13 diem Ianuarii 21 gradu Tauri existente in medio celi et Alabor posito in 5 gradu et 20 minuto Cancri, Aldebaran etiam posito in 0 et 20 minuto Geminorum, invenimus Iovem in 2 gradu et 20 minuto Leonis in extremitate noctis.

Consideratio facta de locis planetarum et stellarum fixarum ad meridiem Parisius anno Christi 1315.

Anno incarnationis domini nostri Iesu Christi 1315 in nocte sequente primam diem Martii Alabor posito in quinto gradu et 20 minuto Cancri invenimus Iovem in 28 gradu Cancri. Item in secunda die Martii per eandem considerationem invenimus eum adhuc in 28 gradu Cancri. Item in nocte sequente 30 diem Aprilis 15 gradu Virginis existente in medio celi et Iove posito per aspectum in 29 gradu et 50 minuto Cancri invenimus Venerem in 6 gradu et 20 (minuto) Geminorum quia corde Leonis tunc posito (in 20 gradu et 10 minuta) Leonis invenimus Iovem in 29 gradu et 50 minuto Cancri ut supra. (Item in nocte sequente secundum diem Maii 15 gradu Virginis existente in medio (celi et Alabor) in 5 gradu et 20 minuto invenimus Venerem in 6 gradu Geminorum. Item (in nocte sequente) 23 diem Iulii 5 gradu Capricorni existente in medio celi et Altayr po(s)ito in 21 gradu) et 20 minuto Capricorni invenimus Saturnum in 10 gradu et 55 minuto Aquarii. Item in nocte sequente 30 diem Septembris 27 gradu Capricorni existente in medio celi et Altayr posito in 21 [primo] gradu et 30 minuto Capricorni invenimus Saturnum in 7 gradu et 50 minuto Aquarii. Item in nocte sequente 27 diem Octobris 10 gradu Cancri existente in medio celi et Altayr posito in 21 gradu et 30 minuto Capricorni invenimus Saturnum in 8 gradu Aquarii.

Item 30 die Octobris in crepusculo matutino 12 gradu Leonis existente in medio celi et Corde in 20 gradu et 10 minuto Leonis invenimus Martem in 6 et 20 minuto Leonis, Iovem vero in 4 gradu et 30 minuto Virginis, Venerem etiam in 13 gradu Libre et fuit parum minus quam Spica. Item primo die Novembris in crepusculo matutino 12 gradu leonis existente in medio celi et Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Martem in 7 gradu Leonis et Iovem in 4 gradu et 55 minuto Virginis et Venerem in 16 gradu Libre. Item 9 die Novembris in crepusculo matutino 25 gradu leonis existente in medio celi et Corde Leonis in 20 gradu et 10 minuto Leonis invenimus Martem in 9 gradu et 35 minuto Leonis, Iovem in 5 gradu et 30 minuto Virginis et Venerem in 25 gradu et 50 minuto Libre. Item in 25 die Novembris in crepusculo matutino Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Iovem in 6 gradu et 40 minuto Virginis et Martem in 13 gradu et 40 minuto Leonis, Venerem vero in 15 gradu et 37 minuto Scorpionis. Item 28 die Novembris in crepusculo matutino 10 gradu Virginis existente in medio celi et Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Martem in 14 gradu et 15 minuto Leonis et Iovem in 7 gradu et 25 minuto Virginis. Item in 30 die Novembris in crepusculo matutino 25 gradu Virginis existente in medio celi et Corde

Leonis posito in 20 gradu et 10 minuto Leonis invenimus Martem 14 gradu Leonis et Iovem in 6 gradu et 30 minuto Virginis. Item 4 die Decembris in crepusculo matutino 25 gradu Virginis existente in medio celi et Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Iovem in 7 gradu et 30 minuto Virginis et Martem in 14 gradu et 30 minuto Leonis et Venerem in 27 gradu Scorpionis. Item 7 die Decembris in crepusculo matutino Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Iovem 7 gradu et 30 minuto Virginis et Martem in 14 gradu et 20 minuto Leonis. Item 9 die Decembris invenimus Iovem in 7 gradu et 20 minuto Virginis et Martem in 14 gradu et 20 minuto Leonis. Item in 22 die Decembris Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Iovem in 7 gradu et 24 minuto Virginis et (Martem) 13 gradu et 20 minuto Leonis. Item secundo die Ianuarii in aurora Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Iovem in 7 gradu et 20 minuto Virginis et Martem in 10 gradu et 20 minuto Leonis. Item 6 die Ianuarii in mane eiusdem diei Corde Leonis posito in 20 gradu et 10 minuto Leonis invenimus Iovem in 7 gradu et 10 minuto Virginis et Martem in 9 gradu et 6 minuto Leonis.

Incipit theorica planetarum et primo de sole
Circulus eccentricus vel egressae cuspidis . . .

Columbia University

The Eleventh Century MS Munich 14436: Its Contribution to the History of Co- ordinates, of Logic, of German Studies in France¹

BY HARRIET PRATT LATTIN

A DETAILED analysis of almost any mediaeval manuscript nowadays yields an hitherto unsuspected amount of new information about mediaeval interests. *MS Munich 14436* (St Emmeram E 59) of the Bayerische Staatsbibliothek, together with certain other closely related manuscripts, occupies the front rank of those which illumine the first quarter of the eleventh century, a period which clearly shows the results of the educational organization effected by Gerbert at the cathedral school at Reims.

¹ This article is based entirely upon secondary material, not upon personal examination of the MSS.