Coeli et siderum in eo errantium Observationes Hassiacae

[Observations of the Heavens and of the Stars Wandering in Them, Made in Hesse]

(1618)

by Willebrord Snellius (1580–1626), editor
Translation by Scott Weisman



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Translator Version 2

Upright reason dictates that the recipients of the good, of whatever type and level of beneficence it may be, must show gratitude and blessing to the beneficent person in every way possible, commensurate with the value of the beneficence. And one who has benefited all the people of the world — for example, one who invented a new instrument for the good of the world, or a good book — it is fitting for every discerning person, out of the obligation of love of fellow beings, to at least purchase it, so that the man will profit and his heart will be encouraged thereby to invent yet more good instruments in the world. And similarly, all other wise-hearted people will likewise strive and exert themselves to invent good things and instruments needed for the repair of the world and its perfection.

And therefore, whoever says: "What do I need this new instrument for?" — he does not act well towards the world. For if not for the man who invented it, where would you be? And what would your city do? And more than this, if the man did not exert himself, what would the world do?

— R. Pinchas Eliyahu Hurwitz, *Sefer HaBris HaShalem* (1797)

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A note on the work

The first printing of the observations made at Kassel under Landgrave Wilhelm IV of Hesse, edited by Willebrord Snellius and dedicated to Wilhelm's son Maurice. With Tycho Brahe's own records, the Kassel series is the chief body of precision observation from before the telescope. The book adds a selection from Tycho's Bohemian observations and, under its own signatures, the Nuremberg observations of Regiomontanus and Bernhard Walther, with Johann Schöner's notes on the cross-staff, tables, a passage from Kepler on Walther's refraction, and Regiomontanus's sixteen problems on the size and distance of comets. Snellius also addresses the reader directly, comparing the results.

The Bayerische Staatsbibliothek copy (4 Eph.astr. 121) ends at printed p. 116, although its title page announces the Nuremberg observations. This edition therefore takes that second sequence from the ETH-Bibliothek Zürich copy (Rar 4385).

A note on the translation process

This translation was produced with the translation-pipeline. See the linked repository for details on the process.

This edition has been checked at citation grade. A stratified sample of it was independently re-transcribed from the original page by readers given no sight of the translation, and the two readings were then reconciled letter by letter. Every disagreement in the layer a citing reader depends on — figures, names, headings, and whether a passage is present at all — was settled against the page before publication, and none was left open.

What that does and does not mean. It is a claim about a sample, not about every line. A passage the sample did not reach is neither confirmed nor denied, and silence in an independent reading is not agreement. Where the page itself will not settle a reading, this edition withdraws rather than guesses: a bracketed pair marks a genuine ambiguity the original cannot decide, and a question mark a character that could not be read. Those marks are deliberate refusals, and they are worth more than the confident readings they replace.

A note on the references. A scriptural or bibliographic reference given in brackets or parentheses is, in most cases, an **editorial identification of an allusion rather than a citation printed in the source**. Books of this kind quote and weave scripture constantly without naming it, and the identification is supplied here as a convenience to the reader. Where the source does print a reference of its own, it is given as printed. **An identified allusion is not evidence that the author cited that passage** — look at the original before resting an argument on one.

This text is the product of a highly refined automated translation process. It has undergone only cursory human review and should not be treated as an authoritative or scholarly rendering. It is offered solely as a reference and reading aid — a way to make an otherwise inaccessible work approachable — and any passage of real consequence should be checked against the original source.

Acknowledgements

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Notation and abbreviations

A few conventions have been applied uniformly throughout this translation, so that one quantity is always written one way. They change how a value is *written*, never what it is; where the printed source and this translation differ in notation, the source's own form is recorded in the editorial apparatus.

Numerals are Arabic, even where the source sets Roman ones. Roman numerals are kept only in headings, running headers and signatures, which are transcribed as printed.

Dates are given as year, month, day — *1572 November 11*. Dates are Julian, as the source gives them, and have not been converted to the Gregorian calendar.

Times are written with raised unit letters: $7^{h}\ 36^{m}\ 12^{s}$ for seven hours, thirty-six minutes and twelve seconds. An interval longer than a day carries a raised d — $3^{d}\ 7^{h}$. The degree and minute signs below are never used for time.

Angles are written with the conventional signs — 23° 27′ 30″. Early modern astronomy divides the degree sexagesimally and often runs to places for which modern writing has no common symbol; the orders used in this book are:

sign	order	the source's term
°	degrees	*partes*, *gradus*
′	minutes of arc	*scrupula prima*, *minuta*
″	seconds of arc	*scrupula secunda*

A **sign** is 30° — one twelfth of the circle — and is written with a raised s: 5^{s} 3° 57′ is five signs and 3° 57′, that is 153° 57′. The source uses the sign both as a place in the zodiac and as a plain unit of 30° for a motion or a distance, and this translation keeps that distinction by writing the count rather than naming a constellation.

The signs of the zodiac. Longitude is reckoned eastward from the first point of Aries.

	Latin	English	longitude
♈	Aries	the Ram	0°–30°
♉	Taurus	the Bull	30°–60°
♊	Gemini	the Twins	60°–90°
♋	Cancer	the Crab	90°–120°
♌	Leo	the Lion	120°–150°
♍	Virgo	the Virgin	150°–180°
♎	Libra	the Scales	180°–210°
♏	Scorpius	the Scorpion	210°–240°
♐	Sagittarius	the Archer	240°–270°
♑	Capricornus	the Goat	270°–300°
♒	Aquarius	the Water-bearer	300°–330°
♓	Pisces	the Fishes	330°–360°

The Sun, Moon and planets.

	Latin	English
☉	Sol	the Sun
☽	Luna	the Moon
☿	Mercurius	Mercury
♀	Venus	Venus
♂	Mars	Mars
♃	Iuppiter	Jupiter
♄	Saturnus	Saturn

Abbreviations used in table headings: **Decl.** declination.

Where a table in the source spreads one quantity across separate columns for degrees, minutes and seconds, those columns have been joined into a single column and the value written whole. Where a value runs to thirds and beyond, the columns are kept, since there the columns are the notation.

The Observations of the Heavens and of the Stars Wandering in Them, Made in Hesse

[Cœli & ſiderum in eo errantium OBSERVATIONES HASSIACÆ]

undertaken long ago under the auspices of the most illustrious Prince Wilhelmi [William], Landgrave of Hesse[1],

and

A Two-Year Gleaning [Spicilegium biennale]

from the Bohemian observations of V. N. Tychonis Brahe [Tycho Brahe][2],

now published for the first time by

Willebrordo Snellio [Willebrord Snellius], R. F.[3].

To which have been added

the Nuremberg Observations [Observationes Noribergicæ] of Ioannis Regiomontani [Regiomontanus] and Bernardi Walteri [Bernhard Walther].

Diagram. An oval laurel wreath, tied with a ribbon at the foot and with a spray of leaves at the head, enclosing a printed motto in four lines.

- Centre of the wreath: "Homo ad immortalium cognitionem nimis eſt mortalis." — Man is too mortal for knowledge of immortal things.

Leiden [Lvgdvni Batavorvm]. Printed by Iustum Colsterum [Iustus Colsterus], in the year 1618 [Anno cIↃ IↃ c XVIII].

Alexis

[Greek: Ἅπαντα τὰ ζητούμενα ἐξευ[?]ίσκεται] [Greek: Ἂν μὴ προαπεστῆς, μήδε τὸν πόνον φύγης.] [Greek: Ὅπου γὰρ εὑρήκασιν ἄνθρωποι τινες,] [Greek: Μέρος τι τῶν θείων, τοσούτῳ τῷ τόπῳ] [Greek: Ἀπεχοντες, ἄστρων ἐπιτολὰς, δύσεις, τροπὰς,] [Greek: Ἔκλειψιν ἡλίου. τί τῶν κοινωντὲ] [Greek: Καὶ τῶν συγγενῶν δύναιτ' ἄνθρωπον φυγεῖν;] [Greek: Τῷ γὰρ πονοῦντι καὶ Θεὸς συλλαμβάνει.]

Everything that is sought can be found [?], if you do not give up beforehand and do not run from the labor. For since certain men have discovered some part of divine things, though they stand so far off in place: the risings of the stars, their settings, their turnings, the eclipse of the Sun, what, of things both common and akin, could escape a human being? For God too lends a hand to the one who labors.

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[1] identified as William IV of Hesse-Kassel; the title page gives no regnal number

[2] "V. N." presumably stands for *viri nobilis*, "the nobleman"; the page prints only the initials

[3] "R. F." presumably stands for *Rudolphi filio*, "son of Rudolph"; the page prints only the initials

Preface

[PRÆFATIO.]

To the Most Illustrious Prince Mauritium [Maurice], Landgrave of Hesse[4], Count in Catzenelbogen [Katzenelnbogen], Dietz [Diez], Zigenhain [Ziegenhain] and Nidda, etc., Lord.

Most Illustrious Prince,

That maxim of the divine Plato is a magnificent and illustrious one, and he longs to see it engraved above all on the minds of those who, endowed with the most refined intellects, also surpass all others in rank in the state: [Greek: ὁτι σοφώτατον ἀνάγκη τὸν ἀληθῶς ἀστρόνομον εἶναι (hoti sophōtaton anankē ton alēthōs astronomon einai, "that the one who is truly an astronomer must of necessity be the wisest")], that is, the true astronomer must necessarily be the wisest of all people. For our thought breaks through the very heaven. Not content simply to know what is shown to it, it also probes what lies beyond the world; and through the things that meet the sense of the eyes, it also conceives a desire for the rest, so that by investigating it may open a way for itself, and in this way lay certain foundations of truth, until the inquiry itself passes from the manifest to the obscure and finds something more ancient than the world itself, by whose authorship those very stars were brought forth with such wonderful beauty. So it is most deservedly that Plato has attributed such great dignity and such great majesty to this science. Anaximander, when it was laid to his charge that he had cast off all concern for his fatherland and the commonwealth, pointed his finger at the sky and said: "Mind your words, I beg you, for anxiety and care for that fatherland of mine affect me deeply." Indeed, the motions of the stars and the contemplation of higher things compel the soul, which wanders as a foreigner on this earth and is an exile from its own fatherland, to look back to that place again and again. For no one is so slow and dull and so bowed down to the earth that he is not lifted toward divine things and does not rise up with his whole mind. Nor, indeed, does so splendid a spectacle belong to any other kind of living creature. For this reason God raised human beings from the ground and set them tall and erect, so that by gazing at the sky they might be able to grasp the knowledge of him. [Greek: τὰ γὰρ ἀόρατα αὐτοῦ ἀπὸ κτίσεως κόσμου τοῖς ποιήμασι νοούμενα καθορᾶται, ἥ τε ἀΐδιος αὐτοῦ δυνάμις καὶ θειότης (ta gar aorata autou apo ktiseōs kosmou tois poiēmasi nooumena kathoratai, hē te aidios autou dynamis kai theiotēs, "for his invisible things, from the creation of the world, are clearly seen, being understood through the things made, both his everlasting power and divinity")]: for the things in God that cannot be seen with the eyes of the body are nevertheless perceived by the keen sight of the mind, from the founding of the world onward, from created things, namely his eternal power and divinity alike, says that chosen Apostle of the Gentiles. For who of all people, I ask, has grown so brutish against reason that such great and so manifold a variety of things, so

[4]identified as Maurice of Hesse-Kassel; the page gives no further identification

stupendous a swiftness of the machine of the world, the constant wandering [error] of the planets, the course of the Sun, the motion of the heaven and the stars, and the grace, alternation and order of all things do not move him? That, enticed by the taste of these sweetest things, he is not wholly kindled with an incredible love of knowing the author of all of them? Looks up to him? Reveres him? With how much joy, then, must the mind of our wise man be filled as it dwells and spends its nights among those concerns? Drawn on by this variety of so many stars, so wonderful and so manifold, wise men spent their whole lives in seeking and learning, in the knowledge of nature. Since they could not be sated with this pursuit, they forgot all other things and thought of nothing abject, nothing low, but applied themselves with all their strength to this concern, and set themselves no limit in investigating the truth. For to weary of seeking is shameful when what is sought is most beautiful. That is why Pythagoras, Plato, Eudoxus and others, in their zeal for learning, did not regret undertaking what were more truly exiles than journeys, to the Egyptians, to the Chaldeans and to the Brahmans of the Indians, for the sake of erudition, so as to receive numbers and heavenly matters from barbarian priests. For these things lie wonderfully hidden in nature, so that they can be neither discerned nor known unless, noted and investigated over a long time, they are handed down to posterity as if from hand to hand. For those men the truth, by the observations of innumerable [recte: innumerabilium; printed imumerabilium] ages, are thought to have attained. [Greek: ὅθεν πανταχόσε καὶ δεῦρο ἐξήκει βεβασανισμένα[?] χρόνῳ μυριετεῖ τε καὶ ἀπείρῳ (hothen pantachose kai deuro exēkei bebasanismena chronōi myrietei te kai apeirōi, "from which it has reached everywhere and to this place too, tested over a time of ten thousand years and without limit")] From these men, made public in all parts of the world and proved over infinite intervals of time, it has at last reached us too, says Plato in the *Timaeus*. For the Chaldeans, who excelled in the knowledge of the stars because of their flat and open plains, and the Egyptians, to whose priests yearly allowances and very generous stipends were for this reason granted, were the first to turn all their care and thought to this, and they applied solid effort to noting the revolutions of the heaven and the stars. And because we are so made that everyday things, even if worthy of wonder, pass us by, and habit takes away the greatness of things, they were therefore first roused by eclipses [defectus] of the Sun and Moon (which in the whole contemplation of nature seem most to be wondered at and like a portent), and they began to inquire how often these occurred and what caused them. From this they noticed that the years are bounded by the Sun, and that by the Moon, with such great variety, the days of the months are marked as if they were a calendar [fastos]. Moved again by these things, they began to probe and investigate the motions and courses of those bodies somewhat more deeply. Next they also discovered that some stars are fixed in the heaven and in their seats, while others roam with a constant wandering. They readily perceived that they could not at all set these things out in writing or hand

them down to the memory of posterity, unless they divided the heaven itself into its own spaces and the stars, separated by their seats and regions, as if into order re- duced them, and established a kind of geodesy [gæodæsiam] of the whole heaven. Then indeed, undertaking a thing beyond the human lot, they dared also to count out the stars for posterity and to fix [expangere] the heavenly bodies [sidera] to a rule, having devised instruments by which to mark the size of each, so that it could be noted all the more easily not only whether they were passing away or being born, but whether any of them at all passed across or moved. And they did this by a method almost impossible to work out, since across so great a distance nothing at all was certain to the conjecturing mind about the way by which access to heaven itself lay open. It therefore took greater industry and the utmost effort, once these things were established, to have the places of the planets next recorded against true epochs, through a history of observations over the lasting periods of a long time. This concern, however, and the splendour of so illustrious a subject took hold of the minds even of kings and princes. Babylon boasts of its Jupiter Belus for this reason: that it believed him the inventor of the science of the stars. It would be an endless task to summon here the kings of the Egyptians from remotest antiquity, Hermem Trimegistum [Hermes Trismegistus], Petosiris, Necepsum [Nechepso], and so many star calendars [parapegmata] of the Chaldeans, the Egyptians and the Greeks. Osymandyes [Osymandyas] alone will serve us in place of them all. In his tomb, as that most careful writer Halicarnasseus Dionysius [Dionysius of Halicarnassus] has left on record, was placed a circle of solid gold, 365 cubits in circumference and a cubit wide, so that a single cubit was assigned to each single day, in which space the risings and settings of the stars and their effects on earth were noted. Beyond doubt he attested his love and his discoveries to posterity by so proud a monument. So great, indeed, is the majesty of the science of the stars that it is worthy of students of the liberal arts, worthy of the learned, worthy of distinguished men, worthy of princes, worthy of kings. But I pass over ancient matters, already almost shrouded by the long lapse of distant time, although they ought rather to have been celebrated in eternal memory. So little grateful, surely, are we toward those who by their labour and care opened the light to us in this light. After this same discipline was brought into Greece, whom did it not keep anxiously occupied? Thales, Anaximander, Harpalus, Meton, Euctemon, Callippus, even though their success answered too little to their diligence, until the Greeks, examining the calendars of the Chaldeans and the Egyptians more accurately, carried the long history of observations over to their own people. Certainly Epigenes, who on Seneca's authority studied among the Chaldeans together with Apollonio Myndio [Apollonius of Myndus], teaches that observations of 720 years survive, inscribed on baked bricks [coctilibus laterculis]; those who give the least, such as Berosus and Critodemus, 480 years. And Aristotle, when Babylon had been captured by Alexander the Great, far preferred the astrology [astrologiam] of the Babylonians, which is said to have consisted

of observations of 1903 years, to all the spoils of the East. Afterwards Conon Samius [Conon of Samos] collected the eclipses [defectiones] observed by the Egyptians. Hipparchus, the eclipses [deliquia] of both heavenly bodies from the Chaldeans to Nabonas- sar, recorded that far, he adapted to the months common to all [omnum] [recte: omnium] the nations of Greece. He published, I say, a history of eclipses [defectuum] covering 600 years: a work truly both great and useful. The same observations were repeated once more by Ptolemy III, with much greater care and diligence. At the urging of Eratosthenes he equipped Alexandria with rules [regulis] and armillary rings [armillis], and he instituted daily observations of the heaven and the stars. Relying, therefore, on so rich a stock of material and on these foundations, first Hipparchus and then Ptolemy set in order the science and doctrine of heavenly things with such success, through so many centuries. Iulius Cæsar [Julius Caesar] with his Sosigine [Sosigenes], once the world had been subdued, also corrected the calendar [fastos] and fixed a measure for the year. And although all these things were established by the greatest minds and with exquisite learning, they were nevertheless by no means able to keep a perpetual account of times and revolutions [conversionum]. For that supreme divinity wants us to lift the keen gaze of our eyes to the heights again and again, and to contemplate more diligently that army which serves as soldiers for God its creator, and the starry dances of the heaven, so as to shake out of us the deep lethargy in which the human mind, hindered by the torpor of the body, lies almost crushed. Hence, after so many prayers, corrections and critical remarks, with so many centuries gone by, God inflamed the lofty heart of Alfonsi Regis [King Alfonso][5] with love of so noble a science. He, taking pity on it as it was already faltering, with the utmost effort, at the greatest expense and with immense labour (would that it had been with a happier outcome), the tottering machine of the world with a sup- port placed beneath it, he held up for a while. For this most munificent king lacked the resource most needed for so great an undertaking: a frequent and careful history of observations. So it should be less surprising that his canons [canonibus] agree so little with the sky itself, and that so illustrious and magnificent an effort could not last [ætatem ferre]. Having been taught by use and experience, the best and most prudent prince, the father of Your Highness [Tuæ Celsitudinis], William, Landgrave of Hesse, noticed this very thing as well; and after so many centuries had gone by, he was the first who set about fetching the whole matter from still further back. For since there were two things that here fill both pages for us, the motions of the planets and the canonical account [Canonica] of the fixed stars [affixarum], he attacked both with the greatest strength and incredible diligence. For when he had been intent for some time on observations of the Sun [solis], he then attempted a heroic work, and through his assistants he measured 400 stars with such diligence that he cast darkness over the effort of all the ancients, and indeed

[5] Alfonso X of Castile, an identification supplied here; the page names only King Alfonso

over Hipparchus himself, the counsellor of nature. Beside the observations of so many nights spent awake, and beside the bronze sphere of Your Highness, let the golden star calendar of King Osymandyas vanish altogether, and show off nothing but the arrogance of barbaric pride. With these things completed, that great prince also applied his mind to the restoration [restitutionem] of the remaining planets, which had always before gone forward with too little success. The result is that the science of the stars can most truly boast that from no one, in so many centuries past, has it ever received greater or more abundant benefits. And for that reason [Greek: ει [?] δὴ τιν' ἄνδρα θνατὸν ὀλύμπου σκοπὸι ἐτίμασαν (ei [?] dē tin' andra thnaton olympou skopoi etimasan, "if [?] indeed the watchers of Olympus have honoured any mortal man")] (to use the words of Pindar), they will with the fullest right raise William, Landgrave of Hesse, to the heavens with eternal praises. They will celebrate the House of Hesse with perpetual praises, not only of its piety and prudence but also of its learning and munificence. For if we held this art, perfect and complete in every part, the one thing most splendid of all and most to be praised, as if in our hands, with what joy would our minds be filled, seeing that, with circuits of revolutions [conversionum] so tangled, we delight so greatly in a shadowy notion of it? Allow, I beg you, most illustrious Prince, these rivulets to flow from your springs for public use; or rather, measure out to us yourself, from a full granary, the observations of both the fixed and the wandering stars, so that all may praise and proclaim publicly as well the liberality and munificence inborn in Your Highness. Although the Sun will sooner lack heat than Your Highness will lack clemency, liberality or munificence: as our family has both felt in private and, with a grateful heart, often recalls among themselves. But I will restrain my words, lest my lack of eloquence should harm Your very great virtues, since no voice could ever equal them.

To Your Most Illustrious Highness,
devoted [deyotus] [recte: devotus]
Willebrordus Snellius [Willebrord Snellius] R. F.

On the Observations of the Stars by the Most Illustrious Prince William, Landgrave of Hesse, Published by the Most Renowned Willebrord Snellius

Petrus Cunaeus, I.C.[6]

The lofty race of kings and princes, which by a nearer step touches heaven and enjoys commerce with the gods, always rises, noble, toward its own origins, and has no room for trivial cares. From this stock, once, the great parent of Hesse and its leader WILLIAM, while the ages stood amazed, flashing far and wide, lifted up his head to the world. He, while he unfolded himself through all the resources of ruling rightly and conducted the greatest affairs, on which rests the supreme law, the safety of the people, did not know how to stop at this limit, but, restless, carried himself around through the spaces of the universe, and,

[6]presumably *iuris consultus*, "jurist"; the page prints only the initials

made a rival of his native aether, he surveys the kindred stars, and is the first to see their various positions and motions, known to no one. All these, to be sent at last into the shores of light, our SNELLIUS brings out and makes public, and with a great gift earns the gratitude of the age. Now you, WILLIAM, thrice best of princes, the duty of mortality discharged, sit among the orbs of heaven, and find to be true these things that you noted in the learned dust. And, long since returned to your origin, if there is anything that our night had earlier covered, you roam through all of it in open light. You sit, and into the deep breast of your son, who now wields the paternal sceptre with his hand, you rain down a shower of your virtue, and, favouring him, you lend your auspices to his highest affairs. Exalted leader of the people, these discoveries of your industry, which are given out man by man to be worn by public use, accept with good grace, and may you always be kind to your SNELLIUS.

Most Accurate Observations of the Heavens and of the Stars Wandering in Them

carried out over several consecutive years with the greatest care and diligence, partly by the Most Illustrious Prince himself, Lord William, Landgrave of Hesse, partly by his mathematicians.

Some Observations of the Sun, excerpted from the observations of the Most Illustrious Prince William, Landgrave of Hesse.

The first observations, not so much [quia] so that they might be tested with the utmost exactness as so that they may be seen as first attempts. And indeed all of them are to be understood as taken at midday itself [meride] [recte: meridie].[7]

Year 1561

Date	Altitude [Altitud.]	Declination [Decl.]	Position [Locus.]
April 13	51° 8′	12° 22′	2° 31′ ♉
April 30	56° 13′	17° 27′	18° 49′ ♉
May 11	58° 50′	20° 4′	♉ 29° 33′
May 30	61° 35′	22° 49′	♊ 16° 30′
June 12 exact	62° 12′	23° 26′	
June 20	61° 54′	23° 8′	

Date	Altitude [Altitud.]	Declination [Decl.]	Position [Locus.]
June 30	60° 58′		♋ 18° 15′
July 19	57° 28′		♌ 6° 15′
August 23	46° 40′		♍ 9° 20′[8]
September 22	35° 5′		

[7] the first sentence has no main verb on the page, and *quia* stands directly before *ut* with no clause of its own; it is left unconstrued here.

[8] supplied from the Zurich copy

Date	Altitude [Altitud.]	Declination [Decl.]	Position [Locus.]
October 7	29° 24′	9° 22′	♎ 24° 8′
October 31	21° 27′		
November 16	17° 39′		♐ 4° 45′
December 10	15° 10′	sky cloudy [cœlo nubilo]	
December 12	15° 8′		
December 30	16° 28′		

Year 1562

Date	Altitude	Declination	Position
January 4	17° 16′	exact	♑ 23° 55′
February 11	27° 58′		
March 11	38° 44′	sky very cloudy [cœlum admodum nubilum.]	
April 11	50° 24′		
May 21	60° 42′		
June 23	61° 45′		
July 17	58° 2′		

Year 1563

Date	Altitude	Declination	Position
August 20	47° 58′		
September 6	41° 25′		♍ 22° 52′
December 22	15° 40′		♑ 9° 45′

Year 1564

Date	Altitude	Declination	Position
June 11	62° 12′		

Date	Altitude [Altit.]	Declination [Decl.]	Position [Locus.]
July 8	59° 48′		
August 4	53° 5′		
September 17	36° 59′		

Year 1565

Date	Altitude	Declination	Position
January 25	22° 31′		
March 9	38° 8′	to which corresponds [?] [quibus cōptit]	♓ 28° 40′
June 10	62° 12′		
August 24	46° 20′		

Year 1566

Date	Altitude	Declination	Position
September 11	39° 33′		
September 17	37° 10′		
October 20	24° 59′		
October 31	21° 34′		
November 5	20° 14′	Sun clear [☉ claro]	22° 26′
November 22	16° 44′		♐ 9° 47′
December 13	15° 12′	Sun clear [☉ claro]	

Hence, from the earlier observations, the following is established:

- the maximum declination of the zodiac [maxima Zodiaci declinatio]: 23° 30′
- the elevation of the pole [Elevatio poli]: 51° 18′
- of the equator [Æquatoris]: 38° 42′

Date	Altitude	Declination	Position
December 18	15° 25′		♍ 7° 30′

Year 1567

Date	Altitude	Declination	Position
January 3	17° 6 ν[?]′		♍ 22° 39′
February 11	28° 0′		♓ 2° 14′

Date	Altitude [Altitud.]		Position [Locus.]
February 27	34° 0′	very carefully [dilig.val.]	♓ 18° 8′
March 11	38° 42′		♈ 0° 0′
March 19	41° 50′	very carefully [dilig.vald.]	7° 52′
March 28	45° 17′	carefully [dilig.]	16° 42′
April 7	48° 54′	very carefully	26° 22′
May 4	57° 8′	carefully	♉ 22° 28′
May 12	58° 55′		♊ 0° 51′
June 12	62° 11′		
August 1	54° 16′		♌ 17° 41′
August 22	47° 17′	carefully	♍ 8° 0′

Year 1568

Date	Altitude	Position
March 10	38° 38′	♓ 29° 50′
April 4	48° 7′	♈ 24° 14′
April 28	55° 46′	♉ 17° 25′

Date	Altitude	Position
May 13	59° 17′	♊ 1° 50′

Thereafter, with the instruments corrected [Deinceps inſtrumentis rectificatis]:

Date	Altitude		Position
June 12	62° 12′	Sun very clear [☉ clariſſ.]	
June 14	62° 9′	Sun very clear	
June 28	61° 11′		♋ 16° 26′
July 20	57° 10′		♌ 7° 24′
August 24	46° 10′		♍ 11° 0′
September 9	40° 4′		26° 35′
September 13	38° 30′		♎ 0° 30′
October 5	30° 0′		22° 18′
November 3	20° 32′		♏ 21° 26′

Year 1569

Date	Altitude [Altitud.]		Position [Locus.]
January 28	23° 22′		♒ 28° 27′
February 17	30° 20′		♓ 8° 35′
March 8	37° 41′		27° 27′
April 8	49° 25′		♈ 27° 46′
May 6	58° 18′		♉ 24° 44′
June 11 {	62° 10′	By the smaller quadrant [Per minor. Quadrantem]	
	62° 12′	By the larger quadrant [Per majorem Quandrant.] [recte: Quadrant.]	
June 12 {	62° 10′	By the smaller quadrant [Per minor. Quadrant.]	
	62° 12′	By the larger quadrant [Per majorem Quadrant.]	
June 14	62° 7′	Most carefully, as on the preceding days [diligentiſſ. ut ſuperioribis diebus] [recte: ſuperioribus]	
June 29	61° 8′		♋ 16° 51′
July 27	55° 25′		♌ 13° 49′
August 28	44° 46′		♍ 14° 38′
September 20	35° 52′		♎ 7° 8′
October 13	27° 13′		29° 57′
November 3	20° 34′		♏ 21° 19′

Date	Altitude [Altitud.]	Position [Locus.]
December 23	15° 44′	♑ 11° 50′

Year 1570

Date	Altitude	Position
January 29	23° 38′	♒ 19° 19′
February 19	31° 0′	♓ 10° 22′
March 11	38° 47′	♈ 0° 12′
March 28	45° 20′	16° 50′
April 29	55° 54′	♉ 17° 53′

Date	Altitude [Altit.]	Declination [Decl.]	Position [Locus.]
May 22	60° 42′		♊ 10° 0′
June 12	62° 11′	at the time of the solstice [tempor.ſolſtitiali.]	
July 1	60° 51′		♋ 19° 0′
July 27	55° 31′		
August 5	52° 57′		♌ 21° 54′

Year 1571

Date	Altitude	Declination	Position
February 7	26° 27′		♒ 27° 51′
21	31° 37′		♓ 12° 0′
22	32° 0′		13° 0′
23	32° 23′		14° 0′
24	32° 47′		15° 0′
March 9	37° 55′	the Prince's [*Principis*]	28° 2′
March 13	39° 30′		♈ 2° 0′

From this it is clear that the Sun's entry into Aries fell on March 10, 23^{h} 31^{m} after noon [Hinc patet introitum ☉ in Arietem incidiſſe in 10 Martij horis à meridie 23. minut. 31.].

Date	Altitude	Declination	Position
March 14	39° 54′	the Prince's	♈ 3° 0′
March 16	40° 40′		♈ 4° 55′
April 4	47° 50′		23° 27′
9	49° 37′	the Prince's	28° 22′
April 11	50° 18′		♉ 0° 17′
26	55° 0′		14° 42′

Date	Altitude	Declination	Position

Because of clouds the solstice was not observed [Propter nubes non eſt obſervatum ſolſtitium.].

Date	Altitude	Declination	Position
June 26	61° 38′		♋ 12° 12′
July 2	60° 44′		19° 47′
11	59° 17′		28° 10′

Date	Altitude	Declination	Position
August 6	52° 36′		♌ 22° 57′
August 29	44° 32′		♍ 15° 13′
September 13	38° 46′		♍ 29° 50′
September 14	38° 23′		♎ 0° 48′
October 3	31° 2½′	most exact [exactiſſ.]	19° 31½′
7	29° 33′		23° 30′
October 27	22° 46′		♏ 13° 30′

Year 1572

Date	Altitude	Declination	Position
January 10	18° 28′		♑ 29° 51′
February 11	27° 55′		♓ 2° 0′
28	34° 19′		18° 57′
March 7	37° 28½′		26° 56′
March 11	39° 3′		♈ 0° 52′
30	46° 18′		19° 22′
April 6	48° 50′		26° 11′

With the quadrant corrected [Rectificato quadrante]

Date	Altitude	Declination	Position
April 7	49° 11′		27° 9′
30	56° 7½′		♉ 19° 17′
May 23	60° 51′		♊ 11° 0′
May 24	60° 59′	careful [dilig.]	12° 0′
June 4	61° 57′		
June 8	62° 5′		

Clouds again [Rurſum nebulæ]

Date	Altitude	Declination	Position
July 7	59° 52′		♋ 25° 5′
July 27	55° 22′		♌ 14° 0′
August 13	50° 6′		♍ 0° 17′
October 3	30° 52′		♎ 20° 0′
7	29° 23′		23° 27′

Date	Altitude	Declination	Position
November 11	18° 43′		♍ 29° 0′[9]
December 11	15° 14′	the Sun very clear [☉ clariff.]	the Prince's [*Principis*]
December 17	15° 22′	the Prince's	♑ 6° 40′
28	16° 23′	the Prince's	17° 45′

Year 1573

Date	Altitude	Declination	Position
	4′	larger quadrant [major. Quad.]	♑ 22° 24′
January 2	17° {	the Prince's	
	5′	smaller quadrant [minor. Quadr.]	22° 30′
January 14	19° 32′	the Prince's	♒ 4° 34′
March 4	36° 10′	careful [diligens]	♓ 23° 37′
11	38° 56′	careful [diligens]	♈ 0° 35′
13	39° 43′	the Prince's	2° 32′
16	40° 53′	the Prince's	5° 29′
April 7	49° 5′	the Prince's	26° 52′
June 12	62° 12′		
December 7	15° 18′		♐ 25° 0′
8	15° 16′		26° 0′

Year 1574

Date	Altitude	Declination	Position
January 4	17° 26′		♑ 24° 33′
29	23° 43′		♒ 19° 35′
February 16	29° 59′		♓ 7° 39′
20	31° 29′	careful	♓ 11° 39′
23	32° 39′	careful	14° 40′
March 2	35° 21′		21° 35½′
6	36° 55′		25° 32½′
12	39° 16′		♈ 1° 25′

[9] both copies print ♍ here.

Date	Altitude	Posi-tion
March	40° 4′	♈
14		3° 25′
March	46° 8′	18° 55′
30		
April 19	53° 3′ careful [dilig.]	♉
		8° 25′
April 21	53° 39′ careful	10° 19′
	12′ smaller quadrant [minor.quad.]	
June 12	62° { the Prince's observation [*Obſerv.Princ.*] } careful, the Sun clear [dili. ⊙ claro.]	
	13′ larger quadrant [major. quad.]	

Year 1575

Date	Altitude	Position
March 1	34° 44′	♓ 20° 0′
March 5	36° 19′	24° 0′
April 2	47° 12′ the Prince's [*princip.*]	♈ 21° 46′
April 11	50° 25′ careful	♉ 0° 37′
May 13	59° 11′	♊ 1° 20′
May 17	59° 55′	5° 11′
June 1	61° 46′	19° 15′
June 4	61° 56⅓′	
Solstice [Solftitium]	62° 12′	
June 20	61° 56′	
July 20	57° 24′	♌ 6° 28′
July 26	55° 50′	

Year 1576

Date	Altitude	Position
March 11	39° { 4′	♈ 0° { 55′
	5′	57½′
April 9	49° 56′	29° 14′
12	50° 57′	♉ 2° 9′
May 11	58° 54′	♊ 0° 0′

Year 1577

Date	Altitude	Position
November 16	17° 42′	
December 14	15° 19′	
22	15° 44′	
31	16° 46′	

Year 1578

Date	Altitude	Position
January 14	19° 33′	
19	20° 37′	
February 14	29° 14′	♓ 5° 30′
16	30° 0′	
20	31° 30′	
March 11	38° 54′	
12	39° 18′	
31	46° 34′	
April 2	47° 18′	
5	48° 22′	
May 1	56° 32′	
May 16	59° 48′	
June 9	62° 10′ the Prince's [*Principis*]	
11	62° 11′	
12	62° 12′	
19	62° 0′	
July 11	59° 18′	
August 2	53° 50′	
August 26	45° 40′	
September 2	43° 2′	

Date	Altitude	Position
September 14	38° 23′	
November 7	19° 48′	
December 9	15° 20′	
December 24	15° 55′ accurate [accurata]	
25	16° 1′	

Year 1579

Date	Altitude	Position
January 2	17° 5′	
7	27° 57′	[10]
28	23° 40′	
February 12	28° 28′	
20	31° 23′ very careful [dil. val.]	♓ 11° 24′
22	32° 10′ very careful [dil. val.]	13° 26′
March 1	34° 50′	20° 16′
15	41° 29′	
29	45° 42′	
April 1	46° 48′	
14	51° 25′	
21	53° 35′	
June 13	62° 11′	

[10] so in both copies, out of series with its neighbours.

Date	Altitude	Position
July 7	62° 0′	
September 6	41° 33′	

With a most exact instrument [Exactiſſ. inſtrumento]

Date	Altitude	Position
October 22	24° 25′	
23	24° 7′	
25	23° 28′	
28	22° 28′	
December 5	15° 26′	
8	15° 20′ the Prince's [*Principis*]	

Date	Altitude	Position
December 16	15° 21′	
December 31	16° 43′	

Year 1580

Date	Altitude	Position
January 1	16° 52′	
2	17° 0′	
3	17° 10′	
7	17° 54′	
8	18° 5′	
9	18° 18′	
15	19° 40′	
21	21° 12′	
30	23° 54′	
31	24° 12′	
February 1	24° 35′	
February 17	30° 10′	
29	34° 47′	
March 3	36° 0′	
March 9	38° 20′	
21	39° 30′	[11]
31	46° 43′	
April 10	50° 16′	
14	51° 38′	
May 13	59° 16′	
June 1	61° 50′	
6	62° 4′	
Solstice [Solſtitium]	62° 12′	

[11] so in both copies, out of series with its neighbours.

Date	Altitude	Position
October 13	27° 13′	
November 30	15° 44′	

Year 1581

Date	Altitude
January 6	17° 48′
7	18° 0′
8	18° 12′
9	18° 23′
10	18° 34′
January 11	18° 50′
25	22° 32′
February 6	26° 25′
8	27° 8′
March 3	35° 48′
9	38° 10′
13	39° 44′
April 6	54° 17′
May 31	61° 42′
June 1	61° 44′
15	62° 4′
25	61° 28′
July 29	54° 50′
August 10	51° 6′
25	45° 51′
December 14	15° 15′, but smaller quadrant 14′ [fed minor. quad. 14 m.]

Year 1582

Date	Altitude
January 21	21° 18′
February 2	24° 58′
February 10	27° 43′

Date	Altitude
February 25	33° 26′
March 10	38° 26′
13	39° 38′
April 1	46° 52′
11	50° 24′
May 3	56° 56′
19	60° 14′
27	61° 22′
June 8	62° 8′

Date	Altitude

Rothmannus [Christoph Rothmann] writes to Prince William that on 1587 June 12 [An.1587. pridie Idus Iunias], the very day of the solstice, he observed the meridian altitude of the Sun at Kassel [Caſſellis] as 62° 11′.

THE END

Observations of the Planets

Made with the Sextant [Sextantem] at Kassel by Iusto Byrgio [Jost Bürgi], Instrument-Maker [Organopœo] to the Most Illustrious Princes William and Maurice, Landgraves of Hesse

At Kassel

Observations of the Year 1590

Old Style, or Julian

On the fifth of December, at $8\frac{1}{2}^{h}$ after noon, as the Moon was rising.

Planet	Star	Distance
Saturn	The Eye of Taurus [♉] was distant	21° 39′
	Right Shoulder of Auriga	22° 39½′
	Capella	25° 39′
	Following Head of Gemini [♊]	23° 34′
	Preceding Head of Gemini [♊]	22° 16′
	Left Foot of Orion [Siniſter per Orionis] [recte: pes]	32° 55′

The same night, that is, December 6, at 2^{h} before noon.

Planet	Star	Distance
Saturn	Eye of Taurus	21° 36′
	second observation	21° 36′
	Right Shoulder of Auriga [anrigæ] [recte: aurigæ]	22° 40′

Planet	Star	Distance
Saturn	Capella	25° 40′
	Head of the Preceding Twin [♊]	22° 17½′

December 6, at 8^{h} after noon.

Planet	Star	Distance
Saturn	Eye of Taurus	21° 36′
	second	21° 35′
	third	21° 36′

Planet	Star	Distance
	fourth	21° 35′
	Preceding Twin [Præcedens Gemin.]	22° 22′

December 7, at 5^h and 6^h before noon.

Planet	Star	Distance
Saturn	Canis Minor	28° 43′
	Right Shoulder of Auriga	22° 40′
	Preceding Head of Gemini [♊]	22° 19½′
Jupiter	Spica of Virgo	22° 0′
	Northern Scale of Libra [♎]	8° 20′
	and Mars	14° 19½′

December 12, at $7½^h$ after noon.

Planet	Star	Distance
Saturn	and the Eye of Taurus	21° 5½′

December 15, at 8^h after noon.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	20° 49′
	Head of the Preceding Twin [♊]	22° 55½′

December 18, at 9^h after noon.

Planet	Star	Distance
Saturn	and the Preceding Twin [♊]	23° 11½′

December 23, at 5^h before noon.

Planet	Star	Distance
Saturn	Following Twin [♊]	24° 53′
	second	24° 55′
	Shoulder of Auriga	22° 37′
	second	22° 38′
	third	22° 37 $^2/_1$′ [?]
Mars	Spica of Virgo	17° 20′
	Northern Scale of Libra [♎]	11° 35′ ob.obf. [?]
♃ [Jupiter]	and Spica of Virgo	24° 42′
	second	24° 45′

Planet	Star	Distance
Jupiter [♃]	and Spica of Virgo	24° 42′
	second	24° 45′

12

In the Year 1591

January 29, after noon, at 9^h.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	18° 18′
	Capella	24° 33′
	Following Twin [♊]	26° 50′
	Left Foot of Orion	31° 47½′

January 30, in the evening, at 9^h.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	18° 18′
	Capella	24° 33′
	Following Twin [♊]	26° 50′
	Left Foot of Orion	31° 47½′

13

January 30, at $4½^h$ before noon.[14]

Planet	Star	Distance
Mars [♂]	and Spica of Virgo	38° 56½′
	second	38° 58′
Jupiter [♃]	and Spica of Virgo	29° 13½′
Jupiter [♃]	and the Northern Scale of Libra [♎]	8° 2½′; quadrature of the Sun and Jupiter [□ ☉ & ♃]
Mars [♂]	and the star in the forehead of Scorpius [♏]	36′; and Mars [♂] has a slightly smaller latitude than this star has
Mars [♂]	and the Heart of Leo	8° 55¼′

February 8, at 5^h before noon.

[12] These two rows, with the same figures, also stand as the last two rows of the preceding page.
[13] both copies print these four figures for January 29 and again for January 30, evening.
[14] so placed in both copies, after the evening group of the same day.

Planet	Star	Distance
Jupiter [♃] and	Spica of Virgo	29° 44′
	second	29° 44′
	Mars [♂], observed in passing	14° 10′
Jupiter [♃]	Spica of Virgo	29° 48½′
	Mars [♂], in passing	14° 34½′
	Mars [♂] and Spica of Virgo	44° 20′

February 24, at 9^h after noon.

Planet	Star	Distance
Saturn	Capella	24° 30′, good [bona]
	Eye of Taurus [♉]	18° 18′
	Following Twin [♊]	26° 49′
	Left Shoulder of Orion	15° 10′
	quadrature of the Sun and Saturn [□ ☉ & ♄]	

February 25, at 9^h after noon.

Planet	Star	Distance
Saturn [♄]	Capella	24° 30′
	Eye of Taurus [♉]	18° 21′
	Left Shoulder of Orion	15° 10′
	Following Twin [♊]	26° 46′

June 8, at 9^h after noon and 10^h.

Planet	Star	Distance
Jupiter [♃]	and Arcturus	35° 21′
Mars	and the Heart of Scorpius	22° 32′
	second	22° 30′
	third	22° 30′
Jupiter [♃]	and Mars	48° 23′
Jupiter [♃]	and Spica of Virgo	20° 37 ½[?]′
	opposition of the Sun and Mars [☍ ☉ & ♂]	
Jupiter [♃]	and the Northern Scale of Libra [♎]	9° ½′
Mars	and Aquila	43° 39′
	second	43° 39′

September 13, at $8½^h$ after noon.

Planet	Star	Distance
Mars [♂]	Head of Serpentarius	45° 9′
	Shoulder of Sagittarius	4° 8′

September 14, at 9^h.

Planet	Star	Distance
Mars [♂]	Head of Serpentarius	45° 24½′
	Aquila	35° 18½′
	second	35° 19′
	Shoulder of Sagittarius	4° 47′
	the more southern star in the horn of Capricorn [♑]	18° 38′

September 21, at 5^h before noon.

Planet	Star	Distance
Saturn	Eye of Taurus	38° 31¼′
	second	38° 32′
	third	38° 33′
	Canis Minor	17° 10′
	and second and third the same [* □ ♄] [?]	
	Head of the Following Twin [♊]	8° 58½′
	Capella	34° 40′

September 28, at $6½^h$ after noon.

Planet	Star	Distance
Mars	and Venus	48° 3′
Venus [♀]	Arcturus	53° 36′
Mars	Aquila	32° 37′
	second	32° 38′
	quadrature of the Sun and Mars [□ ☉ & ♂]	

The same day, at $7¾^h$.

Planet	Star	Distance
Mars	Shoulder of Sagittarius	13° 5½′
	second	13° 6′
	Aquila	32° 37 ½[?]′
	The same day, at 8^h.	
	The following one of the two at the emergence of the tail of Capricorn [♑]	27° 59 ½[?]′
	second	28° 0′
	Head of Serpentarius	49° 33 ½[?]′
	second	49° 33′

September 29, at 5^h before noon.

Planet	Star	Distance
Saturn	Eye of Taurus	38° 50′
	second	38° 50 ½[?]′
	third	38° 50′
	Canis Minor	17° 2½′
	second	17° 2′
	quadrature of the Sun and Saturn [□ ☉ & ♄]	

September 29, at 7½^{h} *prim. min.* [?]

Planet	Star	Distance
Mars [♂]	and Venus [♀]	47° 46′
	second	47° 45′
Venus [♀]	and Arcturus	54° 23′
	second	54° 23′

The same day, at 8^{h}.

Planet	Star	Distance
Mars [♂]	Shoulder of Sagittarius	13° 41′
	second	13° 42′
	third	13° 42′
	The following one of the two at the emergence of the tail of Capricorn [♑]	27° 20′
	second	27° 19′
	third	27° 20′
	fourth	27° 20′
	Aquila	32° 28 ½[?]′
	second	32° 28½′
	Head of Serpentarius	49° 52′
	second	49° 52′

September 20, at 5½^{h} before noon.[15]

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	38° 52 ½[?]′
	second	38° 52′
	third	38° 52′
	fourth	38° 52′
	Canis Minor	17° 1½′
	second	17° 1½′

At 6^{h} *pro meridiana* [?].

[15] so in both copies, after the September 29 groups.

Planet	Star	Distance
Venus [♀]	and Mars [♂]	47° 20½′
	second	47° 20′
Arcturus		55° 6′

At 8^h.

Planet	Star	Dis-tance
Mars	Shoulder of Sagittarius	14° 20′
	second	14° 20½′
	third	14° 20′
	The following one of the two [*duaumirn*; recte: *duarum in*] at the emergence of the tail of Capricorn [♑]	26° 44′
	second	26° 44½′
	Aquila	32° 23′
	second	32° 23′
	Head of Serpentarius	50° 12′
	second	50° 12′

October 4, at 6^h.

Planet	Star	Distance
Mars	and Venus	46° 3′
	second	46° 3′

At 7^h.

Planet	Star	Distance
Mars [♂]	Shoulder of Sagittarius	16° 53′
	The following one at the emergence of the tail of Capricorn [♑]	24° 12′
	Aquila	31° 58½′
	second	31° 59′
	Head of Serpentarius	51° 16′

October 5, at 6^h after noon.

Planet	Star	Distance
Venus [♀]	Mars	45° 45′
	second	45° 46′
	Head of Serpentarius	40° 19′
	second	40° 20′

At 7^h after noon.

Planet	Star	Distance
Mars [♂]	Shoulder of Sagittarius	17° 32′
	second	17° 32′
	third	17° 32′
	The following one at the emergence	

___[16]

Planet	Star	Distance
Mars	The following one at the emergence of the tail of Capricorn [♑]	23° 34′
	second	23° 33½′
	Aquila	31° 56′
	second	31° 56′
	Head of Serpentarius	52° 1′
	second	52° 1½′

October 8, at 3^{h} before noon.

Planet	Star	Distance
Saturn	Eye of Taurus	39° 1½′
	second	39° 1½′
	Canis Major	16° 58′
	second	16° 58′
	quadrature of the Sun and Saturn [□ ☉ ♄]	

October 10, at 5½^{h}.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	39° 4′
	second	39° 3½′
	Canis Minor	16° 57′
	second	16° 57′

At 6½^{h} after noon.

Planet	Star	Distance
Mars	Shoulder of Sagittarius	20° 47′
	second	20° 47′
	The following one at the emergence of the tail of Capricorn [♑]	20° 21 ½[?]′
	second	20° 22′ — quadrature of Mars [□ ♂]

[16] The words *Sequens in eductione* also stand as the last line of the preceding page, with no figures, above the catchword *Cau-*. They are set again here, and the figures follow on the next line.

Planet	Star	Distance
	Aquila	31° 44½′
	second	31° 45′

October 11, at 6^h before noon.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	39° 4′
	second	39° 3½′
	third	39° 4′
	Canis Major	16° 57′

October 20, at 6^h after noon.

Planet	Star	Distance
Venus [♀]	and Mars [♂]	42° 36½′
		42° 36½′

October 21, at 6^h after noon.

Planet	Star	Distance
Venus	Mars	42° 28′
	second	42° 28½′
	Head of Serpentarius	40° 31′
	Aquila	46° 31′
Mars	Aquila	32° 31¼′
	second	32° 31¾′ — quadrature of the Sun and Mars [□ ☉ ♂]
	The following one at the emergence of the tail of Capricorn [♑]	13° 5′
	second	13° 4½′

October 31, at $5\frac{1}{2}^h$ before noon.

Planet	Star	Distance
Saturn	Heart of Leo	41° 32′
	second	41° 31½′
	Head of the Preceding Twin [♊]	10° 50′
	second	10° 49½′
	third	10° 49½′
	Eye of Taurus [♉]	38° 50′
	Canis Major	39° 5′
	second	39° 5′

December 20, at 7^h after noon.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	35° 45′
	second	35° 44′
	third	35° 45′
	Preceding Head of Gemini [♊]	11° 46 ¾′
	second; opposition of the Sun and Saturn [☌ ☉ & ♄]	11° 46′
	Following Head of Gemini [♊]	10° 47½′
	Right Shoulder of Orion	22° 30′
	second	22° 29½′

December 21, at 7½^{h} *pro merid.* [?].

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	35° 38 [?]/[?]′
	second	35° 38¼′
	third	35° 38 [?]/[?]′
	Preceding Head of Gemini [♊]	11° 48′
	second	11° 48′

Opposition of the Sun and Saturn [☌ ☉ & ♄].
December 26, at 7^{h} after noon.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	35° 13¾′
	second	35° 14′
	third	35° 13¾′
	Preceding Twin [precedens Gemin.]	11° 57′
	second	11° 57′

In the Year 1592
February 18, at 5½^{h} before noon.

Planet	Star	Distance
Venus	Heart of Scorpius	48° 48′
	second	48° 49′
	Aquila	26° 39½′
	second	26° 40′
	Jupiter	35° 10′

February 23, at 5^{h} before noon.

Planet	Star	Distance
Venus	Heart of Scorpius	53° 39′
	second	53° 39′

Planet	Star	Distance
	Aquila	26° 51′
Jupiter [♃]	Heart of Scorpius	14° 35½′ — quadrature of Jupiter [□ ♃]
	Head of Serpentarius	35° 16′
	Venus [♀]	39° 41½′
	second	39° 41½′

October 14, at 4^{h} before noon.

Planet	Star	Distance
Saturn	Heart of Leo	27° 23′
	second	27° 22′
	third	27° 23′
	fourth	27° 23′
	Canis Minor	17° 15′
	second	17° 16′
	third	17° 15′
	Eye of Taurus	52° 57′ — tested three times [ter probat.]
	Canis Major	42° 58′
	second	42° 57′
	third	42° 57′

October 15, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Heart of Leo	27° 21′
	second	27° 21′
	Canis Major	42° 56½′
	second	42° 57′ — quadrature of the Sun and Saturn [□ ☉ & ♄]
	Canis Minor	17° 13 [?]′[?]′
	second	17° 14½′

October 16, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Heart of Leo	27° 19′
	second	27° 19′
	Canis Minor	17° 14′
	second	17° 14′
	Eye of Taurus [♉]	53° 2′
	second	53° 1½′
	third	53° 3′

December 18, at 6^{h} before noon.

Planet	Star	Distance
Saturn	Heart of Leo	29° 17¾′
	second	29° 17¾′

Planet	Star	Distance
Saturn	Neck of Leo	30° 10′
	second	30° 10′
	On the Back of Leo	42° 43 [illegible][?]′
	second	42° 43 [illegible][?]′
	Following Head of Gemini	9° 45′
	second	9° 44½′
	third	9° 45′
	Canis Minor	16° 40′
	second	16° 40′
	Bright Star of Hydra	34° 28′
	Capella	43° 59′
	second	43° 58 [?]′
	third	43° 59′
	fourth	43° 58′

December 19, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Heart of Leo	29° 22⅔′
	second	29° 22 [?]⅓′
	Neck of Leo	30° 15⅓′
	second	30° 14 [?]⅓′
	third	30° 16′
	fourth	30° 15 [?]⅓′
	fifth	30° 15⅓′
	On the Back of Leo	42° 47′
	Following Head of Gemini [♊]	9° 43′
	Capella	43° 55′

December 20, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Heart of Leo	29° 27′
	second	29° 27′
	Neck of Leo	30° 20⅔′
	second	30° 20 [?]½′
	third	30° 20⅔′

Planet	Star	Distance
Saturn	Following Head of Gemini	9° 39′
	second	9° 39½′
	third	9° 39′
	Canis Minor	16° 40′
	Capella	43° 51′
	second	43° 51½′
	third	43° 51′

At 6^h.

Planet	Star	Distance
Mars	and Spica of Virgo	30° 45′
	second	30° 46′
	third	30° 46′

December 21, at 6^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	29° 33′
	second	29° 32¾′
	third	29° 32⅓′
	fourth	29° 33′
	fifth	29° 33′
	Neck of Leo	30° 23′ — three times [ter]

December 29, at 6^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	30° 11′
	second	30° 11′
	Neck of Leo	31° 0′
	second	30° 59½′
	third	30° 59⅔′
	fourth	30° 59 2/[?]′
	Following Twin [♊]	9° 7′
	second	9° 6 1/[?]′
	third	9° 7′

In the Year 1593

January 2, at 6^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	30° 32′
	second	30° 31′

Planet	Star	Distance
	third	30° 32½′
	fourth	30° 30′
	fifth	30° 31′
	Following Twin	8° 51′
	second	8° 52′

January 3, at 6½^{h} after noon.

Planet	Star	Distance
Saturn	Following Head of Gemini	8° 46′
	second	8° 46′ — opposition of Saturn and the Sun [☌ ♄ ☉]
	Right Shoulder of Orion	34° 12′
	second	34° 12′

January 4, at 6 ♈[?]^{h} after noon.

Planet	Star	Distance
Saturn	Following Head of Gemini	8° 43′
	second	8° 43′
	Right Shoulder of Orion	34° 8 ♈[?]′
	second	34° 9′
	third	34° 8½′

January 5, at 7^{h} after noon.

Planet	Star	Distance
Saturn	Following Head of Gemini	8° 40′
	second	8° 40′
	Right Shoulder of Orion	34° 2¾′
	second	34° 3′
	third	34° 3′

January 23, at 5¾^{h} after noon.

Planet	Star	Distance
Saturn	Eye of Taurus [♉]	48° 8′
	second	48° 8′
	Canis Minor	16° 15⅓′

January 23, at 9½^{h} after noon.

Planet	Star	Distance
Saturn	Heart of Leo	32° 14 [?]⅓′
	second	32° 14 [?]⅓′
	Canis Minor	16° 15¼′
	second	16° 15¼′
	third	16° 15′
	Eye of Taurus	48° 8 [?]⅓′
	second	48° 9′
	third	48° 8¾′
	fourth	48° 8¾′

February 11, at 9^h after noon.

Planet	Star	Distance
Saturn	Heart of Leo	33° 24¾′
	second	33° 24½′
	third	33° 24½′
	Canis Minor	16° 12′
	Eye of Taurus	46° 59′
	second	46° 59⅓′
	third	46° 59′

March 4, at 9^h.

Planet	Star	Distance
Saturn [♄]	Northern Horn of Taurus	33° 35½′ — three times [ter]
Saturn	Canis Minor	16° 12′

March 31, at 9^h after noon.

Planet	Star	Distance
Saturn	Northern Horn of Taurus	33° 53½′
	second	33° 53′ — quadrature of Saturn [□ ♄]
	Canis Minor	16° 15′
	second	16° 14′
	third	16° 14′
Venus	Capella	24° 10½′
	second	24° 10′
	Right Shoulder of Orion	26° 50′
	second	26° 49½′

April 1, at 9^h.

Planet	Star	Distance
Saturn	Northern Horn of Taurus	33° 57½′
	Canis Minor	16° 13½′
Venus	Capella	23° 36′
	second	23° 35′
	third	23° 35′
	Right Shoulder [Dexter humerus]	26° 5¼′

April 7, at 10^{h} after noon.

Planet	Star	Distance
Saturn	Heart of Leo	33° 30′
	second	33° 29′
	third	33° 29′
	Canis Minor	16° 22′
Venus	Capella	20° 55 ſ[?]′
Venus [♀]	Right Shoulder of Orion	22° 9′

April 8, at 3^{h} before noon.

Planet	Star	Distance
Jupiter [♃]	Heart of Scorpius	47° 28′
Jupiter [♃]	Aquila	29° 10′

April 15, at 3^{h} before noon. Quadrature of Jupiter [□ ♃].

Planet	Star	Distance
Jupiter [♃]	and Mars	12° 24′
	second	12° 22′
	Aquila	29° 40′
	second	29° 39½′ — quadrature of Mars [□ ♂]

April 16, at 3^{h} before noon.

Planet	Star	Distance
Jupiter [♃]	Heart of Scorpius	48° 16′
	Mars	12° 54½′ — cloudy [nebiloſū] [recte: nebuloſū]
	Aquila	29° 40′
Mars [♂]	and Aquila	31° 55′

May 8, at about [fere] 10^{h} after noon.

Planet	Star	Distance
Venus	Heart of Leo	41° 19 [?]⅓′
	Preceding Head of Gemini	7° 6¼′
	Saturn	10° 21 1/[?]′ — second: the same [?] [ſec.eadem]

Planet	Star	Distance
Saturn	Heart of Leo	31° 17′
	second	the same
	Preceding Head of Gemini	12° 48′
	second	the same

May 11, at 2^{h} before noon.

Planet	Star	Distance
Jupiter [♃]	Heart of Scorpius	48° 11′
	second	48° 12′
	third	48° 12′
	Aquila	29° 43′
	second	the same
	Mars	27° 59′
	second	the same
Mars	and Aquila	39° 10′
	second	the same

The same day, at $9½^{h}$ after noon.

Planet	Star	Distance
Venus	Capella	34° 52′
	second	the same
	Following Twin	4° 4′
	second	4° 5′
Saturn	Heart of Leo	30° 59′
	Capella	42° 30′
	second	42° 30′
Mercury	Capella	21° 56′
	second	21° 51′
	third	21° 59′
	fourth	21° 55′ — cloudy [nebiloſ.]
	Following Twin [♊]	24° 32′
	second	34′
	third	35′
	fourth	35′

May 12, at $9½^{h}$.

Planet	Star	Distance
Mercury	Capella	22° 30′
	second	22° 30′
	third	22° 31′
	Following Twin	23° 42′ — cloudy [nubilof.]
Mercury	Capella	
	Heart of Leo	37° 42′
	Following Twin	

May 15, at $9\frac{1}{2}^{h}$.

Planet	Star	Distance
Mercury	Following Twin [♊]	21° 8′
	second	21° 4′

May 16.

Planet	Star	Distance
Mercury [☿]	Following Twin	19° 58′
Mercury	Capella	24° 21′

June 25, at $10\frac{1}{2}^{h}$ after noon.

Planet	Star	Distance
Jupiter	Heart of Scorpius	43° 6′
	second	43° 5 *v*[?]′
	On the Left Shoulder of Aquarius [♒]	11° 39 *v*[?]′
	second	the same
	Aquila	30° 36′ — opposition of Jupiter [☌ ♃]

July 6, at 9^{h} after noon.

Planet	Star	Distance
Jupiter [♃]	Heart of Scorpius	42° 38⅔′
Jupiter	Aquila	30° 57′

July 8, at 9^{h}.

Planet	Star	Distance
Jupiter [♃]	Heart of Scorpius	42° 35½′
Jupiter	Aquila	31° 5′

August 6, at 3^{h} before noon.

Planet	Star	Distance
Venus	Left Foot of Orion	45° 38½′
Venus [♀]	Following Head of Gemini	14° 15½′

August 7, at 3½^{h} before noon.

Planet	Star	Distance
Venus	Left Foot of Orion	45° 46½′
Venus [♀]	Following Head of Gemini	14° 15′

August 9, at 4^{h} before noon.

Planet	Star	Distance
Mars [♂]	More Southerly Tail of Cetus	17° 48′
Mars	Third Star of Aries [♈]	48° 11′
Venus	Right Shoulder of Orion	30° 39½′
	second	the same
	Following Head of Gemini	14° 10′

August 10, at 10^{h} after noon.

Planet	Star	Distance
Mars	The following one at the emergence of the tail of Capricorn [♑]	28° 30′
	Head of Andromeda	38° 58′

August 12, at 10^{h} after noon.

Planet	Star	Distance
Mars	The following one at the emergence of the tail of Capricorn [♑]	28° 6′
	second	28° 7′
	Head of Andromeda	38° 57 [?]¼′

August 13, at 9^{h} after noon.

Planet	Star	Distance
Jupiter	Aquila	32° 16′
Jupiter [♃]	Right Knee of Serpentarius	31° 27½′
Mars [♂]	Head of Andromeda	39° 16′
	The following one at the emergence of the tail of Capricorn [♑]	27° 50′
	In the Mouth of Pegasus	34° 13½′
	Third Star of Aries [3 * ♈]	49° 5 ½[?]′

August 14, at 3^{h} before noon.

Planet	Star	Distance
Mars [♂]	Third Star of Aries	49° 3′
Mars [♂]	In the Mouth of Pegasus	34° 13½′
Venus [♀]	Left Foot of Orion	4° 25″[17]
Venus	Right Shoulder of Orion	32° 1′

August 21, at 9^h after noon.

Planet	Star	Distance
Mars	Head of Andromeda	40° 7 ♈[?]′
	Left Shoulder of Aquarius [♒]	29° 38′
	Third Star of Aries [3 * ♈]	50° 59¾′ — three times the same [ter eadem.]

The same night, to investigate the parallax [paralaxin].

Star and observation	Figures, left	Figures, right	Altitude of Mars
Mars, In the Mouth of Pegasus		32° 57′	
second observation	33° 0′	33° 0′	was 13°
third	33° 2′	33° 22′	18
fourth	33° 2½′		22 ♈[?]

At 11^h. Opposition of the Sun and Mars [☍ ☉ & ♂].

Planet	Star	Distance
	Aquila	32° 21¼′
	Famahant	49° 6½′

August 22, at $8½^h$.

Planet	Hour	Star and observation	Distance	Altitude of Mars
		In the Mouth of Pegasus	32° 48′	
			the same	8
Mars		second	32° 49′	14
	10^h	third	32° 50′	22
	12^h	fourth	32° 50′	25
	2^h	fifth	32° 50′	22
	3^h	sixth	32° 50′	16
	$3½^h$	seventh	32° 50′	14

At 10^h.

[17]so in both copies, a single figure.

Planet	Star	Distance
	Third Star of Aries [♈]	51° 15¾′
	second	the same

At 11^{h}.

Planet	Star	Distance
Jupiter	Famahant	49° 6⅘′
Jupiter	Aquila	32° 15 [?]/[?]′

At 11½^{h}.

Planet	Star	Distance
Mars	Left Shoulder of Aquarius [♒]	29° 25′
	second	29° 25½′
Mars [♂]	Famahant	20° 46½′

At 12½^{h}.

Planet	Star	Distance
Mars	In the southern extremity of the tail of Cetus	19° 43′
	second	the same
Mars [♂]	In the Right Shoulder of Aquarius [♒]	22° 52′, careful [dilig.]

Note: Mars and the two aforementioned stars fall on a straight line, one preceding and the other following. To correct the sextant, the distances of the two stars were observed, and the distance of the star in the right shoulder of Aquarius [♒] from the star in Cetus was found to be 42° 36¼′, carefully [diligent.].

August 22, at 3^{h} before noon.

Planet	Star	Distance
Mars	Third Star of Aries [♈]	51° 17′

August 24, at 9^{h} after noon.

Planet	Star and observation	Distance	Altitude of Mars [altit. ♂]
Mars	Third Star of Aries [♈]	51° 44′	
	second	51° 44′	
	Mouth of Pegasus	32° 29′	11
	second	32° 30′	15
	a third time, at 10^{h}	32° 30′	19

August 28, at 9^h after noon.

Planet	Star and observation	Distance	Altitude of Mars [altit. ♂]
Mars	Mouth of Pegasus	31° 53½′	14
	second	31° 53′	16
	Third Star of Aries [♈]	52° 44′	

August 31, at $4½^h$ before noon.

Planet	Star	Distance
Venus	Following Twin	19° 1[?]′
Venus [♀]	Canis Minor	17° 48′
Saturn	Following Twin	19° 53′
Saturn [♄]	Canis Minor	23° 3½′
Venus [♀] and Saturn		5° 20½′

September 1, at 4^h before noon.

Planet	Star	Distance
Venus	Following Twin	19° 33′
Venus	Canis Minor	18° 25′

Planet	Star	Distance
Saturn	Following Twin	19° 58′
	Canis Minor	23° 8′
	Venus	4° 55′

September 3, at 4^h before noon.

Planet	Star	Distance
Venus [♀]	Canis Minor	19° 41′
Venus [♀]	Following Twin	20° 41′

September 11, at $4½^h$ before noon.

Planet	Star	Distance
Venus	Following Twin	26° 20′
	second	26° 19 [?]⅓′
	Canis Minor	25° 38′
	second	the same
Saturn	Following Twin	21° 0′
Saturn [♄]	Canis Minor	23° 52 [?]⅓′

October 11, at 4½^{h} before noon.

Planet	Star	Distance
Saturn	Following Twin	23° 11 [?]⅓′
	second	the same
	Canis Minor	25° 39′, good [bona]
	Venus	32° 18½′, good [bona]
Venus	Heart of Leo	18° 10½′
	second	the same
	Last of the Tail of Leo	12° 16 [?]½′
	second	the same

December 2, at 8^{h} after noon.

Planet	Star	Distance
Mars	Head of Andromeda	25° 42′
	second	25° 42¼′
	Third Star of Aries	21° 26′
	second	26¼′
	third	26¼′

December 28, at 7^{h} after noon.

Planet	Star and observation	Distance
Mars	Head of Andromeda	26° 2¼′
	second	26° 3′
	third	26° 3′
	Third Star of Aries	19° 20¼′, □ ♂

December 29, at the seventh hour.

Planet	Star	Distance
Mars	Head of Andromeda	26° 10½′
Mars [♂]	Third Star of Aries [♈]	18° 50′
Saturn [♄]	Following Twin	22° 9′
Saturn	Canis Minor	25° 4½′

Year 1594

January 1, at 8^{h} after noon.

Planet	Star and observation	Distance
Saturn	Following Twin	21° 55¾′
	second	the same
	Canis Minor	24° 52′

Planet	Star and observation	Distance
	second	the same

January 2, at 8^h.

Planet	Star	Distance
Mars	Eye of Taurus [♉]	46° 28′
Mars [♂]	In the Belt of Andromeda, the middle one	26° 18¾′
Saturn	Following Twin [♊]	21° 52′
Saturn [♄]	Canis Minor	24° 49⅓′

January 12, at 7^h after noon.

Planet	Star	Distance
Mars	Eye of Taurus [♉]	40° 32 [?]⅓′
Mars [♂]	In the Belt of Andromeda, the middle one	25° 20′
Saturn	Canis Minor	24° 15 [?]⅓′
	Following Head of Gemini [♊]	21° 4 [illegible][?]′
	Heart of Leo	16° 17′

January 13, at $7½^h$.

Planet	Star	Distance
Saturn	Heart of Leo	16° 21 [illegible][?]′
	Following Head of Gemini [♊]	21° 1⅔′
	Canis Minor	24° 14′
Mars	Eye of Taurus [♉]	39° 54½′
Mars [♂]	In the Belt of Andromeda, the middle one	25° 8′

January 24, at 7^h after noon.

Planet	Star	Distance
Saturn	Following Twin	20° 8′
Saturn [♄]	Canis Minor	23° 38′
Mars	Eye of Taurus [♉]	33° 20′
Mars [♂]	Third Star of Aries [3 ♈]	9° 5½′

January 25, at 8^h.

Planet	Star	Distance
Saturn	Canis Minor	23° 34½′
Saturn [♄]	Following Twin	20° 5′
Mars	Eye of Taurus	32° 42′

Planet	Star	Distance
Mars [♂]	Third Star of Aries [♈]	9° 9′

January 29, at 8^h.

Planet	Star	Distance
Mars	Eye of Taurus	30° 17′
Mars	Third Star of Aries	9° 25′
Saturn	Following Twin	19° 46′
Saturn [♄]	Canis Minor	23° 20′

February 4, at 8^h.

Planet	Star	Distance
Saturn	Following Twin	19° 17′
Saturn [♄]	Canis Minor	22° 59′
Mars	Eye of Taurus [♉]	26° 38′
Mars	Third Star of Aries [♈]	10° 59′

February 5, at 9^h.

Planet	Star	Distance
Mars	Third Star of Aries	11° 16½′
Mars	Eye of Taurus [♉]	26° 0′
Saturn	Following Twin	19° 12′
Saturn	Canis Minor	22° 55′

___[18]

Planet	Star	Distance
Mars	Eye of Taurus	25° 28½′
Mars [♂]	Left Foot of Andromeda [ſiniſter pes Androm.]	26° 53′

February 12, at 8^h.

Planet	Star	Distance
Saturn	Following Twin	18° 46′
Saturn	Canis Minor	22° 40′

March 4, at 8^h.

[18] no date line stands above the next two rows on the page; the last date printed before them is February 5.

Planet	Star	Distance
Mars	Eye of Taurus [♉]	10° 39′
Mars	Capella	29° 25′

July 17, at 11^{h} after noon.

Planet	Star	Distance	Note
Jupiter	Aquila	40° 59′	good [bona][19]
	Tip of the Wing of Pegasus [extrema alæ pegaſ.]	40° 50¾′	
	Shoulder Blade of Pegasus [Scapula pegaſi]	30° 36′	

July 23, at 10^{h}.

Planet	Star	Distance
Jupiter	Aquila	40° 31⅓′
Jupiter [♃]	Head of Andromeda	50° 48′

July 25, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	40° 13½′
Jupiter [♃]	Shoulder Blade of Pegasus	31° 18′

July 26, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	40° 18′
Jupiter [♃]	Shoulder Blade of Pegasus	31° 25′

August 1, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	39° 51′
Jupiter [♃]	Shoulder Blade of Pegasus	31° 59′

August 5, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	39° 33′
Jupiter [♃]	Shoulder Blade of Pegasus	32° 23′

[19] on the page a brace joins this word to all three rows.

Planet	Star	Distance

August 6, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	39° 29′
Jupiter [♃]	Shoulder Blade of Pegasus	32° 28′

August 7, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	39° 23′
Jupiter [♃]	Shoulder Blade of Pegasus	32° 36′

August 8, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	39° 18′
Jupiter [♃]	Shoulder Blade of Pegasus	32° 42′

August 9, at 8^{h}.

Planet	Star	Distance
Jupiter	Aquila	39° 15′
Jupiter [♃]	Shoulder Blade of Pegasus	32° 47′

August 14, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	38° 51′
Jupiter [♃]	Shoulder Blade of Pegasus	33° 17 *v*[?]′

August 23, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	38° 14′
Jupiter [♃]	Shoulder Blade of Pegasus	34° 9′

August 25, at $8\frac{1}{2}^{h}$.

Planet	Star	Distance
Jupiter	Aquila	38° 6½′
Jupiter [♃]	Shoulder Blade of Pegasus	34° 20′

August 26, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	38° 3½′
Jupiter [♃]	Shoulder Blade of Pegasus	34° 25¾′

August 31, at 10^{h}.

Planet	Star	Distance
Jupiter	Aquila	37° 46′
Jupiter [♃]	Shoulder Blade of Pegasus	34° 51½′

September 1, at 9^{h}.

Planet	Star	Distance
Jupiter	Aquila	37° 43′
Jupiter [♃]	Shoulder Blade of Pegasus	34° 55′

September 2, at 10^{h}.

Planet	Star	Distance
Jupiter	Aquila	37° 40′
Jupiter [♃]	Shoulder Blade of Pegasus	34° 59½′

September 6, at 9^{h}.

Planet	Star	Distance	Note
Jupiter	Aquila	37° 25 ♈[?]′	careful [dilig.][20]
	Shoulder Blade of Pegasus	35° 15′	
	Southern Star in the Horn of Capricorn [Auſtralis in cornu ♑]	21° 8′	

September 8, at $8\frac{1}{2}^{h}$.

Planet	Star	Distance
Jupiter	Aquila	37° 18′
Jupiter [♃]	Shoulder Blade of Pegasus	35° 28′

[20] on the page a brace joins this word to all three rows.

Planet	Star	Distance

September 11, at 9^h.

Planet	Star	Distance
Jupiter	Aquila	37° 12½′
Jupiter	Shoulder Blade of Pegasus	35° 35½′

September 13, at 8^h.

Planet	Star	Distance
Jupiter	Aquila	37° 8′
Jupiter	Shoulder Blade of Pegasus	35° 45′

September 14, at 8^h.

Planet	Star	Distance
Jupiter	Aquila	37° 5¾′
Jupiter	Shoulder Blade of Pegasus	35° 45′

September 15, at 3^h and 4^h before noon.

Planet	Star	Distance
Saturn	Following Twin	33° 5¼′
	Neck of Leo [cervix ♌]	8° 34⅔′
	Canis Minor	34° 19′
	Heart of Leo	3° 49′
	In the Flank of Ursa Major [in ilibus urſæ majoris]	44° 27 ſ[?]′

September 16, at 4^h before noon.

Planet	Star	Distance
Jupiter	Following Twin	33° 17′
Saturn [♄]	In the Flank of Ursa Major	44° 29¾′

September 16, at 8 ſ[?]^h after noon.

Planet	Star	Distance
Jupiter	Aquila	37° 1′
Jupiter	Leg of Pegasus [crus pegaſi]	46° 52½′

September 17, at 4^h before noon.

Planet	Star	Distance
Saturn	Following Twin [♊]	33° 23′
Saturn	In the Flank of Ursa Major	44° 31′

September 18, at 4^h before noon.

Planet	Star	Distance
Saturn	Following Twin	33° 29′
Saturn [♄]	In the Flank of Ursa Major	44° 31¾′

September 18, at 9^h after noon.

Planet	Star	Distance
Jupiter	Aquila	36° 59′

September 19, at 4^h before noon.

Planet	Star	Distance
Saturn	Following Twin	33° 35′
Saturn	In the Flank of Ursa Major	44° 32′
	second [fecund.]	44° 31¼′

September 20, at 4^h.

Planet	Star	Distance
Saturn	Following Twin [♊]	33° 41 ı̷[?]′
Saturn [♄]	In the Flank of Ursa Major	44° 32½′
	second [fecund.]	44° 32′

September 21, at 8^h.

Planet	Star	Distance
Jupiter	Aquila	36° 54′
Jupiter [♃]	Shoulder Blade of Pegasus	36° 2′

September 22.

Planet	Star	Distance
Jupiter	Aquila	36° 54′

September 30, at 8^h.

Planet	Star	Distance
Jupiter	Aquila	36° 45 *v*[?]′
Jupiter [♃]	Shoulder Blade of Pegasus	36° 11½′

October 1, at 5^h before noon.

Planet	Star	Distance
Saturn	Following Twin	34° 45′

October 1, at 8^h after noon.

Planet	Star	Distance
Jupiter	Aquila	36° 46′
Jupiter [♃]	Shoulder Blade of Pegasus	36° 13⅔′

October 2, at 5^h before noon.

Planet	Star	Distance
Saturn	Following Twin [♊]	34° 50′
Saturn	In the Flank of Ursa Major	44° 39½′

October 2, at 8 after noon.

Planet	Star	Distance
Jupiter [♃]	Aquila	36° 46′
Jupiter	Shoulder Blade of Pegasus	36° 11¾′
	second [fecunda]	36° 12′

October 3, at 8^h after noon.

Planet	Star	Distance
Jupiter	Aquila	36° 46′

October 3, at 5^h before noon.[21]

Planet	Star	Distance
Saturn	Following Twin [♊]	34° 55′
	second	34° 54 *v*[?]′
Saturn [♄]	In the Flank of Ursa Major	44° 38½′

[21]so placed in both copies, after the after-noon group of the same day.

October 4, at 8^h before noon.

Planet	Star	Distance
Jupiter	Aquila	36° 45 [?]⅓′
	second	36° 46′
Jupiter [♃]	Shoulder Blade of Pegasus	36° 12′

October 26, at 6^h before noon.

Planet	Star	Distance
Saturn	Following Twin	36° 33′
Saturn [♄]	Bright Star of Hydra [Lucida hydræ]	23° 39′

November 4, at 5^h before noon.

Planet	Star	Distance
Saturn	Following Twin	36° 57′
Saturn [♄]	Neck of Leo [Cervix ♌]	7° 39⅓′

November 12, at 5^h and 6^h after noon.

Planet	Star	Distance	Note
Jupiter	Venus	34° 47½′	altitude of Venus [alt.♀] 11
Jupiter	Venus	34° 44½′	altitude of Venus [altit.♀] 8
Venus	Aquila	33° 30′	altitude not observed [altit. non fuit obſer.][22]
	second	33° 28⅓′	
	third [tert,]	33° 23½′	
Jupiter	Aquila	38° 5¼′	
Jupiter	Shoulder Blade of Pegasus	34° 7′	

November 15, at 5^h after noon.

Planet	Star	Distance	Note
Venus	Aquila	32° 40′	altitude of Venus [altit.♀] 9 [?]½
	second	32° 39′	8 ν[?]

Planet	Star	Distance	Altitude
		32° 36′	altitude [Altitud.] 5°
		32° 27′	1°
Venus [♀]	Jupiter [♃]	31° 43½′	8°

[22] on the page a right brace joins this row and the next two; the four words stand on four lines to its right, the last, obſer., level with the Jupiter and Aquila row, below the brace.

Planet	Star	Distance	Altitude
		31° 35′	2°
Jupiter	Aquila	38° 19′	
Jupiter [♃]	Shoulder Blade of Pegasus	33° 48½′	

November 16, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Following Twin	37° 19′
Saturn [♄]	Bright Star of Hydra	23° 48⅓′

November 16, at 5^{h} after noon.

Planet	Star	Distance	Altitude
Jupiter	Venus	30° 44½′	altitude of Venus [altit.♀] 11°
		30° 33′	2°
Venus	Aquila	32° 28′	10°
		32° 25′	7½°
		32° 14′	1°
Jupiter	Aquila	38° 23′	
Jupiter [♃]	Shoulder Blade of Pegasus	33° 40′	

November 17, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Following Twin	37° 19′
Saturn [♄]	Bright Star of Hydra	23° 50′

November 17, at 5^{h} after noon.

Planet	Star	Distance	Altitude
Venus [♀]	Aquila	32° 16′	altitude of Venus [altit.♀] 11½°
		32° 13′	6½°
		32° 3 𝑣[?]′	1½°
Venus [♀]	Jupiter	29° 45⅓′	11°
		29° 40′	6°
		29° 30′	1°
Jupiter	Aquila	38° 28′	
Jupiter [♃]	Shoulder Blade of Pegasus	33° 34 𝑣[?]′	

November 18, at 5^{h} after noon.

Planet	Star	Distance	Altitude
Jupiter	Venus	28° 46′	altitude of Venus [altit.♀] 12°
		28° 43¼′	7½°
Venus	Aquila [apuila] [recte: aquila]	32° 5⅓′	10½°
		32° 4½′	7½°
Jupiter	Aquila	38° 33¼′	

November 18, at 5^{h} before noon.[23]

Planet	Star	Distance
Saturn	Bright Star of Hydra	23° 50′
Saturn [♄]	Following Twin [Sequens Gem.]	37° 20′

November 19, at 5^{h} before noon.

Planet	Star	Distance	Altitude
Saturn [♄]	Bright Star of Hydra	25° 51′	[24]
Saturn [♄]	Following Twin	37° 21′	
Jupiter	Venus	27° 46′	altitude of Venus [altit.♀] 11°
		27° 44′	9°
Venus	Aquila	31° 58′	11°
		31° 57½′	6°
Jupiter	Aquila	38° 37′	
Jupiter [♃]	Shoulder Blade of Pegasus	33° 25′	

November 21, at 5^{h} after noon.

Planet	Star	Distance	Altitude
	Jupiter	25° 52′	altitude of Venus [altit.♀] 12¼°
Venus		25° 46⅓′	5°
	Aquila	31° 51′	5°
Jupiter	Aquila	38° 49½′	
Jupiter [♃]	Shoulder Blade of Pegasus	33° 8′	

[25]

December 22, at 5^{h} after noon.[26]

Planet	Star	Distance	Altitude
	Jupiter	24° 52¾′	altitude of Venus [alt.♀] 12½°

[23]so placed in both copies, after the after-noon group of the same day.
[24]so in both copies.
[25]on the page a brace opening to the right joins the first three rows of this table, with `Venus` at its point, level with the second row.
[26]so in both copies, between November 21 and November 25.

Planet	Star	Distance	Altitude
		24° 50½′	11½°
Venus		24° 48½′	7°
	Aquila	31° 50′	11½°
		31° 49′	7°

27

Planet	Star	Distance
Jupiter	Shoulder Blade of Pegasus	33° 2′
Jupiter	Aquila	38° 35′

November 25, at 5^{h} before noon.

Planet	Star	Distance
Saturn [♄]	Bright Star of Hydra	23° 50′
Saturn	Following Twin [ſequens Gemin.]	37° 22′
	second [ſecund.]	37° 23′
	third [tert.]	37° 23′

November 25, at 5^{h} after noon.

Planet	Star	Distance	Note
Venus	Jupiter	22° ν[?]′	altitude of Venus [altitud.Ven.] 13
Venus	Aquila	31° 58 ν[?]′	13

November 26, at 5^{h} before noon.

Planet	Star	Distance
Saturn	Following Twin	37° 24′
	second and third the same [ſec. & tertia eadem]	

November 28, at 5^{h} after noon.

Planet	Star	Distance	Note
Venus [♀]	Jupiter [♃]	19° 12′	altitude of Venus [altitud.Ven.] 14½
	second [ſecunda]	19° 10′	11½
Jupiter	Aquila	33° 29½′	[28]
Jupiter [♃]	Shoulder Blade of Pegasus	32° 19′	
Venus [♀]	Aquila	32° 23′	altitude of Venus [altit. Ven.] 14½

[27] on the page a brace opening to the right joins all five rows of this table, with Venus at its point, level with the third row.
[28] so in both copies.

Planet	Star	Distance	Note
	second [fecunda]	32° 23′	12

November 29, at 5^{h} after noon.

Planet	Star	Distance	Note
Venus	Jupiter	18° 15½′	altitude of Venus [altit. Ven.] 12
Venus	Aquila	32° 36½′	
Jupiter	Aquila	39° 34′	
Jupiter [♃]	Shoulder Blade of Pegasus	32° 13′	

December 12, at 6^{h} before noon.

Planet	Star	Distance
Saturn [♄]	Bright Star of Hydra	23° 54′
Saturn [♄]	Following Twin	37° 7′

December 12, at 5^{h} after noon.

Planet	Star	Distance	Note
Venus	Aquila	37° 21′	altitude of Venus [Altit. Ven.] 19½
		37° 19′	17

Planet	Star	Distance	Note
		37° 21′	altitude of Venus [altit.Ven.] 12
Venus	Jupiter	6° 52½′	19
		6° 49′	10
		6° 44′	altitude of Jupiter [altitud.♃] 9
Jupiter	Aquila	40° 56 ı[?]′	
Jupiter [♃]	Shoulder Blade of Pegasus	30° 30′	altitude of Jupiter [altitud.♃] 10
	second [fecund.]	30° 25′	11

December 13, at 5^{h} before noon.

Planet	Star	Distance
Saturn [♄]	Following Twin [Sequens Gem.]	37° 6½′
Saturn	Bright Star of Hydra	23° 51′

December 17, at 5^{h} after noon.

Planet	Star	Distance	Note
Venus	Aquila	39° 53′	altitude of Venus [altitud.♀] 18½
Venus [♀]	Shoulder Blade of Pegasus	31° 54′	
Jupiter	Aquila	41° 34′	
Jupiter [♃]	Shoulder Blade of Pegasus	29° 46′	
	second [ſecund.]	29° 47′	
Jupiter	Venus	2° 50′	

December 20, at 5^{h} after noon.

Planet	Star	Distance	Note
Venus	Aquila	41° 30′	careful [dilig.]
Venus [♀]	Shoulder Blade of Pegasus	29° 37′	
Jupiter	Aquila	41° 58′	careful [dilig.]
Jupiter	Shoulder Blade of Pegasus	29° 20′	

December 21, at 5½^{h} after noon.

Planet	Star	Distance
Venus	Aquila	42° 4′
Venus	Shoulder Blade [ſcapula]	28° 51 [?]½′
Jupiter	Aquila	42° 3½′
Jupiter	Shoulder Blade of Pegasus	29° 12 [?]½′

December 22, at 5^{h} after noon.

Planet	Star	Distance
Venus	Aquila	42° 34½′
Venus	Shoulder Blade [ſcapula]	28° 2 [?][?]′
	second the same [ſecund. eadem]	

Planet	Star	Distance
Jupiter	Aquila	42° 12′
Jupiter	Shoulder Blade [Scapula]	29° 4′

December 23, at 5^{h} after noon.

Planet	Star	Distance
Venus	Aquila	43° 8′
Venus [♀]	Shoulder Blade of Pegasus	27° 25 [?]½′
Jupiter	Aquila	42° 19½′
Jupiter	Shoulder Blade of Pegasus	28° 55′

December 24, at 5^h.

Planet	Star	Distance
Venus	Aquila	43° 42′
Venus	Shoulder Blade of Pegasus	26° 44¼′
Jupiter	Aquila	42° 29′
Jupiter	Shoulder Blade of Pegasus	28° 45′

December 27, at $5½^h$ after noon.

Planet	Star	Distance	Note
Venus	Neck of Leo	7° 22½′	doubtful [dubia]
Venus	Following Twin [ſequens Gemin.]	36° 29′	

December 27, at $5½^h$ after noon.[29]

Planet	Star	Distance
Venus	Tail of Cetus [cauda ceti]	31° 48′
Venus	Shoulder Blade of Pegasus	24° 44½′
Jupiter	Tail of Cetus	34° 40′
Jupiter	Shoulder Blade of Pegasus	28° 19½′

December 28.

Planet	Star	Distance
Venus	Tail of Cetus	31° 15′
Venus	Shoulder Blade of Pegasus	24° 8½′
Jupiter	Tail of Cetus [Caude ceti]	34° 29′
Jupiter	Shoulder Blade of Pegasus	28° 11′

December 29.

Planet	Star	Distance
Saturn	Neck of Leo	7° 26′
Saturn [♄]	Following Twin [Sequens ♊]	36° 20′

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January 3, at $5½^h$ after noon.

Planet	Star	Distance	Note
Jupiter	Tail of Cetus	33° 31′	

[29]this date line is printed twice in succession in both copies.

Planet	Star	Distance	Note
Jupiter	Shoulder Blade of Pegasus	27° 6′	doubtful [dubia]
Venus	Tail of Cetus	28° 13′	
Venus [♀]	Shoulder Blade of Pegasus	20° 52′	

February 7, at 9^h after noon.

Planet	Star	Distance
Saturn	Neck of Leo	8° 4½′
Saturn	Heart of Leo	3° 43′

February 18, at 8^h after noon.

Planet	Star	Distance	Note
Saturn	Neck of Leo	8° 24′	good [bona]
Saturn [♄]	Heart of Leo	4° 32′	careful [diligent.]

March 9, at 9^h.

Planet	Star	Distance
Saturn	Neck of Leo	9° 3 [?]½′
	second [fecunda]	9° 4′
Saturn [♄]	Heart of Leo	5° 43′

March 18, at 8^h.

Planet	Star	Distance
Saturn	Neck of Leo	9° 18½′
Saturn [♄]	Heart of Leo	6° 7′

March 19, at 8^h.

Planet	Star	Distance
Saturn	Neck of Leo	9° 19 [?][?]′
Saturn	Heart of Leo	6° 9′

March 20, at 8^h.

Planet	Star	Distance
Saturn	Neck of Leo	9° 20′
Saturn [♄]	Heart of Leo	6° 11 [?]½′

March 29, at 9^h.

Planet	Star	Distance
Saturn	Neck of Leo	9° 30′
Saturn	Heart of Leo	6° 25′

April 28, at 10^h.

Planet	Star	Distance
Saturn	Heart of Leo	6° 11′
Saturn [♄]	Neck of Leo	9° 24′

April 30, at 9^h.

Planet	Star	Distance	Note
Saturn	Heart of Leo	6° 11′	good [bona][30]
Saturn [♄]	Neck of Leo	9° 21′	

March 25, at 3^h before noon.[31]

Planet	Star	Distance
Jupiter	Mars	4° 9′

June 6, at 10^h.

Planet	Star	Distance
Saturn	Heart of Leo	3° 42½′
Saturn [♄]	Neck of Leo	8° 7⅓′

June 22, at 2^h and 3^h.

Planet	Star	Distance
Mars	Third Star of Aries [tertia Arietis]	20° 35⅔′
Mars [♂]	Tip of the Wing of Pegasus [extrema alæ pegasi]	19° 6′
Jupiter	Shoulder Blade of Pegasus	25° 37′
Jupiter	Third Star of Aries	30° 54⅓′
Jupiter	Mars [♂]	12° 22′
Venus	Third Star of Aries	29° 41½′
Venus [♀]	Capella	29° 59 ı[?]′

[30] on the page a brace joins this word to both rows.
[31] so in both copies, after the April dates.

July 19, at 2^h before noon.

Planet	Star	Distance
Jupiter	Right Shoulder of Aquarius [♒]	38° 2′
Jupiter [♃]	Head of Andromeda	27° 32′
Mars	Third Star of Aries	12° 26½′
Mars	Eye of Taurus	31° 46′
Venus	Eye of Taurus	26° 48′

July 21, at 3^h.

Planet	Star	Distance
Jupiter [♃]	Shoulder Blade of Pegasus	26° 9′
Jupiter [♃]	Third Star of Aries [tertia ∗ ♈]	30° 17 [?]⅓′

July 21, at 3^h.

Planet	Star	Distance
Mars [♂]	Third Star of Aries [Tertia ∗ ♈]	12° 32′
Mars [♂]	Eye of Taurus	30° 36′

Planet	Star	Distance
Venus	Eye of Taurus	29° 9′

July 22, at 2^h.

Planet	Star	Distance
Venus	Preceding Twin [præcedens ♊]	15° 5½′
Venus	Eye of Taurus	30° 16′
Mars	Eye of Taurus	30° 2′
Mars	Third Star of Aries	12° 37½′
Jupiter	Third Star of Aries	30° 15⅔′
Jupiter	Shoulder Blade of Pegasus	26° 7½′

August 9, at 3^h before noon.

Planet	Star	Distance
Jupiter [♃]	Third Star of Aries [3 ♈ ∗]	31° 13⅔′
Jupiter	Leg of Pegasus	33° 52½′
Mars	Head of Medusa [caput Meduſæ]	25° 42½′
Mars	Eye of Taurus	20° 37′
Mars	Jupiter	40° 51′

Planet	Star	Distance
Venus	Border [?] of Ursa Major [in limb. urſæ majoris][32]	47° 52′
Venus	Following Twin	10° 25½′

August 23, at 2^h and 3^h in the morning.

Planet	Star	Distance
Jupiter	Third Star of Aries	32° 30′
Jupiter	Leg of Pegasus	33° 36½′
Mars	Third Star of Aries	21° 30⅓′
Mars	Capella	36° 2′
Jupiter	Mars	48° 14 ſ[?]′

August 24, at 3^h.

Planet	Star	Distance
Jupiter	Mars	48° 44′
Jupiter	Leg of Pegasus	33° 34⅔′
Jupiter	Third Star of Aries	32° 34½′
Mars	Third Star of Aries	21° 49′
Mars	Capella	35° 46′
Venus [♀]	Following Twin [♊]	26° 45 [?]¼′
Venus	In the Loins of Ursa Major [in lumbis urſæ majoris]	44° 25′

August 27, at 3^h.

Planet	Star	Distance
Jupiter	Leg of Pegasus	33° 30½′
Jupiter	Third Star of Aries [3 ∗ Arietis]	32° 56′
Mars [♂]	Third Star of Aries [Tertia ∗ Ariet.]	22° 43′
Mars	Capella	35° 0′
Mars	Jupiter [♃]	50° 8 ſ[?]′

September 3, at 11^h after noon.

Planet	Star	Distance
Jupiter	Third Star of Aries	33° 51½′
Jupiter	Leg of Pegasus	33° 21′

September 7, at [?]0^h after noon.[33]

[32] the page prints limb. here, and in lumbis in the August 24 entry below.
[33] the page sets a small broken mark before the 0, not a legible figure.

Planet	Star	Distance
Jupiter	Third Star of Aries [3. Ariet.∗]	34° 21½′
Jupiter	Leg of Pegasus	33° 24′
Mars	Eye of Taurus	10° 9′
Mars [♂]	Capella	32° 42 [?]½′
Jupiter	Third Star of Aries	34° 37′
Jupiter	Leg of Pegasus	33° 10½′

September 10, at 11^h after noon.

Planet	Star	Distance	Note
Jupiter	Third Star of Aries	34° 45′	
Jupiter	Leg of Pegasus	33° 8′	nearly [fere]

September 11, at 11^h.

Planet	Star	Distance	Note
Jupiter	Third Star of Aries	34° 52′	good [bonæ][34]
Jupiter	Leg of Pegasus	33° 11′	
Mars	Eye of Taurus	9° 29′	
Mars	Capella	32° 8′	

September 12, at 10^h.

Planet	Star	Distance	Note
Jupiter	Third Star of Aries	33° 59½′	good [bonę][35]
Jupiter	Leg of Pegasus	33° 9′	nearly [fer.] good [bonæ]

September 30, at 10^h.

Planet	Star	Distance
Jupiter	Third Star of Aries [3 ♈ ∗]	37° 9′
Jupiter	Leg of Pegasus	32° 51½′

Planet	Star	Distance
Mars[36]	Eye of Taurus	9° 2′
	Capella	31° 14′
	Third Star of Aries [3 ♈ ∗]	26° 29′

[34]on the page a brace joins this word to all four rows.
[35]so in both copies.
[36]on the page a brace joins this name to all three rows.

October 12, at 9^h.

Planet	Star	Distance
Jupiter	Third Star of Aries	38° 21′
Jupiter	Leg of Pegasus	32° 46′
Mars [♂]	Third Star of Aries	24° 17′
Mars	Capella	32° 13 [?]⅓′

October 15, at $4½^h$ before noon.

Planet	Star	Distance
Mars	Capella	32° 33′
Mars	Eye of Taurus	11° 52′

October 15, at 9^h after noon.

Planet	Star	Distance	Note
Mars	Eye of Taurus	12° 3′	good [bonæ][37]
Mars	Capella	32° 41′	
Mars	Third Star of Aries [Tertia ∗ ♈]	23° 28′	
Jupiter	Third Star of Aries	38° 34¾′	
Jupiter	Leg of Pegasus	32° 44′	

October 16, at 9^h after noon.

Planet	Star	Distance	Note
Mars	Eye of Taurus	12° 21½′	careful [dilig.][38]
Mars	Capella	32° 50½′	
Mars	Third Star of Aries [Tertia Arietis ∗]	23° 11′	
Jupiter	Third Star of Aries	38° 39½′	
Jupiter	Leg of Pegasus	32° 47′	

October 22, at 5^h before noon.

Planet	Star	Distance
Mars	Capella	33° 49′
Mars	Eye of Taurus	14° 10′

The same day, at 9^h after noon.

[37]on the page a brace joins this word to all five rows.
[38]on the page a brace joins this word to all five rows.

Planet	Star	Distance
Mars	Capella	33° 58′
Mars	Eye of Taurus	14° 21′

October 24, at 5^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	12° 2⅔′
Saturn	Back of Leo [dorſum Leon.]	12° 45′

October 27, at 9^h.

Planet	Star	Distance
Jupiter	Third Star of Aries [3 ♈ ✱]	39° 17′
Jupiter	Leg of Pegasus	32° 41½′
Mars	Eye of Taurus	16° 10′
Mars	Capella	35° 8¾′

October 28, at 5^h in the morning.

Planet	Star	Distance
Saturn	Heart of Leo	12° 21⅔′
Saturn [♄]	Back of Leo [dorſum ♌]	12° 45 ſ[?]′

The same day, after noon, at 9^h.

Planet	Star	Distance
Mars	Eye of Taurus	16° 31′
Mars	Capella	35° 25′
Jupiter	Third Star of Aries	39° 23′
Jupiter	Leg of Pegasus	32° 40′

October 29, at $5½^h$ before noon.

Planet	Star	Distance
Saturn	Heart of Leo [Cor ♌]	12° 27′
Saturn [♄]	Back of Leo	12° 46′

October 31, at 9^h after noon.

Planet	Star	Distance
Mars	Eye of Taurus	17° 38½′

Planet	Star	Distance
Mars	Capella	36° 5′

November 5, at 6^h in the morning.

Planet	Star	Distance
Saturn	Heart of Leo	12° 52′
Saturn	Back of Leo	12° 47½′

November 11, at $8½^h$ after noon.

Planet	Star	Distance
Mars	Eye of Taurus	21° 16′
Mars	Capella	38° 36′
Jupiter	Third Star of Aries [Tertia ∗ Arietis]	39° 31⅓′
Jupiter [♃]	Leg of Pegasus	32° 38′

November 12, at 5^h.

Planet	Star	Distance
Saturn	Heart of Leo [Cor ♌]	13° 15′
Saturn	Back of Leo [dorſum ♌]	12° 46′

November 20, at 9^h.

Planet	Star	Distance
Jupiter [♃]	Tail of Cetus, lower [cauda ceti inferior]	19° 32 *v*[?]′
Jupiter	Third Star of Aries [Tertia Arietis ∗]	39° 18′
Mars	Eye of Taurus	23° 27′
Mars	Capella	40° 6′

November 21, at 6^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	13° 37′
Saturn	Back of Leo	12° 47′

November 25, at $8½^h$.

Planet	Star	Distance	Note
Jupiter	Tail of Cetus, lower	19° 31′	careful [dil.]
Jupiter	Third Star of Aries	39° 6′	careful [dili.]

Planet	Star	Distance	Note
Mars	Eye of Taurus	24° 13′	
Mars	Capella	40° 36′	
	second [fecund.]	40° 35′	
Mars	Jupiter	46° 27½′	

November 26, at 5^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	13° 46′
Saturn	Back of Leo	12° 50 [?]¼′

November 27, at 5^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	13° 47 ν[?]′
Saturn	Back of Leo	12° 48½′

December 10, at 9^h after noon.

Planet	Star	Distance
Mars	Eye of Taurus	24° 30′
Mars	Capella	40° 31⅔′
Jupiter	Tail of Cetus, lower [Caude ceti inferior]	19° 30′
Jupiter	Third Star of Aries	37° 56′

December 11, at 9^h after noon.

Planet	Star	Distance
Jupiter	Third Star of Aries	37° 50′
Jupiter	Tail of Cetus, lower	19° 28 [?]/[?]′
Mars	Eye of Taurus	24° 26′
Mars	Capella	40° 27′

December 13, at 9^h after noon.

Planet	Star	Distance
Mars	Eye of Taurus	24° 15′
Mars	Capella	40° 16′

December 19, at $10½^h$ after noon.

Planet	Star	Distance
Mars	Eye of Taurus	23° 21 [?]′[?]′
Mars [♂]	Left Foot of Andromeda [ſiniſter pes Androm.]	26° 16 ν[?]′

December 24, at 7^h after noon.

Planet	Star	Distance
Jupiter [♃]	the lower of the two in the Tail of Cetus [duarum in cauda ceti infer.]	19° 30′
Jupiter	Third Star of Aries	36° 20′
Mars	Eye of Taurus	22° 26′

Year 1596

January 2, at 5^h before noon.

Planet	Star	Distance	Note
Saturn	Back of Leo	13° 34 [?]′[?]′	most careful [diligentiſſ.]
Saturn	Heart of Leo	13° 24′	careful [dilig.]

January 3, at 9^h after noon.

Planet	Star	Distance
Mars	Eye of Taurus	19° 53 ν[?]′
Mars	Right Side of Perseus [?] [dextrum latus Perſecut.]	30° 4½′

January 7, at 9^h after noon.

Planet	Star	Distance
Mars	Right Side of Perseus [?] [Dextrum latus Perſec.]	29° 38′
Mars	Eye of Taurus	18° 39 ν[?]′

January 9, at 5^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	13° 5 ν[?]′
Saturn	Back of Leo	12° 30′

On the same day, at 8^h after noon.

Planet	Star	Distance
Mars	Right Side of Perseus [dextrum latus Perſei]	29° 24′
Mars	Eye of Taurus	18° 2 [?]⅓′

January 10, at 5^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	13° 1′
Saturn	Back of Leo	12° 33 1/[?]′

January 17, at 9^h before noon.

Planet	Star	Distance
Saturn	Heart of Leo	12° 37′
Saturn	Back of Leo	12° 25½′

At 7^h.

Planet	Star	Distance
Mars	Eye of Taurus	15° 22½′
Mars	Right Side of Perseus	28° 45⅔′

January 28, at 9^h.

Planet	Star	Distance	Note
Mars	Eye of Taurus	11° 33′	
Mars	Capella	28° 53½′	
Saturn	Heart of Leo	11° 45′	
Saturn	Back of Leo	12° 20′	doubtful

January 30, at 9^h.

Planet	Star	Distance
Mars [♂]	Eye of Taurus	10° 49½′
Mars	Capella	28° 36′

February 3, at 8^h.

Planet	Star	Distance	Note
Jupiter [♃]	Head of Andromeda	26° 56′	
Jupiter	Third Star of Aries	28° 54′	
Mars	Eye of Taurus	9° 2′	
Mars	Capella	26° 50′	
Saturn	Heart of Leo	11° 11′	
Saturn [♄]	Back of Leo	12° 16′	doubtful

February 6, at 6^h.

Planet	Star	Dis-tance
Venus	Jupiter	23° 6′
Venus [♀] at the emergence [in educt.]	Bright Star of the Leg of Pegasus [crur. pegas. Lucid.]	34° 16′

Planet	Star	Distance
Jupiter	Third Star of Aries	28° 45′
Jupiter [♃]	Head of Andromeda	27° 4 *v*[?]′

At 7^{h}.

Planet	Star	Distance
Mars	Eye of Taurus	8° 48′
Mars	Capella	26° 36′
Saturn	Heart of Leo	11° 7½′
Saturn	Back of Leo	12° 21 [?]⅓′

February 7, at $5\frac{1}{2}^{h}$ after noon.

Planet	Star	Distance
Venus [♀]	Jupiter	22° 5′
Jupiter	Head of Andromeda	27° 50′
Jupiter	Third Star of Aries	28° 32 *v*[?]′

February 8, at $5\frac{1}{2}^{h}$.

Planet	Star	Distance
Venus	Jupiter	21° 3′
Venus at the emergence	Bright Star of the Leg of Pegasus	33° 36′
Jupiter	Third Star of Aries	28° 23′
Jupiter	Head of Andromeda	26° 57½′
Mars	Eye of Taurus	8° 18′
Mars	Capella	26° 2′
Saturn	Heart of Leo	10° 58½′
Saturn	Back of Leo	12° 23′

February 15, at 8^{h}.

Planet	Star	Distance
Saturn	Heart of Leo	10° 25′
Saturn	Back of Leo	12° 24½′
Mars	Eye of Taurus	7° 23′

Planet	Star	Distance
Mars [♂]	Northern Horn of Taurus [cornu Taur. ſeptent.]	13° 34′

February 16, at 8^{h}.

Planet	Star	Distance
Saturn	Heart of Leo	10° 19′
Saturn	Back of Leo	7° 24½′[39]
Mars	Eye of Taurus	7° 22′
Mars	Northern Horn of Taurus	13° 6′

February 24, at 8^{h}.

Planet	Star	Dis-tance
Venus	Jupiter	4° 47′
Venus [♀]	Southern of the Three in the Girdle of Andromeda [in cingul.Andro.triū auſtr.]	33° 13′
Mars	Following Twin	39° 29′
Mars	Eye of Taurus	8° 30′
Saturn	Heart of Leo	9° 46′
Saturn	Back of Leo	12° 27′

February 25, at 6^{h}.

Planet	Star	Distance
Venus	Jupiter [♃]	3° 48′
Venus	Southern of the Three in the Girdle of Andromeda	32° 32′
Jupiter	Head of Andromeda	26° 50′
Jupiter	Third Star of Aries	24° 49½′
Saturn	Back of Leo	12° 29 ſ[?]′
Saturn	Heart of Leo	9° 41′

March 7, at 9^{h}.

Planet	Star	Distance
Saturn	Heart of Leo	8° 50 [?]ſ[?]′
Saturn	Back of Leo	12° 37′

March 10, at 10^{h}.

[39]both copies print 7.

Planet	Star	Distance
Saturn	Heart of Leo	8° 38′
Saturn	Back of Leo	12° 36 [?]′[?]′

March 12, at 7½^{h}.

Planet	Star	Distance
Venus	Eye of Taurus	39° 49 [?]½′
Venus	Right Shoulder of Perseus [Dexter humerus Perf.]	26° 20′
Mars [♂]	Following Twin	30° 32′
Mars	Capella	21° 8′

March 22, at 8^{h}.

Planet	Star	Distance
Venus	Eye of Taurus	20° 9′
Venus	Capella	22° 9 ♈[?]′
Saturn	Heart of Leo	7° 58′
Saturn	Back of Leo	12° 51 [?]′[?]′

March 23, at 7 ♈[?]^{h}.

Planet	Star	Distance
Mercury [☿]	Venus	8° 12′
Venus	Eye of Taurus	25° 38′
Venus	Right Shoulder of Perseus	27° 40′
Mars	Eye of Taurus	20° 39½′
Mars	Capella	22° 19′
Saturn	Heart of Leo	7° 54′
Saturn	Back of Leo	12° 53′

March 24, at 8^{h}.

Planet	Star	Distance
Saturn	Back of Leo	12° 54′
Saturn	Heart of Leo	7° 51′

April 5, at 9^{h}.

Planet	Star	Distance
Saturn	Heart of Leo	7° 24⅓′
Saturn	Back of Leo	13° 4½′

April 6, at 8^{h}.

Planet	Star	Distance
Venus	Left Shoulder of Orion [ſiniſter humer. Orionis]	31° 35½′
Venus	Capella	29° 30′
Mars	Capella	25° 53′
Mars	Following Twin	16° 54′
Saturn	Heart of Leo	7° 15′
Saturn	Back of Leo	13° 8′

April 13, at 9^h.

Planet	Star	Distance
Venus	Left Shoulder of Orion	25° 8′
Venus	Capella	24° 29½′
Mars	Following Twin	13° 7′
Mars	Capella	28° 20 [?]/[?]′
Saturn	Heart of Leo	7° 15′
Saturn	Back of Leo	13° 8′

April 14, at 9^h.

Planet	Star	Distance
Venus	Left Shoulder of Orion	24° 19′
Venus	Capella	23° 56 [?]/4′

Planet	Star	Distance
Mars	Following Twin	12° 36′
Mars	Capella	28° 40½′
Saturn	Heart of Leo	7° 14′
Saturn	Back of Leo	13° 9′

April 15, at 9^h.

Planet	Star	Distance
Saturn	Back of Leo	13° 9′
Saturn	Heart of Leo	7° 12′
Mars	Following Twin	12° 5′
Mars	Capella	29° 7′

April 21, at 9^h.

Planet	Star	Distance
Venus	Capella	21° 29 1/[?]′

Planet	Star	Distance
Venus	Following Twin	33° 5′
Mars	Capella	31° 30½′
Mars	Following Twin	9° 3¼′

April 25, at 9^h.

Planet	Star	Distance
Venus	Capella	21° 25 *v*[?]′
Venus	Canis Minor	35° 35′
Mars	Following Twin	7° 15′
Mars	Capella	33° 15½′
Venus	Mars	23° 33¼′

May 2, at 9^h.

Planet	Star	Distance
Venus	Capella	23° 35′
Venus	Following Twin	20° 56 *v*[?]′
Mars	Capella	36° 24′
Mars	Following Twin	5° 15′
Saturn	Heart of Leo	7° 14′
Saturn	Back of Leo	13° 6½′

May 5, at 9^h.

Planet	Star	Distance
Venus	Mars	17° 38′
Venus	Following Twin	17° 31½′
Venus	Capella	25° 15⅔′

Planet	Star	Distance
Saturn	Heart of Leo	35° 54 [?]¼′
Saturn	Back of Leo	5° 14 *v*[?]′
Saturn	Heart of Leo	7° 17′
Saturn	Back of Leo	13° 8′

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May 7, at 9^h.

[40]both copies print these four rows here, under no date line; the first two disagree with the last two.

Planet	Star	Distance
Venus	Following Twin	15° 14′
Venus	Capella	26° 32′
Mars	Heart of Leo	34° 41′
Mars	Following Twin	5° 29′
Saturn	Neck of Leo	10° 10′
Saturn	Tail of Leo	17° 52′

By the Sextant. Observations at the Castle of Brake [in Arce Brake] In the Year 1597

March 16, in the evening, at 9^h 45^m.

Star	Longitude	Latitude
Heart of Leo	♌ 24° 19′ 32″	0° 29′ 20″ north
Tail of Leo	♍ 16° 7′ 12″	12° 21′ 16″ north

Planet	Star	Distance
Saturn	Heart of Leo	22° 14½′
	second	22° 14½′
Saturn	Tail of Leo	9° 59⅓′
	second	9° 59′

March 17, at 8^h 10^m.

Planet	Star	Distance
Saturn	Heart of Leo	22° 11⅓′
	second	22° 11½′
Saturn	Tail of Leo	9° 57 [?]¼′
	second	9° 58¼′

March 26, at 9^h 6.

Planet	Star	Distance
Saturn	Heart of Leo	21° 39¾′
	second	21° 39 *1*[?]′
Saturn	Tail of Leo	10° 0¼′
	second	10° 0½′
	third	10° 0¾′

March 27, at 8^h 30^m.

Planet	Star	Distance
	Heart of Leo	21° 35½′
	second	21° 35½′
Saturn	third	21° 35′
	Tail of Leo	10° 2 ν[?]′
	second	10° 2′
	third	10° 2 ν[?]′

41

Diameter of the Moon: 36′.

Star	Longitude	Latitude
Aquila	♑ 26° 12′ 42″	29° 19′ 54″ north
Head of Andromeda	♈ 8° 48′ 27″	25° 39′ 48″ north

Observations of the Moon by the Sextant

1597 September 13, after noon.

Body	Hour	Star	Distance	Semidiameter
Moon	$7^h\ 26^m$	Head of Andromeda	40° 46½′	Moon 18 subtr.
	29^m	Aquila	50° 26¼′	Moon 18 add.
Moon	$7^h\ 39^m$	Head of Andromeda	40° 46′	18 subtr.
	42^m	Aquila	50° 26 [?]¼′	18 add.
Moon	$7^h\ 47^m$	Head of Andromeda	40° 45′	18 subtr.
	50^m	Aquila	50° 27′	18 add.

Body	Hour	Star	Distance	Semidiameter
Moon	$8^h\ 0^m$	Head of Andromeda	40° 43′	Moon 18 subtr.
	3^m	Aquila	50° 32′	Moon 18 add.
Moon	$8^h\ 12^m$	Head of Andromeda	40° 34′	18 subtr.
	15^m	Aquila	50° 37′	18 add.
Moon	$8^h\ 26^m$	Head of Andromeda	40° 28′	18 subtr.
	29^m	Aquila	50° 41 ν[?]′	18 add.
Moon	$8^h\ 37^m$	Head of Andromeda	40° 25½′	18 subtr.
	40^m	Aquila	50° 44′	18 add.
Moon	$8^h\ 44^m$	Head of Andromeda	40° 23 [?]½′	18 subtr.
	47^m	Aquila	50° 45′	18 add.
Moon	$8^h\ 53^m$	Head of Andromeda	40° 20½′	18 subtr.
	56^m	Aquila	50° 46′	18 add.

[41] On the page the single label Saturn stands at the meeting of two braces. The upper brace joins the three Heart of Leo rows and the lower joins the three Tail of Leo rows.

Star	Longitude	Latitude
Eye of Taurus	♊ 4° 15′ 12″	5° 31′ 45″ south
Right Shoulder of Orion	♊ 23° 14′ 12″	16° 6′ 0″ south

Observations of Mars and Jupiter by the Sextant In the Year 1597

September 13, at 2^h 45^m after the midnight that was followed by the 14th.

Planet	Star	Distance
Jupiter	Eye of Taurus	13° 2′
	second	13° 2½′
Jupiter	Right Shoulder of Orion	16° 53 ν[?]′
Mars	Jupiter	12° 13½′
Mars	Right Shoulder of Orion	16° 56′

Observations of the Moon on September 16

Star	Longitude	Latitude
Third Star of Aries [Tertia ♈ ſtella]	♉ 2° 7′ 44″	9° 54′ 12″ north
Head of Andromeda	♈ 8° 48′ 27″	25° 39′ 48″ north

Body	Hour	Star	Distance	Semidiameter
Moon	8^h 56^m	Third Star of Aries [Tertia ſtella Ariet.]	15° 15′	Moon 18 subtr.
	59^m	Head of Andromeda	25° 33′	18 add.
Moon	9^h 58^m	Third Star of Aries [Tertia * ♈]	14° 45′	18 subtr.
	10^h 1^m	Head of Andromeda	25° 40′	18 add.

Star	Longitude	Latitude
Following Head of Gemini	♋ 17° 44′	6° 49′ north
Canis Minor	♋ 20° 20′	15° 56′ south
Right Shoulder of Orion	♊ 23° 14′ 12″	16° 6′ south

Observations of Mars and Jupiter by the Sextant In the Year 1597

September 29, at 4^h 0^m before noon.

Planet	Star	Distance
Mars	Following Head of Gemini	14° 26′
	second	14° 26½′
	Canis Minor	22° 26 ν[?]′
	second	22° 27′

Planet	Star	Distance
Jupiter	Right Shoulder of Orion	16° 50′
	second	16° 49′
	third	26° 50′[42]
	Mars	18° 29 [?]¼′
	second	18° 30′

Star	Longitude	Latitude
Eye of Taurus	♊ 4° 15′ 12″	5° 31′ 45″ south
Capella	♊ 16° 17′ 32″	22° 50′ 50″ north
Right Shoulder of Orion	♊ 23° 14′ 12″	16° 6′ 0″ south
Northern Head of Gemini [Caput Gem.fept.]	♋ 17° 44′ 12″	6° 39′ 10″ north
Canis Minor	♋ 20° 20′ 12″	15° 56′ 22″ south

By the Sextant. Observations in Brake Castle [in Arce Brake] In the Year 1597

October 2, before noon, at 1^h 14^m.

Planet	Star	Distance
Jupiter	Eye of Taurus	13° 5′
	Mars	19° 37′
	Capella	23° 47′
Mars	Canis Minor	20° 52½′
Mars	Following Head of Gemini	13° 29′

October 7, at 3^h 14^m before noon.

Planet	Star	Distance
Jupiter	Right Shoulder of Orion	16° 53′
	Eye of Taurus	12° 57′
	second	12° 58′
	Mars	21° 29′
	second	21° 30′
	Capella	23° 41′
	second	23° 42′
Mars	Following Head of Gemini	11° 54′
	second	11° 54½′
	Canis Minor	20° 52′
	second	20° 51 [?]/[?]′

Observations of the Moon

1597 October 14, after noon.

[42]both copies print 26.

Star	Longitude	Latitude
Head of Medusa	♉ 20° 38′ 36″	22° 20′ 54″ north
Eye of Taurus	♊ 4° 15′ 12″	5° 31′ 45″ south

Time	Star	Distance
9^h 8^m	Eye of Taurus	37° 31′
	Head of Medusa	29° 48′
9^h 41^m	Eye of Taurus	37° 15′
	Head of Medusa	29° 34′
9^h 55^m	Eye of Taurus	37° 10′
	Head of Medusa	29° 29′
10^h 4^m	Eye of Taurus	37° 8′
	Head of Medusa	20° 27′[43]

A brace spanning all eight rows reads: semidiameter of the Moon, 18′, subtracted [ſemidiam. Lunę 18 min. ſubſtrahiert].

Observations of the Moon, October 15, after noon

Time	Star	Distance
9^h 6^m	Eye of Taurus	24° 50′
	Head of Medusa	20° 57′
9^h 30^m	Eye of Taurus	24° 39′
	Head of Medusa	20° 47′
10^h 0^m	Eye of Taurus	24° 29′
	Head of Medusa	20° 40 ı[?]′
10^h 31^m	Eye of Taurus	24° 18 ı[?]′
	Head of Medusa	20° 29′
10^h 55^m	Eye of Taurus	24° 6½′
	Head of Medusa	20° 23′
11^h 20^m	Eye of Taurus	23° 59′
	Head of Medusa	20° 18′

A brace spanning all twelve rows reads: semidiameter of the Moon, 18′, added [ſemidiamet. Lunæ 18 min. add.].

Observations of Jupiter and Mars by the Sextant, in the Year 1597

October 15, at 11^h 5^m after noon.

Planet	Star	Distance
Jupiter	Eye of Taurus	12° 19½′
	second	12° 30′
	Capella	23° 42′
	second	23° 42′
Mars	Jupiter	24° 26½′

[43]both copies print 20.

Planet	Star	Distance
	second	24° 26′
	Right Shoulder of Orion	23° 54′
	second	23° 54 *v*[?]′

October 17, at 9^h and at 12^h.

At 9^h

Planet	Star	Distance
Jupiter	Eye of Taurus	12° 24′
Jupiter	Capella	23° 42′

At 12^h

Planet	Star	Distance
Jupiter	Eye of Taurus	12° 23½′
	second	12° 23′
Jupiter	Capella	23° 43′
	second	23° 42 *v*[?]′

At 12^h

Planet	Star	Distance
Mars	Jupiter	25° 3′
	second	25° 2 [?]/[?]′
	third	25° 2 *v*[?]′
	Right Shoulder of Orion	24° 15′
	second	24° 14′
	third	24° 14½′

By the Sextant
Observations of the Moon, 1597 October 17

Time	Star	Distance
	Jupiter	10° 46′
9^h 25^m	Capella	20° 53′

Time	Star	Distance
9^h 55^m	Jupiter	10° 34 [?]/1′
58^m	Capella	20° 45′
10^h 26^m	Jupiter	10° 22′
29^m	Capella	20° 34′
10^h 55^m	Jupiter	10° 10¾′

Time	Star	Distance
58^m	Capella	20° 29′
$11^h\ 26^m$	Jupiter	9° 59½′
29^m	Capella	20° 21′
$11^h\ 55^m$	Jupiter	9° 47′
58^m	Capella	20° 9½′

Moon's semidiameter: add 18′ [ſemidiamet. ☽ 18 min. add.]

A Gleaning from the Bohemian Observations of the Most Excellent and Most Noble Tycho Brahe

Observations of Tycho Brahe for the Year 1599, in the New Style, that is, the Gregorian

Tycho Brahe made [inſtuit] [recte: inſtituit] a large part of these observations at Benátky Castle [Benaticæ Arcis] in Bohemia. In the eclipse of the Sun he himself places the longitude of the castle under the meridian of 39° 0′. In the eclipse of the Moon, however, he takes the same longitude as somewhat smaller, 39° 50′[44], and as greater than the longitude of Vrancoburgum [Vrancoburgi][45] in Denmark by 0° 9′.

Near the preceding winter solstice, in order to establish the altitude of the pole exactly at Benátky Castle, this altitude was taken as exactly as the clear weather allowed, before and near the beginning of the following year. The maximum altitude of the Pole Star [ſtellæ polaris] was 53° 9′ 15″, and the minimum 47° 27′ 5″; therefore the elevation of the pole is 50° 18′ 10″. I had previously found this to be 50° 18′ 25″.

At Prague I found the elevation of the pole to be 50° 4½′, which some make 50° 7′.

And finally: we shall have hit the mark precisely enough in setting the elevation of the pole at Benátky at 50° 18½′.

Quantity	Value
For the corrected meridian altitude of the Heart of Leo	53° 35′
its declination at this time	13° 53 [?]¼′
therefore the altitude of the equator	39° 41¼′
and for that reason the altitude of the pole at Benátky	50° 18 [?]¼′[46]

The Year 1600

The night preceding January 1

[44]so printed; 39° 50′ is larger, not smaller, than the 39° 0′ just given
[45]so printed; the identification with Uraniborg, Tycho's observatory, is supplied
[46]both copies print ½ in the prose above and a denominator 4 here.

Quantity	Reading	Value
Meridian altitude of Mars		58° 54 [?]′[?]′
	second	58° 54′
Meridian altitude of Jupiter		55° 6½′
	second	55° 6′

Two hours after their transit through the meridian, the distance was taken:

Planet	Star	Distance
Mars	from Pollux	29° 45′
	second	29° 45′
Jupiter	from Pollux	33° 35⅙′
	second	33° 35′
	third	33° 35 ′[?]′

Planet	Star	Reading	Distance
Mars	from the Tail of Leo		29° 26′
		second	29° 26½′
		third	29° 26′
Jupiter	from the Tail of Leo		29° 30½′[47]
		second	27° 31⅓′
		third	27° 30½′

January 2

Quantity	Value
Meridian altitude of the Sun	16° 45½′

The preceding night, on the morning of January 5, 1^h before their transit through the meridian:

Planet	Star	Reading	Distance
Mars	Pollux		29° 3′
		second	29° 3′
	Tail of Leo		30° 13′
		second	30° 13′
Jupiter	Pollux		33° 18′
		second	33° 18′
	Tail of Leo		27° 47′
		second	27° 46 [?]⅓′

[47]both copies print 29.

Quantity	Value
Meridian altitude of Mars	59° 22′
Meridian altitude of Jupiter	55° 17⅓′

January 19

Quantity	Reading	Value
Altitude of the Sun		19° 16¾′
	otherwise	19° 18 [?]/[?]′

On January 21, in the evening after sunset, the altitude of Mercury was about 10°, but clouds came at once.

Again it is demonstrated [Demonſt.] from the fixed stars that the altitude of the pole at Benátky [Benaticæ] is 50° 18′ 30″.

On January 23 the sky was clear and Venus was very bright; at 6^h on the public clock it was observed.

Quantity	Value
Distance of Venus from the Heart of Scorpius	20° 41′
The altitude was	16° 0′

Nor could the distance of Venus from any of the fixed stars be observed any further, because of the dawn. Judging by eye, Venus stood about midway between the meridian and the place of its rising, so the time can be corrected from this, or from what follows. The distance between Venus and Saturn was as follows:

Quantity	Value	Note
Distance between Venus and Saturn	53° 49′	three times
Altitude of Venus	16° 25′	7^h
Distance of Venus and Saturn, repeated	53° 49′	
Altitude of Venus	16° 25′	

At $7¾^h$ the Sun was rising clear.

With the Brass Armillaries [Per Armillas Orichalcicas]

Time	Reading	Declination of Venus	Altitude of Venus
$7¼^h$ on the clock	I	17° 50′	16° 53½′
	II	17° 50′	17° 12′
	III	17° 49′	17° 31′

The Sun was seen to rise at 7^h 45^m by the clock, when the clock struck 8^h. By the clock used previously, the observed altitude of the Sun was 1½°. From this, applying refraction and parallax, correct the clock.

Afterwards the meridian altitude of Venus, which itself appeared distinctly enough, was observed: 21° 46½′.

The distance of the Sun from Venus was observed as follows:

Time	Quantity	Distance	Altitude of the Sun
8½^h	Distance of the Sun from Venus	40° 35½′	3° 25′
		40° 36′	4° 0′
		40° 36′	4° 16′

After that, Venus could not be observed distinctly from the Sun. Then, towards night, immediately after sunset, the observation of Mercury was as follows.

Observation	Value
Mercury: distance from the Bright Star in the Breast of `ligni` [Lucid. in pect. ligni]	48° 52½′
At the same moment, Mercury and the Tail of Cetus [caudæ cete]	40° 22 *r*[?]′
Altitude of Mercury	5° 50′
Declination by the armillaries, but do not trust it much	14° 4′
Mercury: distance from the Bright Star in the Mouth of Pegasus [Lucid. in ore peg.]	22° 13′ 35″
Altitude of Mercury	2° 41′
Declination of Mercury; do not trust it much	14° 6′
The distance, repeated immediately afterwards	22° 12′
Altitude of Mercury	1° 54′

The distances of Mercury and of the fixed stars have been adjusted [limitatæ] on account of refraction, and the declinations too, in accordance with the declination of Sirius at the same altitude, setting [occidentem].

24 January. Shortly afterwards the distance of Venus from the Sun was taken, together with the altitude of the Sun.

Hour on the clock	Distance of the Sun from Venus	Altitude of the Sun
9⅓^h	41° 11′	13° 40′
9½^h	41° 10′	about 15° [15 circiter]
9⅔^h	41° 11′	16° 0′
9¾^h	41° 10′	16° 12′

After sunset Mercury was observed as soon as it could be seen.

At 5½^h, between Mercury and the Bright Star in the Tail of Cetus [Luc. in cauda cetes]:

Hour	Distance	Altitude of Mercury
5½^h	40° 7′	5° 0′
5⅔^h	40° 6′	4° 27′
5⅚^h	40° 5′	4° 0′

Hour	Distance	Altitude of Mercury
$5^h\ 55^m$	40° 4′	3° 0′
$6^h\ 0^m$	40° 4′	3° 0′

Note well: around this day and the day before, according to the view of Copernicus, Mercury had passed the limit of its greatest distance [maximæ remotionis] from the Sun. According to Alfonso [Alphonſum] it could have become more distant, but the observation stands with Copernicus.

According to the last three observations, the bright star of Sirius [ſirij lucida], toward the east, stood almost as high above the horizon as Mercury, that is, between 3° and 4° of altitude.

A little after the sixth hour the distance was:

	Distance	Altitude of Mercury
Mercury from the Mouth of Pegasus [ab ore pegaſi]	21° 37′	2° 10′
$6\frac{1}{6}^h$, the same distance repeated [eadē diſt. repet.]	21° 35′	1° 55′

So from this and the preceding distance of Mercury its position is clear, but remember refraction and parallax.

2 February, New Style [ſtilo novo]

Meridian altitude of the Sun: 22° 43′

3 February

Quantity	Value
Meridian altitude of the Sun	23° 5½′
Parallax, to be added	2′ 45″
Refraction is greater here than in Denmark by 2′, so that it comes to	5′, to be subtracted [ſubt.]
So that the Sun's true altitude is	23° 3¼′
Altitude of the equator here	39° 41 v[?]′
Declination of the Sun	16° 38¼′
So that the Sun's position is at	14° 10′ ♒
Our calculation gives	14° 8′ ♒

The following night Mars was observed, which had passed its acronychal position [Acronychium ſitum] by nearly 5 days [per 5. dies proximè].

Quantity	Value
Mars and the Bright Star in the Foot of Gemini [Lucid. ped. Gem.]	34° 38 v[?]′
The second and third [ſecund. & tert.] the same	
But it has been adjusted [limitata eſt] to	34° 39′

at that time the first in the Head of Hydra [prima in Cap. hydræ] was near the meridian; from this the hour is clear.

Quantity	Value
Next, Mars from the Lower Head of Gemini [Hinc ♂ ab infer. Cap. ♊]	18° 39′
Adjusted [limitata]	18° 39′ 30″
Jupiter and the Bright Star in the Foot of Gemini [Iupit. Lucid. pede ♊]	44° 11 ν[?]′
The second and third [ſecund. & tert.] the same	
Adjusted [Limitata]	11⅝′[48]
From the Lower Head of Gemini [ab infer. cap. Gem.]	29° 54⅝′
Second [ſecund.]	29° 51⅝′
Adjusted [Limitata]	29° 52 ν[?]′

The Head of Hydra [caput hydræ] had passed the meridian by almost a whole hour.

The Bright Star of Hydra [Lucida hydrę] was about one degree from the meridian, toward the east.

3 February.

The Heart of Leo and Spica of Virgo [Cor Leon. & ſpica ♍]: observed at 54° 1 [?]ν[?]′, whereas it is 54° 2′.

Next, Saturn was observed nearest to its station, within two or three days.

Quantity	Value
Meridian altitude of Saturn [Saturn. Altitud. meridiana]	31° 7½′
Adjusted [Limitata]	31° 6′ 37″
Saturn from Spica of Virgo [Saturn. à ſpica ♍]	11° 12′
The second and third [ſecund. & tert.] the same	
Adjusted [Limitata]	11° 12½′
Saturn from the Northern Scale of Libra [Satur. à lance lib. Borea.]	16° 19 ν[?]′
The second and third [ſecund. & tert.] the same	
Adjusted [Limitata]	16° 19⅙′

A little earlier Spica of Virgo had crossed the meridian, having an altitude [habens Altitud.] of:

Quantity	Value
Altitude	30° 41⅓′
It should have been [debuit eſſe]	30° 40′ 37″

From these, Saturn's position near its first station can be investigated, in order to verify the parallax of the orb [parallaxim orbis], as Copernicus calls it, or, according to our hypotheses, by the annual motion of the center [motu centri annuo].

4 February.

[48]both copies print no degree figure here.

Quantity	Value
Venus and the Heart of Scorpius [Ven. & Cor ♏]	24° 45′
Second [ſecund.]	24° 44′
Altitude of Venus [Ven. Altitudo]	10° 0′
Venus and the Middle Star of the Forehead of Scorpius [Ven. media frontis ♏]	27° 32′
Second [ſecund.]	27° 33′
Altitude of Venus [Ven. Altitudo]	10° 40′
Venus and the Uppermost Star of the Forehead of Scorpius [Ven. ſuprema frontis ♏]	33° 59⅓′
Altitude of Venus [Ven. Altitudo]	11° 1′
Venus and the Uppermost Star of the Forehead of Scorpius [Ven. ſuprema frontis ♏]	33° 59⅓′
Altitude of Venus [Ven. altitud.]	11° 13′
Venus and the Northern Scale of Libra [Ven. lanx lib. Boreal.]	46° 18 ı[?]′
Altitude of Venus [Ven. Altitudo]	11° 31′
Venus and the Northern Scale of Libra [Ven. Lanx lib. Boreal.]	46° 18 ı[?]′
Altitude of Venus	11° 37′
Venus and the Bright Star of Aquila [Ven. Lucida aquilæ]	34° 36′
Altitude of Venus [Ven. Altitudo]	12° 50′
Venus and the Bright Star of Aquila [Ven. Lucida aquilæ]	34° 35′
Second [ſecund.]	34° 35′
Altitude of Venus [Ven. altitud.]	13° 12′

Afterwards, when the Sun had risen, since the southern sky [merid.] was clear and serene:

Distance of Venus and the Sun [♀ & ☉ diſtantia.]	Altitude of the Sun [Altitud. ☉]
44° 33′	2° 6′
44° 35′	2° 30′
44° 33′	26′[49]

Distance of Venus and the Sun [♀ & ☉ diſtant.]	Altitude of the Sun [Altitud. ☉]
44° 34′	3° 40′
44° 34½′	3° 50′
44° 34′	5° 2′
44° 34½′	5° 30′
44° 35′	5° 49′
44° 36′	6° 5′
44° 36′	7° 0½′
44° 36⅙′	8° 31½′
44° 36 [?]⅓′	9° 34′
44° 39′	10° 0′
44° 39½′	10° 36′
44° 39 ı[?]′	11° 50′
44° 39¾′	11° 50′
44° 39⅚′	12° 20′
44° 40⅚′	12° 36′

[49]both copies print no degree figure here.

Distance of Venus and the Sun [♀ & ⊙ diſtant.]	Altitude of the Sun [Altitud. ⊙]

Meridian altitude of Venus [Altitudo ♀ Meridiana]: 21° 7′. However, it could have been slightly less, as the next day's observation will show, which is 21° 0⅙′. Since Venus was then in the first degree of Capricorn [primo gradu ♑], and the altitude of the equator is 39° 41′ 30″, the declination of Venus comes out at 18° 34′ 30″; and, the declination of that position being 23° 31′, the northern latitude of Venus [latitudo Boreal. Ven.] comes out at 4° 56′ 30″.

Refraction and parallax cancel each other out, except by however much the parallax is greater than the refraction. So, very nearly, the latitude of Venus would be 4° 58′.

Quantity	Value
Meridian altitude of the Sun [⊙ Altitudo meridian.]	23° 23′ 0″
Parallax adds [parallaxis addit.]	2′ 45″
Refraction subtracts [refraxio demit]	5′

Quantity	Value
So the true altitude [Itaque vera altitudo]	23° 20¾′
Declination of the Sun [Declinatio Sol.]	16° 20¾′
Position [Locus]	15° 10′ Aquarius [♒]
Our calculation [Noſter calculus]	15° 9′

In the night that followed
4 February.

Quantity	Value
Meridian altitude of Jupiter [Iovis Meridiana alt.]	56° 29⅔′
Meridian altitude of the preceding southern star in the Head of Leo [alt.mer.antece.auſt.in cap.♌]	51° 23 [?]/[?]′
Meridian altitude of the following star in the other [?] foot of Leo [alt.mer.ſequent.in alt.ped.♌]	65° 15 [?]/3′

These three altitudes were taken at the same moment, so the position of Jupiter is clear, and also its distance from each of the fixed stars. Jupiter had passed the meridian by only the diameter of its body.

Hour, minute [Hora min.]: $5^h\ 55^m$

Venus from the Heart of Scorpius [♀ à corde ♏]: 28° 30 ♑[?]′; altitude of Venus [alt. ♀]: 10° 57′.

Hour [Hora]: $5^h\ 57^m$

Venus from the middle star in the Forehead of Scorpius [Ven. à media in fronte ♏]: 34° 43⅚′; altitude of Venus [alt. ♀]: 11° 5′.

Scorpius and Venus had nearly the same altitude, so refraction does little harm here.

Distance of the Sun and Venus, for 5 February [Diſtant. Sol & ♀ ad 5. Februarij]

In the morning [Mane]

Hour [Hor.]	Distance of the Sun and Venus [Diſtant. Sol & ♀]	Altitude of the Sun [Altit. Sol.]
7^h 53½^m	44° 49 2⁄1[?]′	4° 17′
7^h 55½^m	44° 50⅓′	5° 56′
7^h 58^m	44° 53 [?]⅓′	8° 24′
8^h 8 1⁄7^m	44° 54′	9° 0′

Afterwards Venus crossed [Poſtea tranſijt Ven.]. Meridian altitude above the horizon [Merid. altitud. ſupra Horizont.]: 21° 0⅙′.

The observation is certain, thanks to the clear sky [Obſervatio propter ſerenitatem certa]. After Venus crossed the meridian, we again observed its distance from the Sun five times [poſtquam Venus Meridianū tranſijt iterum quinquies obſervavimus à Sole diſtantiam].

	Distance of Venus and the Sun [Diſtant. Ven. & Sol]	Altitude of the Sun [Altit. Sol]
I	44° 55′	12° 53′
II	44° 55½′	13° 3′
III	44° 55½′	13° 17′
IV	44° 55 1⁄[?]′	13° 40′
V	44° 56′	13° 50′

20 February [20 Februarij.]

Quantity	Value
Venus crossed; meridian altitude [tranſivit Ven. merid. altit.]	20° 27′
Venus was distant from the Sun [Ven. diſtabat à ſole]	46° 40 1⁄[?]′
Second and third the same [ſecund. & tert. eadem]	
Elevation of the Sun [Sol elevatio.]	21° 8′

21 February [21. Februarij]

Quantity	Value
Meridian altitude of the Sun [Sol merid. altit.]	29° 1′ 30″
Refraction takes away [refract. aufert.]	1′ 35″
Parallax adds [Parallax. addit.]	2′ 43″
True altitude [Altit. vera]	29° 2′ 38″
And the position of the Sun in Pisces [& locus Sol in ♓]	2° 20′ 5″

On the night before 22 February [Nocte quæ 22.Febr. præcedebat.]

Hour and minute [Hor. Min.]	Quantity	Value
6^h 10^m	Venus distant from Aquila [♀ diſt. ab aquil.]	27° 37½′
	Altitude of Venus [Ven. altitudo.]	9° 48′
Shortly after six [Paulò poſt ſextam]	Venus and the Heart of Scorpius [Ven. & Cor ♏]	42° 50⅚′, three times [ter]
	Altitude of Venus [Ven. Altitud.]	11° 19′

Hour [Hora.]	Distance of the Sun and Venus [Sol. & ♀. diſt.]	Altitude of the Sun [Altitud. Sol]
8^h 27^m	46° 42′	14° 3′

At 9^h 19^m Venus crossed the meridian, with an altitude of 20° 28 ſ[?]′ [Hor. 9. 19. tranſivit Ven. Meridianum habens altitudinem].

From the preceding observations [Ex obſervatíonibus antecedentibus.]

For 4 February, Saturn is derived [4. Februarij concluditur ♄.]

Quantity	Value
Longitude [Longitudo]	Libra [♎] 28° 30′ 44″
Latitude [Latitudo]	2° 34′ 20″ north [Bor.]
Right ascension [Aſcenſ. Recta]	207° 24′ 37″

And for 2 February, Saturn [& 2. Februarij Saturn.]

Quantity	Value
Longitude [Longitudo]	Libra [♎] 28° 18′ 44″
Latitude [Latitudo]	2° 43′ 36″ north [Bor.]
Right ascension [adſcen. Recta]	207° 16′

On 9 March [Die 9. Martij]

Quantity	Value
Meridian altitude of the Sun [☉ Altitud. Mer.]	35° 28⅙′

2 March, at 10^h after noon [2. Martij hor. 10 poſt. merid.][50]

Quantity	Value
Mars, Bright Star of Aries [♂ Lucida ♈]	86° 33′ 20″
Mars, Aldebaran [♂ Aldebor]	55° 47′ 10″
Longitude of Mars [Longit. ♂]	Cancer [♋] 29° 14′ 46″
Latitude [Latitud.]	3° 50′ 51″ north [Bor.]

[50]both copies print this date after 9 March.

Quantity	Value

12 April [12 Aprilis.]
Meridian altitude of the Sun [Sol. altitudo Merid.]: 48° 35 [?]′[?]″

Hour [hor.]	Quantity	Value
$9^h\ 37^m$	Mars, Bright Star in the Foot of Gemini [♂ Lucida ped. ♊]	32° 50′
	Second the same [ſecnnd. eadem.] [recte: ſecund.]	
$9^h\ 51^m$	Mars, Heart of Leo [♂ Cor Leon.]	19° 20 1[?]′[?]″
	Second the same [ſecund. eadem]	
$9^h\ 46^{m\,51}$	Jupiter from the Bright Star in the Foot of Gemini [♃ à Lucid. ped. ♊]	39° 0½′
	Second the same [ſecund. eadem]	
$9^h\ 53^m$	Jupiter from the Heart of Leo [♃ á Corde Leon.]	12° 30′
	Second the same [ſecund. eadem]	
$12^h\ 21^m$	Saturn, meridian altitude [♄ Altit. merid.]	32° 28⅙′
$12^h\ 32^m$	Saturn, Third Star of the Wing of Virgo [♄ 3 * alę ♍]	20° 45½′
	Second and third the same [ſecund. & tert. eadem.]	
$12^h\ 43^m$	Saturn from the Northern Scale [♄ à Lance Bor.]	19° 14⅚′

19 April [19. Aprilis]

Hour [hor.]	Quantity	Value
$11^h\ 32^m$	Saturn, Third Star of the Wing of Virgo [♄ 3 * ale ♍]	20° 13 [?]⅙′
$11^h\ 37½^m$	Saturn, Spica of Virgo [♄ ſpica ♍]	8° 9⅚′
$11^h\ 46^m$	Saturn, Northern Scale [♄ Lanx Borea]	19° 45′
$12^h\ 0^m$	Saturn crossed the meridian [tranſivit mer. ♄]	32° 40′

20 April [20. Aprilis.]

Hour and minute [hor. min.]	Quantity	Value
$7^h\ 25⅓^m$	Distance of the western limb of the Moon from the Heart of Leo [diſt.☾ lumb.occ.à cord.♌] [recte: limb.]	18° 19′
$7^h\ 45⅙^m$	Distance of the western limb of the Moon from Canis Minor [diſt.limb.occ.☾ à can. min.]	21° 15½′

Afterwards, from this and the rest, Tycho derived the Moon [Poſtea hinc & ex cæteris concluſit Tycho. ☽]:
20 April [20. Aprilis], at $7^h\ 32½^m$ [hor. 7 32½]

[51] both copies print this hour after $9^h\ 51^m$.

Quantity	Value
Longitude in Leo [Logitudine in ♌] [recte: Longitudine]	6° 20′ 22″
Latitude south [Latitudine Merid.]	1° 33′ 40″

The observations of this year at Benátky Castle [in Benadka Arce] go up to this point. Afterwards the Emperor [Cæſar] was away for three quarters of the year, having gone to Pilſen [Pilſenam].

Afterwards I lived for 5 months in the city of Prague. The instruments were in the Emperor's gardens for 2 months.

The Prague Observations Follow [Sequuntur Obſervationes Pragenſes.]

In the Year 1601 [Anno 1601.]

On the morning of 25 February, at dawn, Tycho moved [mungravit] [recte: migravit] into Kurz's house [in Curtij Domum], which the Emperor Rudolf [Rudolphus imperator] had bought from the widow of Jakob Kurz [à Iacobi Curtíj vidua] for his use.

29 April, in the evening [29. Aprilis veſperi.]

Mercury appeared for a short time. We recorded it as best we could, as follows [☿ parumper apparuit. illum denotavimus qualitercunque ut ſequitur.].

Quantity	Value
Mercury, Capella [Mercur. Capella]	25° 41′
Altitude of Mercury [Mercur. Altitudo]	7 [?]⁄6°

Distance repeated [Repetita diſtantia.]

Quantity	Value
Mercury, Capella [Mercur. Capella]	25° 40′
Altitude [Altitudo]	7°
V. N. [?] Mercury from Procyon [V.N.☿ à procyone]	53° 14′
Altitude of Mercury [Mercur. Altitud.]	6° 46′

Distance repeated [Diſtantia repetita.]

Quantity	Value
Mercury, Procyon [Mercur. Procyon.]	53° 13′
Altitude of Mercury [Mercur. Altitudo.]	6⅓°

From the observation of 29 April, the longitude of Mercury comes out as 1° 29′ 50″ [Ex Obſervation. 29 April fit Longitudo Mercur. 1 29 ſec. 50.], without yet taking refraction and parallax into account [Non habita adhuc ratione refr. & parall.].

1 May, in the evening [1. Maij veſperi]

Hour and minute [Hor. min.]	Quantity	Value
$8^h\ 21^m$	Venus, Capella [Ven. Capella]	22° 1 [?]⅓′
	Second and third the same [ſecund. & tert. eadem]	
$8^h\ 29^m$	Venus, Procyon [Ven. Procyon.]	30° 25′
	Second and third the same [ſecund. & tert. eadem]	

9 May, at the greatest elongation of Venus from the Sun [9. Maij in maxima Ven. à ſole digreſſ:]

Hour and minute	Quantity	Value
$8^h\ 17^m$	Venus, Capella [Ven. Capella]	29° 19⅔′; corrected, 20′ [corr.20.]
$8^h\ 27^m$	Venus, Lowest Head of Gemini [♀ infim.Caput ♊]	13° 47′, three times [ter]; corrected, 47 ν[?]′ [cor.]
	Altitude of Venus [♀ Altitudo]	25° ½′
$8^h\ 34½^m$	Venus, Heart of Leo [♀ Cor Leon.]	49° 59′, three times [ter]; corrected, 49° 59′ [cor]

16 July, in the evening [16 Iulij veſp.]

Hour and minute [Hor. min.]	Quantity	Value
$9^h\ 22^m$	Jupiter, Arcturus [♃ Arcturus]	41° 20′, corrected [cor.]
	Altitude of Jupiter [♃ Altitudo]	10° 40′
$9^h\ 29^m$	Jupiter, Saturn [♃ Saturn.]	45° 18′, corrected [cor.]
	Altitude of Jupiter [♃ Altitudo]	9° 12′
$9^h\ 39^m$	Saturn, Arcturus [Saturn. Arcturus]	32° 1½′
	Saturn, Northern Scale [Saturn. Lanx Borea]	11° 42¾′

Quantity	Value
From this comes the position of Saturn [Hinc provenit locus Satur.]	3° 50¾′
Our calculation [Calculus noſter]	3° 43′ 23″
Latitude [Latitudo]	2° 20′ 12″
Our calculation [Calculus noſter]	2° 19′ 26″

10 October, in the morning [10 Octobris mane]

Hour and minute [hor. min.]	Planet	Star or quantity	Value
		Lower Head of Gemini [Infer.cap.♊]	25° 0⅙′
$3^h\ 30^m$	Mars [♂]	Bright Star in the Foot of Gemini [Lucida ped.♊]	39° 29⅙′
		Procyon	27° 44 ν[?]′
		Heart of Leo [Cor ♌]	12° 2½′
		Lower Head of Gemini [Infer. cap. ♊]	45° 30½′

Hour and minute [hor. min.]	Planet	Star or quantity	Value
$4^h\ 30^m$	Venus [♀]	Procyon	42° 53′
		Altitude of Venus [Altitudo ♀]	17° [17 grad.]

11 October, in the morning [11 Octobris mane]

Hour and minute [hor. min.]	Planet	Star	Value
		Lower Head of Gemini [Infer. Caput ♊]	25° 33⅚′
$4^h\ 30^m$	Mars [♂]	Heart of Leo [Cor ♌]	11° 23′
		Procyon	28° 12′

On 13 October Tycho Brahe accompanied Lord Minckwitz [Dominum à Mincowitz] to dinner at the home of the most illustrious Lord of Rosenberg [Domini à Roſenberch]. Contrary to his habit, he held his urine and stayed in his seat. When the drinking grew rather freer and he felt the tension of his bladder, he put his health second to courtesy. Once he had returned home, he could no longer pass urine.

At the onset of this illness the Moon was in opposition to Saturn and in quadrature with Mars in Taurus [☾ in oppoſito ♄, & □to ♂ in ♉], and Mars stood in the same place that Tycho had fixed for himself as his ascending degree [orientem gradum].

After five sleepless days had passed, the urine at last came, though barely and with the most severe agony, and nevertheless impe- ded. Constant sleeplessness followed, then an internal fever and, little by little, delirium. His diet, from which he could not be kept, aggravated the illness. So on 24 October, when the delirium had let up for some hours, his nature gave way, and amid consolations, prayers and the tears of his own people he breathed his last most peacefully.

From this time, therefore, the series of celestial observations was broken off, and an end was put to the observations of 38 years.

On the night that was his last, in a delirium in which everything was most delightful, he repeated these words over and over, like someone weaving a poem:

May I not seem to have lived in vain. [Ne fruſtra vixiſſe videar.]

Beyond doubt he wished to add this to his works as a kind of colophon, and with these words to dedicate them to the memory and the use of Posterity.

THE END [FINIS.]

Willebrord Snellius Greets the Studious Reader

[VVILLEBRORDVS SNELLIVS Studioſo Lectori ſalutem.]

Kind reader: at the entrance to this book we have set out the solar observations of 21 consecutive years. We copied them some time ago at Kassel in

Hesse, when access to them had been granted to us, merely as a kind of gleaning from the very dense work of that most excellent Prince, who, if anyone ever did, earned everlasting credit in these arts. We pursued this one aim only: to note down, like compilers of extracts, the Sun's most useful epochs. Such are the positions near the nodes of the equinoxes, or near the Sun's most remote turning points [converſiones], and also those that lie between these in places as nearly midway as can be. We always kept to this as far as was possible, except when an observation was missing in the autograph because the sky was cloudy and the Sun unwilling, or when no observation had been made because of the Prince's absence.

The nobleman Tycho Brahe, a most diligent investigator of the heavens and the stars, valued these very observations so highly that he did not hesitate to gather votes from them too, and to build credit for his own discoveries on them, toward the restoration he was undertaking in the reckoning of the Sun [ſolis epilogiſmo], which he published in his *Progymnasmata* [progyninaſmatis] [recte: progymnaſmatis]. For there he uses the Hessian observation of the Sun for 1572 March 7 and for 1573 March 4. This I noticed only at last, when the observations had already been published.

It is also in your own interest to know this: all these observations, from the year 1561 to the year 1582 inclusive, are none other than what the instrument itself has sho- wn, not doctored by any cosmetic of either parallax or refractions, so that the road to the truth itself might be plainer. For just as the laws of refractions are less constant, and vary and disagree with the position of places, so too they are not always confined within the same limits on one and the same horizon. For Tycho himself also attests that the refraction of the Sun on the day of the solstice, at an altitude of 3°, as he observed it at Uraniborg [Vranoburbi] [recte: Vranoburgi] in Denmark, was only 12′, although in his table of refractions [laterculo refractorio] he set it at 17′. The same man, for 1600 February 2 at Benátky Castle in Bohemia, with the noon Sun raised according to observation to 23° 5 1/[?]′, set that day's refraction 2′ greater than in Denmark. Rothmannus [Christoph Rothmann] at Kassel showed it to be somewhat smaller than at Uraniborg. Moreover, Regiomontanus warned long ago that at the same altitude it varies with the season of the year, since among observations of the equinoxes he prefers the autumn ones to the spring ones, because the air is purer then.

And so you should not be moved to fear by the Zodiac's maximum obliquity, recorded for the year 1566 as 23° 30′, which for Tycho is 1½′ greater. For my part, I am more surprised that no greater discrepancy arose between that select pair. For it is plain that in that place the Most Illustrious Prince (as Eratosthenes and Ptolemy once did) derived the Sun's declination from its maximum and minimum altitude. Since the Sun's altitude on the very day of the solstice in the year 1564 had been recorded as 62° 12′, and then in the following year, 1565, its winter altitude [altitudo brumalis] as 15° 12′, with no account whatever taken of either refraction or parallax, it was easy to gather from this that the interval

lying between the tropics is exactly 47°, half of which is the Sun's maximum de- clination, 23° 30′. The same error was made earlier by Peurbachus [Georg von Peuerbach], Regiomontanus, Bernardus Walterus [Bernhard Walther] and Copernicus, as is clear from their published observations, which we have also appended to these for the benefit of posterity. So under those laws the altitude of the equator will come out as 38° 42′, and from it the altitude of the pole at Kassel will have been derived as 51° 18′.

But if one chose to follow Tycho's laws of refraction and parallax, then for the winter altitude [altitudine brumali] of 15° 12′ the Sun's equated or corrected altitude would come out as 15° 7′ 36″, and the solstitial altitude as 62° 10′ 48″. The maximum declination drawn from the difference of these would come out as 23° 31′ 36″, while Tycho set it at 23° 31′ 30″, so that neither egg to egg nor milk to milk could have been more alike. And from this, too, the corrected altitude of the equator at Kassel will have been 38° 39′ 12″, nearly 3′ less, and the altitude of the pole 51° 20′ 48″.

And yet from the circumpolar stars that same altitude is found to be a little smaller still. For Christoph Rothmann, writing to Tycho around the spring equinox of the year 1586, says that from the circumpolar stars, which never go below the horizon, he found the [Greek: πόλου ἔξαρμα (polou exarma, "elevation of the pole")] at Kassel to be 51° 20′, and he calls these observations most careful. First, from the pole star, whose highest altitude at culmination was 54° 16′ and lowest 48° 24′; the mean altitude of the pole will therefore be 51° 20′. He adds three others besides. The Breast of Cassiopeia [Pectus Caſſiopeæ], at highest altitude 87° 3′ and lowest 15° 37′; a star on the ascent of the Chair of Cassiopeia [in adſcenſu cathedræ Caſſiopeæ], whose highest altitude at culmination is 84° 26½′ and lowest 19° 13½′. [Margin: handwritten, not printed, beside these two lines: 103° 40 / 51′ 50 [?]][52] These two both agree on the same [enndem] [recte: eundem] figure. The fourth deviates somewhat. At the knees of Cassiopeia it is po- sitioned, and its highest altitude is 79° 44½′ and its lowest 22° 55′, which gives the inclination of the pole as 51° 19¾′. But Iustus Byrgius [Jost Bürgi], the designer and maker of all the instruments there, who with his skilled hand fashioned various automata most artfully and ingeniously, both for himself and for leading men [viris principibus], and who for that reason was sought after by the Emperor Rudolf, found the same altitude with larger instruments to be 51° 19′ 20″, from observations repeated several times and recorded with the greatest solicitude and care. Earlier, treating it as corrected, we deduced it from the observations as 51° 20′ 48″.

But an error underlies the observation of the maximum declination, which they afterward found to be only 62° 11′. And Rothmann informed Tycho that in all of these there had been an error, an excess of nearly 1′, because of a hidden fault in the plumb line [perpendiculi], since it was checked only at intervals (in those quadrants, which stood on a horizon divided into azimuthal degrees as

[52] in the Munich copy; the Zurich copy has no handwriting here.

on a base). Indeed, the observations of the years 1567, 1570 and 1579 show the same, although in all the others the solstitial altitude is found to be 62° 12′.

That we have nevertheless drawn from this a maximum declination close to Tycho's was due to the difference of the refractions, since refraction is not the same for Rothmann at Kassel and for Tycho in Denmark. Still, from the Sun's well-determined solstitial altitude of 62° 11′ and the true altitude of the pole of 51° 19′ 20″, which gives the altitude of the equator as 38° 40′ 40″, the very declination of the Sun will also be given. For the parallax of 1′ 22″, added to the altitude of 62° 11′, will give a corrected altitude of 62° 12′ 22″; the altitude of the equator, 38° 40′ 40″, subtracted from this, will leave a maximum declination of 23°

31′ 42″, which differ from Tycho's figures by 12″, a difference that can be wholly disregarded. For I am entirely convinced that no instruments (not even those on which tenths of single minutes can be conveniently distinguished) can determine the corrected altitude of the Sun to ½′ in these regions, at the solstice or on any other day. So I consider it entirely sufficient if only we stop at whole minutes. Whatever we seek beyond that, we have so far only exhausted all our diligence and industry in vain through excessive curiosity. Not that I despair of our being able to attain such things with those same instruments; the reason is that we derive the correction and equation of the observed altitude from a foundation not sufficiently suited to such accuracy. For as long as the theory of the solar parallax is not exactly known, no sane person will ever doubt that for just so long this equation through the customary parallaxes also wavers. And that the measure of the greatest parallax in the Sun still fluctuates in uncertainty, even by as much as 1′, cannot be unknown to anyone who has looked more deeply into these sacred matters. It is therefore evident from what we have said that in correcting the altitude here an error of ½′ or ⅔′ is committed, more in some places and less in others.

And so, in order that no error be made in this respect, the maximum declination of the Sun ought to be observed by those over whose heads it stands perpendicular on the day of the solstice, those who spend their lives under the tropics: for then the Sun is, for them, [Greek: ἀπαράλλακτος (aparallaktos, "without parallax")]. Even if you stand 1° beyond it or short of it, so slight a parallax, barely reaching a very few seconds, escapes the senses and so does no harm to this undertaking. The inclination of the pole is safely found there from the pole star: since that star still stands 20° above the horizon, it is subject to no refraction at all. And from this, now, the remaining things without error can be derived, as we have repeatedly done above. Both the Hessian and the Danish observations assign us the same quantity of the declination for this century, as accurately as possible, even to ½′. Yet that Egyptian Atlas, who for so many centuries held up the tottering world on his shoulders, when he brings these things forward from his own resources, [Greek: ὀικόθεν (oikothen, "from home")], is content to confine the interval of the declination within 5′. For with his quadrant, which he set up in the meridian, whether of wood or of

stone, he says that through many observations, with the Sun brought round to the summer or the winter tropic, he found the interval over which the Sun departs farthest from the equinoctial on either side to be greater than 47° 40′ but less than 47° 45′: [Greek: πάντοτε γινομέν[?] μζ καὶ μείζονος μὲν διμοίρου τμήματος, ἐλάστονος [?] ἡμίσους τετάρτου (pantote... kai meizonos men dimoirou tmēmatos, elastonos... hēmisous tetartou, "always coming to 47, and more than the two-thirds part, less than a half and a quarter")]. Half of this interval will therefore be the maximum declination: 23° 50′ less than the true value, and 23° 52½′ greater than the true value.

The upshot is that Ptolemy, from his observations, confines the maximum [Greek: λόξωσιν (loxōsin, "obliquity")], the obliquity of the zodiac, within only 2½′, and brings forward nothing exact from himself, which would surely be unworthy of the industry of so great a man. I believe that he did not dare to oppose Eratosthenes, or to call into question the observations of a man to whom Hipparchus subscribes, who flourished barely half a century after Eratosthenes. For Eratosthenes, as Suidas[53] teaches, was born in Olympiad 126, was summoned from Athens to Alexandria by Ptolemy III, prolonged his life there to the time of Ptolemy V, and only at eighty departed from the living. While he was head of the Royal Library he equipped the city itself with rulers [regulis] and armillary rings [armillis]; for Hipparchus mentions bronze rings, and very large ones at that, placed in the square portico, Ptolo- mæus [Ptolemy], for his part, also in the palaestra. Therefore, since Eratosthenes, using these rings, recent and then first constructed, had found the ratio of the whole meridian to the distance between the tropics to be as 83 to 11 (from which, on reduction to degrees and minutes, it comes out at 47° 22′ 40″[54]), and since Hipparchus, whom Ptolemy never names without some new title of praise, had approved the same figure, Ptolemy preferred to doubt his own observations rather than call into question the diligence of these men, which he knew thoroughly. Either he thought it insane that the obliquity of the zodiac should vary, or he believed his own instruments to be far [Greek: ὁλοχερέστερα (holocherestera, "coarser")] than their armillary rings. For my part, I would indeed be inclined to believe that this obliquity [Greek: λόξωσιν] had already decreased from Eratosthenes down to Ptolemy's own time, since no fewer than 300 years passed between him and Eratosthenes.

But in truth, if we bring the obliquity [Greek: λόξωσιν] of Eratosthenes back to the anvil, it is certainly not found to be at all as great as he himself established. For they took no account whatever of parallax here, which ought certainly to have been done if these matters are to be pursued as far as ⅓′. Let the altitude of the pole at Alexandria be 31° 0′, the value Ptolemy established for it. The winter altitude of the Sun will then be 35° 9′ 40″, and therefore, corrected for parallax, 35° 12′ 10″. I take no account of refraction at so great an altitude and in a region free of rains, because the air is far purer than it is

[53] the lexicon now called the *Suda*

[54] 11/83 of 360° works out at about 47° 42′ 39″; the page prints 22′

here. The solstitial altitude of the Sun there will be given as 82° 50′ 20″, whose parallax (I use the Tychonic values) is 21″; so the equated altitude of the Sun is 82° 50′ 41″. The difference of these will therefore be 47° 38′ 31″. From this the maximum obliquity of the zodiac also in the time of Eratosthenes would come out at only 23° 49′ 11″[55], almost a whole 1′ less; but that, as I said, is according to the Tychonic parallaxes. If the Sun is nearer the Earth, those values will disagree even more. Hence this too should be noted: all the declinations given by the more ancient authors exceed the correct value. This is plain to anyone testing the point by the method I have shown.

Let a second example be found in Albategino [al-Battānī], who, under a pole inclination of 36° 22′, observed the solstitial altitude of the Sun as 77° 13′ and the winter altitude as 30° 3′. Therefore the former, corrected for parallax, will be 77° 13′ 40″, and the latter 30° 5′ 40″; and so the distance between the two obliquities is 47° 8′ and the maximum declination 23° 34′. But if refraction also has a place at the lowest altitude, as Tycho defines it, then according to this formula the exact obliquity of the zodiac in that age would be 23° 34′ 25″. And since, later on, Arzakel [al-Zarqālī], Hispanus, Almeon, Prophatius Iudæus [Jacob ben Machir ibn Tibbon], in nearly the same clime, observed the same by means of the maximum and minimum altitude, it follows, according to this parallactic equation, that in their age the obliquity of the zodiac was different.

How great the maximum obliquity of the zodiac has been observed to be at various epochs of time

Eratosthenes, about 450 years before Ptolemy, found it.	23° 51′ 20″
Ptolemy, in the year 139 from the birth of Christ.	*Lubrica*[56]
al-Battānī, 751 years after Ptolemy.	23° 35′
al-Zarqālī the Spaniard, about 193 years after al-Battānī.	23° 34′
Almeon Almanoris [?], about 70 years after al-Zarqālī.	23° 33′ 30″
Prophatius the Jew, 160 years after Almeon.	23° 32′
Peurbachius [Georg von Peuerbach], around the year of the Lord 1460.	23° 28′
Dominicus Maria [Domenico Maria Novara], teacher of Copernicus, at Bologna, in the year 1461.	23° 29′
Bernhard Walther, at Nuremberg, 1501 and earlier.	23° 28′
Ioannes Wernerus [Johannes Werner], at Nuremberg, in the year 1514.	23° 28′ 30″
Nicolaus Copernicus, at Frombork in Prussia, in the year 1525.	23° 28′ 40″

The same, for the corrected declination

[55] half of 47° 38′ 31″ is 23° 49′ 15½″; the page prints 11″

[56] supplied from the Zurich copy, which prints *u* as the second letter; it is clogged in the Munich copy. *lubrica*: "slippery, unreliable".

Eratosthenes, corrected, will give as the maximum declination of the Sun:	23° 49′ 11″
Ptolemy:	An ambiguous one.
al-Battānī:	23° 34′
al-Zarqālī in Spain, if you set the altitude of the pole at 40°:	23° 33′ 5″
Almeon Almanoris, if you assume the same latitude:	23° 32′ 37″
Or if you also take account of refraction:	23° 33′ 50″
But since everything here is less than certain, I shall take my hand from the tablet [manum tollam de tabula][57]. Tycho has shown clearly enough that the observations of more recent observers remain altogether far below the true value, and that the maximum declination was never smaller.	23° 31′

In vain, therefore, do we use declinations to fix the outermost limits of the wandering [evagationis] and from them fashion its theory, since no one has so far perceived an increase. I would not have pursued these matters so minutely had the greatest masters themselves not believed that they could be tracked down and grasped even to halves and quarters of a minute. Whereas that goal can never be reached by the road they took. But let these remarks on the reckoning of the declination suffice for now. To ob- servations of ours I turn once more; to these we have added the Sun's declination and position. But you should remember that the declination was derived from an altitude of the equator of 38° 42′, whereas it ought to have been taken as 38° 40′ 40″. Next, that the Sun's position was worked out from a maximum declination of 23° 30′, whereas that declination is 23° 31½′.

As an example, let us take 1568 August 24, on which the Sun's meridian altitude was observed as 46° 10′. Subtract from this the altitude of the equinoctial, 38° 40′ 40″, and the remainder will be the Sun's declination on that day, 7° 29′ 20″. Now, given this declination together with the Sun's maximum declination, its position on the ecliptic will also be given. *For the whole sine is to the sine of the maximum declination as the secant of the complement of the given declination is to the secant of the complement of the distance from the nodes*; this is clear from the theory of spherical triangles. The terms of the proportion here will be: 1000000; the sine of the maximum declination, 399149; the secant of the complement of the given declination 7° 29′ 20″, 7672599. From these the fourth term is given, 3062510, the secant of the complement of the distance from the nodes. To this corresponds an arc of 70° 57′ 30″. Since the Sun has here passed the solstice, let it be added to 90; the sum will be 160° 57′ 30″ from Aries, which is 10° 57′ 30″ of Virgo. Yet the position cited has 11° 0′ of Virgo, so that the error is 2½′. But if you first correct the altitude itself by applying parallax, the declination will come out as 7° 31′ 20″, and from that the Sun's position at 10° 51′ 15″ of Virgo. This figure stands 8′ 15″ away from that one. But the hidden fault of the

[57]a proverbial phrase for leaving off work

plumb line too, by Rothmann pointed out above, does some harm here. You must therefore handle these figures with caution.

But since the entire reckoning [epilogiſimus] of the Sun's course depends on the position of the apogee — from which, given the mean motion, the difference according to the anomaly [Greek: ἡ παρὰ τὴν ἀνωμαλίαν διάφορα (hē para tēn anōmalian diaphora, "the difference according to the anomaly")], the difference of the equation, and from that the Sun's position as seen by us, are brought out — I shall now also, for the benefit of lovers of mathematics, append some very accurate observations: the earlier ones made in Hesse by Jost Bürgi, the later ones in Bohemia by Tycho himself, so that from the agreement of the two the question of care and truth may also one day be settled. For we see, and marvel, that so great an absurdity [Greek: ἀτόπημα (atopēma, "absurdity", literally something out of place)] has arisen between al-Battānī and al-Zarqālī that the Sun's apogee must have moved back by more than 4° within two centuries; and this I consider must be attributed entirely to the fallacy of the observations [Greek: τηρήσεων (tērēseōn, "of observations")]. But I will take the matter up from its very origin.

To investigate the apogee of the Sun's eccentric, the place where the Sun withdraws farthest from the Earth, Hipparchus, and Ptolemy following him as well, chose three solar epochs. From these, by means of the observed angles of the apparent motion and the arcs of the mean motions derived from the interval of time, they were to bring out the position of the apogee and the eccentricity. For this purpose they used the Sun's entry into the first degree of Aries, Libra and Cancer, since the calculation has less difficulty there. It is therefore absolutely necessary to have accurately noted and known the moments of time at which the Sun reaches these three epochs. But how they detected these is worth learning from them. For the equinoxes, indeed, the way is easier. Hipparchus observed the equinox with a bronze equatorial armillary ring, [Greek: διὰ χαλκοῦ κρίκου ὃς δοκεῖ διασημαίνειν τὴν ἰσημερίνην ἡμέραν, ἐν ᾗ ἄν ἐκ τοῦ ἑτέρου μέρους ἄρχεται τῆν κοίλην ἐπι- (dia chalkou krikou hos dokei diasēmainein tēn isēmerinēn hēmeran, en hēi an ek tou heterou merous archetai tēn koilēn epi-, "through a bronze ring, which seems to mark the equinoctial day, on which from the other side it begins … the concave sur-")] [Greek: φάνειαν φωτίζεσθαι (phaneian phōtizesthai, "-face to be illuminated")], as soon as the Sun, from the opposite side, has begun to illuminate its concave surface. For when the Sun passes from the southern semicircle into the northern, it casts its rays into the concave of the ring from the upper part of its limb; and when it descends again toward Libra, it begins to illuminate the opposite concavity of the ring from the lower part of its limb. So if Hipparchus seizes on the very first moment of illumination as the equinox, he anticipates the equinoxes by a whole quarter of a degree. I mean this: as soon as the Sun has begun to illuminate the opposite part of the ring, the centre of its body is still a full 15′ away from the equinoctial, since luminous rays flow out from every part of its surface. For that reason it separates the Sun itself by a little more than 37′, on its own circle,

from the nodes of the equinoxes, and to that amount 15^h of motion correspond. By that interval, then, the equinoxes would follow the observations themselves. Although this does not change the interval of time between the equinoxes, nor show a length of the returning year [anni vertentis] other than the true one, since the same anticipation always falls at both, Hipparchus nevertheless seems to have guarded carefully against it in his equinoctial observations, noting only the time at which the opposite concavity received an equal measure of light above and below. For of the vernal observations he speaks as follows: [Greek: καὶ ὁ κρίκος δὲ ὁ ἐν Αλεξανδρείᾳ ἴσον ἐξ ἑκατέρου μέρους παρηυγάσθη (kai ho krikos de ho en Alexandreiāi ison ex hekaterou merous parēugasthē, "and the ring in Alexandria, too, was lit equally from each side")]. And yet so great an anomaly in the annual quantity noted [natatæ] [recte: notatæ] by him keeps him in suspense, and not without reason. For when he observes the illumination of the equinoctial ring around the rising and setting of the Sun, refraction certainly deceived him at those times. Hence those words, wrung, I believe, from Ptolemy against his will, [Greek: ἐνίοτε [?] δὶς ἐν ταῖς αὐταῖς ἰσημερίαις μεταφωτίζεσθαι (eniote [?] dis en tais autais isēmeriais metaphōtizesthai, "sometimes [?] twice in the same equinoxes to change over in illumination")]

[Greek: τὰς κοίλας αὐτῶν ἐπιφανείας (tas koilas autōn epiphaneias, "their concave surfaces")] — that at times, around the same equinox, the concave surfaces [convacas] [recte: concavas] of the rings were illuminated. Even if I grant that this came about [Greek: ἐκ τῆς διαστρ[?]φῆς (ek tēs diastr[?]phēs, "from the distortion")], because the ring had become twisted as it gave way under age and weight, I shall nevertheless maintain that it could have arisen from refraction too. Thus the Sun, seen higher in the morning near the horizon, then returned to its true position once the refractions were overcome, and only afterward entering the equinoctial node, would illuminate the rings at the proper time. Certainly Georg von Peuerbach and Regiomontanus warned us in their epitome that this refraction is persistent [perrinacem] [recte: pertinacem] even when the Sun stands higher in our climate. For that reason they prefer the autumnal rather than the vernal equinox to be observed in our climate. Yet such a thing, they say, better suits an autumnal observation, because the air is purer at that time. Far more certain, therefore, and less misleading is the method that Regiomontanus taught and later writers have followed: that the true moment of time be found from the difference in altitude on the day before and the day after the equinox, although the same reasoning holds for two or three days before and after, if the Sun's position is derived from the declination and its motion from the proportion of the time. I shall here reduce to figures the example set down in the year 1571. On March 9 the Sun's meridian altitude was 37° 55′, and on the 13th the altitude was 39° 30′. The first altitude, corrected for refraction and parallax, would be 37° 57′, from which the Sun's position is given. For the difference between this figure and the true altitude of the equinoctial at that place is the declination, 0° 43′ 40″ southern, and so at that

time the Sun occupied 28° 10′ 35″ ♏[58]. Hence the second altitude, corrected for refraction and parallax, will be 39° 32′.

therefore the Sun's northern declination is 0° 51′ 20″, from which the Sun's true position will be given as 2° 8′ 38″ ♈. So in the four days from March 9 to March 13 the Sun covered 3° 58′ 3″. From this comes the proportion: the Sun passes through 3° 58′ in 4 days; therefore it will complete 1° 49′ 25″ in 1^{d} 20^{h} 8^{m}. And so the equinox fell on March 10, at 20^{h} 8^{m} after noon. If, over an interval of so many days, I had followed the formula of Regiomontanus, the time given would be March 10, 20^{h} 4½ [?]^{m}, so that the difference is 3½^{m}. For this reason, since with larger instruments the Sun's altitude can be observed even to a quarter of 1′, it follows that the Sun's entry into the nodes of the equinoxes is given even to within a quarter of an hour, since at that place the Sun varies its declination by 1′ in each hour.

But the reckoning of the solstices is far more intricate. What Laërtius [Diogenes Laertius] reports of Anaximander, that he was the first to mark out the equinoxes and solstices with a gnomon fixed in sundials [sciotheris], is foreign to the [Greek: ἀκριβεία (akribeia, "exactness")] we are looking for here. But how great the uncertainty is here, and how slippery the path of observation, on account of so tiny a declination over so many days, who does not see? For to have determined the true time of the equinox within a quarter of an hour is plainly a Herculean deed. Meton and Euctemon are indeed censured here by Ptolemy, as having handled these sacred matters too carelessly and with too little accuracy. Indeed Hipparchus himself, had he not called Archimedes into partnership in this matter, seems to distrust himself. For he says: [Greek: ἀλλ' ἐπὶ μὲν τῶν τροπῶν, οὐκ ἀπελπίζω, καὶ ἡμᾶς, [?] τὸν Αρχιμήδη, καὶ ἐν τῇ τηρήσει, καὶ ἐν τῷ συλλογισμῷ, διαμαρτάνειν καὶ ἕως τετάρτου μέρους ἡμέρας (all' epi men tōn tropōn, ouk apelpizō, kai hēmas, [?] ton Archimēdē, kai en tēi tērēsei, kai en tōi syllogismōi, diamartanein kai heōs tetartou merous hēmeras, "but as for the solstices, I do not despair that we too, [?] Archimedes, err both in the observation and in the reckoning, even up to a quarter of a day")]. Concerning the Sun's, to the points tropical points [ad puncta / tropica puncta] [recte: ad tropica puncta] approach, that he does not despair that either Archimedes or he himself as well, both in the observations and in the reckoning [epilogismo], depart [?] from the truth by not so much as a quarter of one day. So he hopes only that he has not erred by six whole hours. But what if that hope proves false? Nothing here is demonstrative [apodicticum], and he does not disclose the method. If he examined the Sun's declination with armillary rings or with a very large quadrant, it is, as I said, entirely in vain. For Erasmus Rheinoldus [Erasmus Reinhold] somewhere warns, very truly, that those positions cannot be detected by any observation thoroughly and free of the suspicion of error. I would believe that they erred not to a quarter, but to half a day. Show me someone who can refute that. He himself grants

[58]both copies print ♍, which does not agree with 9 March and the southern declination.

us the quarter. Certainly these matters cannot be traced out by calculation unless the position of the apogee has first been determined. Tycho alone, who taught how to compare stars with the Sun even by day, seems here to impose silence on us. For if you first work out and fix the positions of the brighter planets, Jupiter and Venus, from the fixed stars, and from them derive the right ascension of the Sun on the meridian (for on the meridian it is not affected by parallax, even with the Sun lower). From this, further, it will not be laborious to determine the Sun's true position in the zodiac, and from there, out of the Sun's daily motion, to draw out its entry into the tropical points. But the work is full of anxious care, and many-sided. For it requires the positions of the stars restored exactly, the positions of the planets carefully noted, and, again, a very scrupulous comparison of the Sun with them. It is a varied work, and costly in its equipment of instruments; and I hardly know whether, for all that application and diligence, it turns out so accurate that an error of 3′, 4′ or 5′ could not intervene; for in a way this is a circle of observations, since the work returns in a circle, so that from the Sun, through the planets, the positions of the stars are first fixed, and from the fixed stars, in turn, the Sun's position is sought out by way of the planets. But let these things be granted as you please: what have they to do with Hipparchus, whose positions of the fixed stars were by no means noted with the care this business requires? And had he taken that road, he would certainly not have kept silent about it, nor would he have fallen into so great an absurdity as to leave even a whole quarter of a day in doubt, since this errs by a full two hours at only five minutes. Nor should we consider Ptolemy any more careful than that counsellor of nature; on this point we have many arguments to hand. And indeed, since Hipparchus preceded Ptolemy by 260 years, he stood by so much the nearer to the birth of the armillary rings, which in Ptolemy's heyday were already tottering under their own weight. From this it becomes quite plain on what slippery ground they set their foot who, in fixing the positions of the apogee, call in the epoch of the solstices for this purpose. For if one chooses to bring these things to calculation and to anticipate the solstice by even a single hour, by so tiny an error the solstice would be drawn back by 51′; if by two hours, by 1° 26′[59]; if by three, by 2° 42′; if by six, by 5° 15′; and finally, if by 12 hours, the apogee would then precede by 9° 56′. And who, I ask, will stand surety that they were not astray by that much in observing the solstice, when they themselves are in doubt about a quarter of a day? Therefore if, in place of the numbers of Ptolemy, who reckons 94½ days from the vernal equinox to the solstice and from there 92½ to the autumnal equinox, I assume 95 for the first and only 92 days for the second, I shall bring the apogee back to 25° 34′ of Taurus, which he set at 5° 30′ of Gemini. The Alphonsines perceived this uncertainty: for that reason, because their own cause it served, they pushed the apogee forward by several degrees, when they ought rather to have drawn it back. But the following age easily

[59]both copies print 26.

refuted their boldness. Ptolemy was succeeded by al-Battānī, who entered plainly on the road of Hipparchus and Ptolemy. He taught that the apogee is not fixed, as Ptolemy supposed, but movable, and that from Ptolemy's age to his own, in 751 years, it had advanced 16° 43′. But, as I have said, this method is less steady and is prone to error, so that a necessity was laid on the Spaniard al-Zarqālī to attempt the investigation of the apogee by another and safer road. For he took three epochs at which the Sun by its daily motion would produce a notable difference of declination, from which its true position in the ecliptic could be known even to the minute, and he appears to have fixed the position of the apogee with not a little more steadiness and accuracy, following the form of reckoning that Ptolemy used in investigating the Moon's apogee. Geber [Jābir ibn Aflaḥ], a man who hates numbers [Greek: μισάριθμος (misarithmos, "number-hating")], may hold that form up to ridicule as treacherous, on account of its frequent multiplications, divisions, findings of the sides of squares, and the rest of the variety of computation, which at this point is manifold and intricate. I bid the man be of easy mind, and I shall easily take care that not even the smallest error creeps up on us, provided that the data agree exactly with the truth. Following this road, then, al-Zarqālī found the position of the apogee at 17° 50′ of Gemini, although 193 years earlier al-Battānī had assigned it 22° 17′ of Gemini, so that in all it must have gone back 4° 27′ within two centuries. For my part, I consider that here a flaw has been introduced into al-Battānī's observations, and this on account of what we noted above in the Ptolemaic formula.

Certainly al-Zarqālī's industry was so outstanding that in his own age he snatched the palm from men for certainty in observing. So illustrious is the testimony that the most learned Aben Ezra [Avraham ibn Ezra] bears him in his book entitled *The Beginning of Wisdom* [initium ſapientiæ]. The passage survives in the books of that very great man Joseph Justus Scaliger, which he titled *On the Correction of Times* [de temporum emendatione]. *There is also* (he says) *someone among them who said that the diminution from the quarter* [quadrante], *which belongs to each year, is a 106th part of one day,* (he means al-Battānī, Cap. 52.) *Someone among them, a 110th part. Yet it is agreed that, according to our age, it is a 131st part. For we rely on the position of the Sun* (that is, on the equinox) *that stood in the time of Elzuphi : we have heard of no practitioner like him in the reckoning of the stars. And he himself taught it so. Abraham Elzarakeel* (I think the one they call Arzakel [al-Zarqālī]) *followed him, with whom no one of his times could be compared. He himself investigated the position of the Sun* (the equinox) *in his own age, and this agreed with the time of Elzuphi.* From this it is clear that everything was attended to by al-Zarqālī with industry and energy, since Ibn Ezra, as he himself discloses, wrote this 472 years ago, which is only 71 years after al-Zarqālī's observation. So the most diligent author deserves trust all the more, the nearer he stood to that man's age.

In the motion of the apogee this further point is worth noting: the nearer the apogee is to the beginning of Cancer, the longer the stay the Sun draws

out in the northern semicircle, going from Aries to Libra; and with the apogee standing in the solstitial point itself, the longest. If it stops on this side of the solstice, the Sun spends more time in the first quadrant, from Aries to Cancer, than from there to Libra. So Ptolemy, from

Aries to Cancer, observed the Sun to have stayed 94½ days. The opposite will happen if the apogee inclines beyond the solstice toward Libra. From Tycho's winter and equinoctial observations of the year 1586 it is established that in that year the Sun spent $93^d\ 4^h\ 24^m$ from Aries to Cancer and $93^d\ 14^h\ 6^m$ from Cancer to Libra, so that the time of its stay in the later quadrant is greater than the time in the earlier by $9^h\ 18^m$. But a smaller difference falls between the quadrants themselves the nearer the apogee is to Cancer. If the eccentricity is always the same and perpetually equal to itself, the Sun's stay, the interval of time it spends from Aries to Libra, ought now to be greater than in Ptolemy's age. Yet for Tycho it is smaller by 5½ hours: and this is the clearest proof that the eccentricity has varied. Al-Battānī, too, found it smaller still than Tycho did. From this no one in his right mind will doubt that the eccentricity was then altogether smaller than it is now, since in that age the apogee stood farther from the point of the summer turning [converſionis æſtivæ]. And lest this seem doubtful to anyone: although al-Zarqālī disagrees with al-Battānī on the position of the apogee, he nevertheless establishes the same thing about the size of the eccentricity. But to make this plainer, I have set before the eyes here the intervals of time, the size of the eccentricity and the position of the apogee, as those men recorded them.

The interval of time in which the Sun traverses the northern quadrants of the ecliptic

		Days, hours [D. H.]		Days, hours [D. hor.]
	Ptolemy	$94^d\ 12^h$		$92^d\ 12^h$
From ♈ to ♋ [ab ♈ ad ♋]	al-Battānī	$93^d\ 14^h$	from ♋ to ♎ [à ♋ ad ♎]	$93^d\ 0^h$
	Tycho	$93^d\ 4\ 4/10^h$		$93^d\ 14\ [?]/[?]^h$

So for Ptolemy the northern semicircle is completed in 187^d, for al-Battānī in $186^d\ 14^h$, and for Tycho in $186^d\ 18½^h$.

The distance of the center of the Sun's eccentric from the center of the world

	Ptolemy	41378
	al-Battānī	34653
The Sun's eccentricity, in parts of which the diameter of the eccentric is 1000000	al-Zarqālī	34653

	Tycho	35842
	but Copernicus	32300

The position of the Sun's apogee

Ptolemy, in	5° 30′	Gemini [Gemin.]
al-Battānī, in	22° 17′	♊
al-Zarqālī, in	17° 50′	♊
Tycho, in	5° 30′	♋
but Copernicus, in	6° 40′	♋

Granted that some of this must be charged to the deceptiveness of the observations [Greek: τηρήσεων], certainly, between Tycho and Copernicus, this error from this source arose. As a result, the Copernican position of the apogee runs ahead of the Tychonic by a whole degree, although Tycho's observation comes after the Copernican one, so that it seems likely that Copernicus was here easily mistaken by two degrees. When al-Zarqālī had detected so great a discrepancy between himself and al-Battānī, and had at the same time observed a decrease in the eccentricity, he devised a small circle [circellum] on whose circumference the center of the eccentric would turn in such a way that it stood now nearer to the Earth, now farther from it, and at the same time the apogee itself could move back [repedare]. An ingenious invention indeed, although it seems to have been introduced for too slight a cause. For who would dare to settle these things for us, when the law of those motions has not yet been detected, and when it is uncertain whether the apogee ever moves back at all? A difficult question is in dispute between al-Zarqālī and al-Battānī, and there is no one to settle that quarrel; for in such great darkness, and in so deep a torpor of the writers [ſcriptotum] [recte: ſcriptorum], no one remains who might hold up a torch for us in the search for the truth. One thing has come to my mind, and one not, I think, altogether to be despised. When Alphonsus [Alfonso X], the truly magnanimous King of Castile, had made up his mind to restrain by fixed laws the tables, which were falling apart, and the numbers of the periods [peridorum] [recte: periodorum], which had run out of bounds, and to restore to the planets their own motions, he spared no expense in summoning from every side learned men trained in that dust, to contribute their labors to so noble an undertaking, as if they were their shares [symbolas]. Here I cannot bring myself to believe that those men girded themselves for so arduous a task so stripped of all observations and so unprepared that they did not undertake to observe even the motion of the Sun and the position of its apogee, when they had obtained a lavishly generous prince. For tell me: what reason would have driven them to advance Ptolemy's apogee by so many degrees, that mo-

tion of the apogee they should drive at a speed equal to the motion of the fixed stars? If they had believed it enough merely to derive this from Ptolemy's observations, they would have had the job done by adding about 15°, so that the Sun's apogee in the era of Alfonso, in the year 1252, would have had to occupy, by this formula, about the 20th or 21st degree of Gemini. This would have agreed with the observations of al-Zarqālī, since about 180 years earlier he had assigned its position at 17° 50′. But they stand very far from this, since they set the apogee at that time at 28° 40′ of Gemini. In doing so they seem to have drawn it all from al-Battānī, who demonstrates that in his age the fixed stars are moved forward a whole degree in 66 years, in the order of the signs. These men attribute the same motion to the apogee; so from this, if you compute the motion of the apogee according to that proportion [analogiam], and add that number to the position assigned by al-Battānī, you plainly reach the same limit as the Alphonsines. And so they reworked [interpolaverunt] the Ptolemaic apogee according to the same laws. Thus, passing over al-Zarqālī, they went over wholly to al-Battānī's opinion. Yet I can scarcely persuade myself that they settled these things in this way without having been instructed by any observations, either their own or at least those of others (for example those of Almeonis [?], who is said to have observed the Sun's greatest declination 70 years after al-Zarqālī, or of anyone else at all). And indeed, the proportion of motion and time, from Tycho to al-Battānī and from there to Ptolemy, seems to pronounce in favor of al-Battānī. The motion of the apogee from al-Battānī to Tycho advanced 13¼° in 708 years. The interval of time from Ptolemy to al-Battānī is 740 years, to which, by the proportion laid down, there fall 13° 50′, which from the apogee's position, as observed by al-Battānī at 22° 17′, being subtracted, leave 8° 27′ as the position of the apogee in Ptolemy's age. Yet Ptolemy assigns it at 5° 30′, so that a discrepancy of 3° intervenes. But the arguments we have already set out show clearly enough that all that difference between Ptolemy and al-Battānī is to be ascribed to the uncertainty of the observations. Al-Zarqālī goes off far from this in another direction, so that it seems plain to me that he — [Greek: παρατηρῆσαι (paratērēsai, "to observe")] — conducted his observations wrongly. Nor is it surprising that some error easily creeps in where great things are concluded from small ones. But if observations from those times were available, or from the remaining times lying between us and them, then the truth would stand in the open before everyone's eyes; as it is, there is room only for guessing. And all posterity must be wrapped in this same error until age and the passing of days, after long periods, at last uncover and unroll these things. Nor inaptly Regiomontanus, where he deals with the motion of the fixed stars: *For if our forebears* (he says) *were deceived by their own instruments, we too shall necessarily be deceived; for our observations, unless they are compared with the observations of the ancients, will never teach anything. But if we judge that this hidden motion is present in the stars, it will be useful to keep an eye constantly on the fixed stars, and likewise to hand down written observations to posterity.* Chiefly for this reason, therefore — so that I may one day

rid posterity of any scruple about the position of the apogee in this age, and so that no one may seize as true that trifling discrepancy between Copernicus and Tycho, which flowed from Copernicus's less accurate observations — several selected, very carefully made solar observa- tions I present here, from which is derived a position of the apogee that differs not very much from Tycho's. These, therefore, like the others, are dedicated to your use, kind reader, and I regard them in such a way that you should understand yourself bound also to the shades [manibus] of those through whose diligence, industry and expense the supply of them has been made available to you.

Solar meridian observations made by Jost Bürgi at Kassel, from which the position of the apogee is given

Observation	Position
1. 1588, Old Style, August 19: the Sun occupied [1. Anno 1588.ſtilo veteri, 19 Auguſti Sol obtinuit]	5° 9′ Virgo [♍]
The same year, September 24 [Eodem anno, 24. Septembr.]	11° 12′ Libra [♎]
The same year, February 14 [Eodem anno, 14. Februarij][60]	5° 59′ Pisces [♓]

Between the first and the second observation 36 days intervene. The Sun, in the eccentric, completed 35° 29′ of mean motion. Between the second and the third lie 143 days. The Sun advanced 140° 57′ in the eccentric.

From this Bürgi concludes that in the said year the apogee stood at 5° 57′ 1″ of Cancer, and that the eccentricity is 2° 3′ 32″ [2. partium 3. ſcrup. 32 ſecund.], on the scale in which the semidiameter of the eccentric is 60.

2. Again, he recommended these as careful ones. In them, as before, he derived the Sun's position in the ecliptic from its observed meridian altitude.

Observation	Position
1588, February 23: the Sun occupied [Anno 1588. 23. Februarij Sol obtinebat]	14° 14′ 0″ Pisces [♓]

Observation	Position
The same year, April 10 [Eodem anno, 10 Aprilis]	0° 31′ 3″ Taurus [♉]
The same year, September 17 [Eodem anno 17. Septembr.]	4° 17′ 30″ Libra [♎]
From the first observation to the second, the Sun's true motion is [A prima obſervatione ad ſecundam obſervationem verus ſolis motus eſt]	46° 17′ 0″
whereas its mean motion in the same time is [medius autem eodē tempore motus]	46° 19′ 31″

[60] both copies print this date after the August and September dates.

Observation	Position
From the second to the third, the Sun's true motion is given as [A ſecunda ad tertiam ſolis motus verus datur]	153° 46′ 30″
and its mean motion in the same time as [& eodem tempore motus medius]	157° 42′ 12″

From this Bürgi concluded that the Sun's apogee stood at 5° 53′ 20″ of Cancer, and the eccentricity at 359133 parts, of which the semidiameter of the eccentric is 10000000.

3. In this third item I present Bürgi's entire table [abacum], showing how he worked out the Sun's declination from its observed altitude.

Quantity	Value [gra. ſcrup. ſec.]
1589, February 8: the Sun's apparent meridian altitude [Anno 1589. 8. Februarij meridiana ſolis altitudo viſa.]	27° 6′ 45″
Parallax taken from the tables, to be added [Parallaxis è tabulis aſſumpta addenda.]	2′ 39″
True altitude of the Sun [Altitudo ſolis vera]	27° 9′ 24″
Altitude of the equator at Kassel [Altitudo æquatoris Caſſellis.]	38° 41′ 0″
Declination of the Sun, therefore [Declinatio ſolis igitur]	11° 31′ 36″
From which the Sun's position is given, in Aquarius [Vnde ſolis locus datur in ♒]	29° 56′ 52″
The same year, March 26: the Sun's apparent altitude [Eodem Anno, 26. Martij ſolis altitudo viſa]	34° 49′ 40″
Parallax to be added [Parallaxis addenda]	2′ 6″
True altitude [Altitudo vera]	44° 51′ 46″

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Quantity	Value [grad. ſcrup. ſec.]
Altitude of the equator at Kassel [Altitudo æquatoris Caſſellis]	38° 41′ 0″
Declination of the Sun, therefore [Declinatio ſolis igitur]	6° 10′ 46″
From which the Sun's position will be given, in Aries [Vnde locus ſolis dabitur in ♈]	15° 39′ 3″
And again the same year, August 13: the Sun's apparent altitude [Et rurſum eodem anno 13. Auguſti ſolis altitudo viſa]	50° 10′ 42″
Parallax to be added [Parallaxis addenda]	1′ 54″
True altitude of the Sun [Altitudo ſolis vera]	50° 12′ 36″
Altitude of the equator at Kassel [Altitudo æquatoris Caſſellis]	38° 41′ 0″
Declination of the Sun [Declinatio ſolis]	11° 31′ 36″

This is exactly equal to the declination observed first. The calculation will therefore show the same distance from the nodes of the equinoxes [æquinoctiorum nodis] and, in this case, a position of the Sun diametrically opposite to that one, at 29° 56′ 52″ of Leo [♌].

Now the time that elapsed from the first observation to the second is 46 days. In that interval the Sun's mean motion was 45° 20′ 23″, and its true motion,

[61] As printed, 34° 49′ 40″ with 2′ 6″ added gives 34° 51′ 46″. The page sets 34 in the apparent altitude and 44 in the true altitude; the minutes and seconds agree.

from the observations, 45° 42′ 11″. Next, from the second to the third, 140 days: the Sun's mean motion 137° 59′ 26″, and its true motion 134° 17′ 49″. From these data Bürgi concluded that the position of the apogee is at 5° 56′ 11″ of Cancer, and the eccentricity 359095 parts, of which the semidiameter of the eccentric is 10000000.

4.

Observation	Position
1590, March 3, exactly at noon, the Sun occupied [Anno 1590. 3. Martij ipſo meridie ſol obtinebat]	22° 43′ 0″ Pisces [♓]
The same year, April 11 [Eodem anno, 11. Aprilis]	1° 1′ 0″ Taurus [♉]
The same year, September 12 [Eodem anno, 12. Septemb.]	28° 54′ 0″ Virgo [♍]

From the first observation to the second, 39 days intervene: the Sun's mean motion 38° 26′ 25″, the true 38° 18′.

From the second to the third, 154 days passed, during which time the Sun's mean motion was 151° 47′ 22″, whereas the true motion was 147° 53′. From these data, then, Bürgi concludes that the Sun's apogee is at 5° 54′ 24″ of Cancer, and the eccentricity 359092, in units of which the semidiameter of the eccentric is 10000000.

5.

Observation	Position
1591, January 13, exactly at noon, the Sun occupied [Anno 1591. 13 Ianuarij ipſo meridie obtinebat ſol]	3° 7′ Aquarius [♒]
The same year, April 22 [Eodem anno, 22. Aprilis]	11° 26′ Taurus [♉]
The same year, August 7 [Eodem anno, 7 Auguſti]	23° 42′ Leo [♌]

From the first observation to the second, 99 days passed; the Sun's mean motion in that time was 97° 34′ 44″, the true 98° 19′. From the second to the third, 107 days passed. In that interval the Sun's mean motion was 105° 27′ 51″, and the true 102° 16′. From this the Sun's apogee will be given at 5° 59′ 5″ of Cancer, and the eccentricity 3589600, in units of which the semidiameter of the eccentric is 10000000.[62]

I add below some meridian altitudes of the Sun, selected from Bürgi's most accurate observations.

[62] The page sets seven figures in this eccentricity, 3589600, against the same semidiameter of 10000000. The two preceding results set six: 359095 and 359092.

Date	Meridian altitude
1592 [Anno 1592.]	
December 11 [11. Decembris.]	15° 15′ 30″
1593 [Anno 1593.]	
March 2 [2 Martij]	35° 27′ 30″
March 5 [5 Martij]	36° 39′ 30″
June 6 [6 Iunij]	62° 8′ 0″
June 14 [14 Iunij]	62° 10′ 45″
June 15: sine of the complement of the altitude 4675, in units of which the whole sine is 10000; and the Sun's apparent meridian altitude [15 Iunij, ſinus complemēti altitudinis 4675. qualium ſinus totus 10000. atque ſolis altitudo meridiana viſa.]	62° 7′ 40″

Date	Meridian altitude
which, corrected by parallax, would be [quæ per parallaxin correcta eſſet]	62° 9′ 2″
September 6: 7520; apparent altitude [6 Septemb.7520,altitudo viſa]	41° 14′ 0″
September 11: 7733; apparent altitude [11 Septemb.7733.altitudo viſa]	39° 20′ 50″
September 12: 7779; apparent altitude [12 Septemb.7779,altitudo viſa]	38° 55′ 50″
1594 [Anno 1594.]	
June 10: 4668½; apparent altitude [10 Iunij 4668½, altitudo viſa]	62° 10′ 22″
June 11: 4668; apparent altitude [11 Iunij 4668, altitudo viſa]	62° 10′ 12″
June 12: 4670; apparent altitude [12 Iunij 4670, altitudo viſa]	62° 9′ 20″
1596 [Anno 1596.]	
January 30 [30 Ianuarij]	23° 52′ 45″
February 6 [6 Februarij]	26° 12′ 30″
February 7 [7 Februarij]	26° 34′ 0″
March 20 [20 Martij]	42° 36′ 15″
March 23 [23 Martij]	43° 48′ 0″
May 7 [7 Maij]	58° 8′ 0″

But it should be noted that Bürgi derived the Sun's positions from the observed altitude in such a way that he assumed a greatest obliquity of only 23° 31′, and moreover that he always neglected all refraction. So it is no wonder that half of one degree separates him from Tycho in fixing the position of the apogee. But if you test these results with a more careful file, you will come closer to Tycho's accurate reckoning. Fixing the position of the apogee to the minute is an altogether exacting business. Let no one suppose that it is nothing at all for them to agree to within half a degree. Next follow some of Tycho's Bohemian observations.

Tycho's Bohemian Solar Observations at Benátky Castle, Whose Polar Elevation He Fixed at 50° 18½′ [Obſervationes Tychonis Bohemicæ ſolares in Arce Benatica cujus poli elevationem ſtatuit 50. grad. 18½ ſcrup.]

1600, Gregorian Style [Anno 1600. ſtilo Gregoriano.]

Date or quantity	Value [grad. ſcrup. ſec.]
January 2 [2 Ianuarij]	16° 45′ 30″
January 19 [19 Ianuarij]	19° 16′ 45″
otherwise [aliàs]	19° 18′ 30″
February 3 [3 Februarij]	23° 5′ 30″
Parallax to be added [Parallaxis addenda]	2′ 45″
Refraction here is greater than in Denmark by 2′, so that there come to be subtracted [Refractio hic major eſt quam in Dania 2. ſcrup. ut fiant ſubtrahenda]	5′ 0″
So that the true altitude of the Sun is [Vt ſit ſolis altitudo vera]	23° 3′ 15″
Altitude of the equator here [Altitudo æquatoris hic]	39° 41′ 30″
declination of the Sun [declinatio ſolis]	16° 38′ 15″
so that the position of the Sun is in Aquarius [ut locus ſolis ſit in ♒]	14° 10′
our calculation gives Aquarius [noſter calculus dat ♒]	14° 8′
February 4, meridian altitude of the Sun [4 Februarij ſolis altitudo merid.]	23° 23′ 0″
Parallax adds [Parallaxis addit]	2′ 45″
refraction takes away [refractio demit]	5′ 0″
and so the true altitude [itaque vera altitudo]	23° 20′ 45″
declination of the Sun [declinatio ſolis]	16° 20′ 45″
position in Aquarius [locus in ♒]	15° 10′
our calculation gives Aquarius [noſter calculus dat ♒]	15° 9′
February 21, meridian altitude of the Sun [21. Februarij ſolis altitudo merid.]	29° 1′ 30″
refraction takes away [refractio aufert.]	1′ 35″
Parallax adds [Parallaxis addit]	2′ 43″

Date or quantity	Value [grad. ſcrup. ſec.]
true altitude [Altitudo vera]	29° 2′ 38″
and the position of the Sun in Pisces [Et locus ſolis in ♓]	2° 20′ 5″
March 9, meridian altitude of the Sun [9. Martij altitudo ſolis meridiana]	35° 28′ 10″
April 12 [12 Aprilis]	48° 35′ 20″
April 23 [23 Aprilis]	52° 26′ 50″
June 26 [26 Iunij]	63° 10′ 10″
July 3 [3 Iulij]	62° 41′ 50″

From Tycho's Observations Made at Prague, Where the Altitude of the Pole Is 50° 4½′ [Ex obſervationibus Tychonis Pragę habitis, ubi altitudo poli 50. grad. 4½. ſcrup.]

1601 [Anno 1601.]

Date or quantity	Value [grad. ſcrup. ſec.]
March 4 [4 Martij]	33° 35′ 40″
July 26, moderately clear [26 Iulij mediocriter ſerenum]	59° 23′ 40″
30, not very clear [30 non bene ſerenum]	58° 28′ 20″
31, moderately clear [31 mediocriter ſerenum]	58° 12′ 40″
August 1, clear [1 Auguſti ſerenum]	56° 57′ 30″
5, clear [5 Serenum]	56° 55′ 0″

Date or quantity	Value [grad. ſcrup. ſec.]
6, very clear [6 Sereniſſimum]	58° 38′ 10″
7	56° 21′ 30″
8	56° 4′ 40″
10	55° 30′ 10″
12	54° 55′ 0″
31	48° 33′ 30″
September 3 [3 Septembris]	47° 27′ 30″
6	46° 22′ 0″
8	45° 35′ 0″
21	40° 35′ 0″
October 10 [10 Octobris]	33° 11′ 0″
11	32° 48′ 30″

So here, friend reader, you have selected solar observations from ten years. If you add them to the earlier ones from twenty-one years, the total will come to thirty-one years. You also have observations of the remaining planets, not to be despised, from nine years. All of these we publish for your use. For your part, use and enjoy them, and may this redound to the glory of the supreme God and of his Christ; and now, at last, farewell.

The End [F I N I S.]

Observations of the Sun by Regiomontanus and by his pupil Bernhard Walther [IOANNIS DE MONTEREGIO, & BERNARDI Waltheri ejus diſcipuli ad Solem obſervationes.]

Observations of the Sun made by Regiomontanus with Ptolemy's rulers [Obſervationes Ioannes de Monteregio per regulas Ptolomæi factæ ad Solem.]

	Chord of the distance from the zenith [chor. diſt. à vertice.]
Year of Christ 1462, Rome [Ann. Chriſt. 1462. Rom.]	
January 3 [3 Ianuarij]: meridian altitude of the Sun [altitudo ☉ meridiana] 26° 12′. Its position 22° 30′ ♑. Its southern declination [Declinatio ejus meridiana] 21° 40′. The altitude of the equinoctial [altitudo Æquinoctialis] therefore comes to 47° 52′, and the altitude of the Arctic Pole [altitudo poli Arctici] to 42° 8′.	
January 11 [11 Ianua.]: meridian altitude of the Sun 27° 50′. Its position 0° 41′ ♒. Southern declination [declinatio meridionalis] 20° 6′. The altitude of the equinoctial therefore comes to 47° 56′, and the altitude of the pole to 42° 4′.	
Year of Christ 1472, Nuremberg [An. Chri. 1472. Nurnb.]	
March 5 or 6 [?] [Martij,], with the whole sine as [ut ſinus to-]	86600
8, 100000 [(tus 100000.]	85300
February 20 [20 Februar.][63]	95625

[63]so printed, after the March dates.

	Chord of the distance from the zenith [chor. diſt. à vertice.]
21	85100
23	92900
September 26 [26 Septemb.], fair, because of the recent arrival from Italy [mediocris propter novum adventum ex Italia.]	91300
27, fair	91920
Year of Christ 1473 [Anno Chriſti 1473.]	
March 10 [10 Martij]	84160
11	83600
30	71850
June 7 [7 Iunij][64]	45020
8	44970
April 6 [6 April.], but strong winds [?] [ſed vēti val.]	67740
19, not entirely exact [non omnin. exact.]	60580
20, careful [Diligens]	59975
27, altitude of the Sun at the end of its eclipse 25 [Altitudo Solis in fine eclipſis ſuæ 25.]	
June 11 [11 Iunij]	44880

	Chord of the distance from the zenith [chor. diſt. à vertice.]
13	44860
June 17 [17 Iunij]	45000
August 31 [31 Auguſti]	75150
September 1 [1 Septembris]	75750
8	80084
11	81940
13	83200
14	83810
September 18 [18 Septembris]	86300
21	88160
Year of Christ 1475 [Ann. Chriſti 1475.]	
June 15 [15 Iunij,]	44835
July 26 [26 Iulij]	55160
28	56012

Observations of the motion of the Sun taken with Ptolemy's rulers at Nuremberg by Bernhard Walther, pupil of M. [Master] Regiomontanus [Obſervationes ſumptæ per regulas Ptolomæi, de motu Solis, per Bernardum Waltherum Nurnbergæ diſcipulum M. Ioannis de Monteregio.]

	Chord of the distance from the zenith [chor. diſt. à vertice.]
Year of Christ 1475 [Anno Chriſti 1475.]	

[64] so printed, between the March and April dates.

	Chord of the distance from the zenith [chor. dist. à vertice.]
August 2, at noon [2 Augusti, in meridie]	58434

	Chord of the distance from the zenith [chor. dist. à vertice.]
3	58900
4, doubtful [Dubia]	59325
5	59910
6	60434
7	60960
10	62567
13	64184
14	64750
16	65910
17	66460
18, doubtful	67100
20	68200
28	73000
29, doubtful	73625
September 1 [1 Septembris.]	75420
2	76100
3	76667
4	77250
5	77900
6	78525
14	83550
16	84780
17, doubtful	85350
18	85980
21	87850

	Chord of the distance from the zenith [chor. dist. à vertice.]
22	88434
October 2, doubtful [2 Octobris, dubia]	94500
5	96150
7	97325
9	98475
12	100110
13	100634
14	101190
30	108910
November 2 [2 Novembris]	110150
3	110534
4	110934
24	116884

	Chord of the distance from the zenith [chor. diſt. à vertice.]
28	117600
29	117790
30	117925
December 1 [1 Decembris]	118050
2	118160
12	118790
19	118600
26	117825
27	117675
Year of Christ 1476, current [Anno Chriſt. 1476. cur.]	
January 30 [30 Ianuarij]	106750
February 20 [20 Februar.]	95650

	Chord of the distance from the zenith [chor. diſt. à vertice.]
March 10 [10 Martij,]	84150
13, doubtful [Dubia]	82[?]67
16	80390
18	79180
23	76080
26	74200
31	71140
April 13 [13 Aprilis]	63600
18	60860
May 9 [9 Maij]	51360
16	49090
19	48210
June 3 [3 Iunij]	45350
11, doubtful [Dubia]	44867
12, certain [Certa]	44890
27	46110
September 13, certain [13 Septembris, Cert.]	83400
14, doubtful [Dubia]	84000
19, certain [Certa]	87090
20	87680
21	88320
Year of Christ 1477, current [Anno Chriſt. 1477. cur.]	
March 11, careful [11 Martij, Diligens]	83675
June 26 [26 Iunij]	45967
27	46125

	Chord of the distance from the zenith [chor. dist. à vertice.]
30	46650
July 1 [1 Iulij]	46850
2	47100
3	47367
4	47600
5	47850
6	48134
20	52825
September 5 [5 Septembris.]	78225
17	85675
22	88775
23	89400
24	89934
25	90500
October 6 [6 Octobris]	97000
9	98700
15	101934
November 8 [8 Novembris]	112625
28	117750
December 11 [11 Decembris]	118780
18	118600
19	118525
20	118420
27	117600
Year of Christ 1478, current [Anno Christ. 1478. cur.]	

	Chord of the distance from the zenith [chor. dist. à vertice.]
March 11, careful [11 Martij, Diligens]	83820
12	83234
March 31, careful [31 Martij, Diligens]	71434
April 30 [30 Aprilis]	55220
May 11 [11 Maij]	50850
20	48050
31	45790
June 7 [7 Iunij]	45025
10	44900
June 11, exact [11 Iunij, Exacte]	44890
13, exact [Exacte]	44890
15	44920
17	45000
18, doubtful [Dubia]	45100
19, doubtful because of the winds [quia venti, dubia]	45125
21, exact [Exacte]	45267

	Chord of the distance from the zenith [chor. diſt. à vertice.]
24	45650
July 2 [2 Iulij]	47050
12	49800
13	50140
19	52320
August 9 [9 Auguſti]	62140
September 2 [2 Septembris]	76225
8, exact [Exacte]	79950
9, exact [Exacte]	80534

	Chord of the distance from the zenith [chor. diſt. à vertice.]
10, exact [Exacte]	81190
11, exact [Exacte]	81800
[?]2, exact [Exacte]	82480
13, exact [Exacte]	83050
15	84390
21	88050
30, exact [Exacte]	93410
October 8, exact [8 Octobris, Exacte]	98040
November 26, strong rays, careful, exact observation [26 Novēb. radij fortes, dil. obſervatio exac.]	117300
December 11, strong rays, careful observation [11 Decēb. radij fort. dilig. obſervat.]	118760
Year of Christ 1479, current [Ann. Chriſt. 1479 currē.]	
February 21, strong rays, careful observation [21 Februarij, radij fort. dilig. obſervatio.]	94860
March 28, strong rays, careful observation [28 Martij, radij fort. diligēs obſervatio.]	73350
September 12 [12 Septembris]	82250
13	82825
14	83490
15	84140
19	86600
Year of Christ 1487, current [Anno Chriſt. 1487. cur.]	
June 10 [10 Iunij]	44934
11	44890

	Chord of the distance from the zenith [chor. diſt. à vertice.]
13	44890
14	44890
16	44960
17	44990
18	45050
22	45388

	Chord of the distance from the zenith [chor. diſt. à vertice.]
25	45800
26	45934
July 11 [11 Iulij]	49480
12	49795
14	50460
18	51910
22	53490
29	56600
30	57075
31	575[?]5
August 1 [1 Auguſti]	58010
2	58510
9	62100
15	65440
16	66000
September 1 [1 Septembris]	75540
5	78000
9, doubtful [Dubia]	80500
10	81100

	Chord of the distance from the zenith [chor. diſt. à vertice.]
11	81720
12	82350
13	82950
14	83600
15	84225
16	84810
17	85440
23	89134
24	89713
25	90334
30	93320
October 1 [1 Octobris]	93910
6	96820
November 2 [2 Novemb.]	110200
22	116475
December 7, strong rays, careful observation [7 Decēb. radij fort. dilig. obſervat.]	118625
13, strong rays, careful observation [13 rad for. dil. obſe.]	118790
14, strong rays, careful observation [14 rad. for. dil. obſe.]	118790
22	118300
Year of Christ 1488, current [Ann. Chriſt. 1488 currē.]	
January 1 [1 Ianuarij]	116734
2, fairly certain [Satis certa]	116525
3, strong rays, careful observation [rad. for. dil. obſe.]	116275
9, strong rays, careful observation [rad. for. dil. obſe.]	114725

	Chord of the distance from the zenith [chor. diſt. à vertice.]
31, strong rays, careful observation [rad. for. dil. obſe.]	106240
February 1, strong rays, careful observation [1 Feb. ra. for. dil. ob.]	105750
10, strong rays, careful observation [rad. fort. dil. obſ.]	101200
17, strong rays, careful observation [rad. for. dil. obſe.]	97338
March 2, strong rays, careful observation [2 Martij, radij fort. diligens obſervatio.]	89010
3, strong rays, careful observation [rad. fort. dil. obſe.]	88400
9, fairly clear [Clarus ſatis]	84700
10, weak rays [Radij debiles]	84090
17, fairly clear [Clarus ſatis]	79725
19, strong rays, careful observation [rad. for. dil. obſer.]	78460
24, strong rays, careful observation [rad. for. dil. obſer.]	75334
25, clear, careful, strong rays [Clara dil. rad. for.]	74710
April 9, strong rays, careful observation [9 Aprilis rad. for. diligens obſervatio.]	65780
10	65200
11, clear [Clar.]	64634
12, clear [Clar.]	64080
29, clear [Clarus]	55440
May 7, clear [7 Maij, Clarus.]	52090
14, cold, clear [Frigus, clarus]	49640
19, clear [Clarus]	48175
25, fairly clear [Satis clarus.]	46710
27, fairly clear [Satis clarus.]	46350
June 3, clear [3 Iunij, Clarus]	45390

	Chord of the distance from the zenith [chor.diſt. à vertice.]
4, clear [Clarus]	45267
7, clear [Clarus]	45025
8	44975
10	44910
13	44880
14	44890
15	44910
16	44930
June 17 [17 Iunij]	45000
18	45090
July 9, clear [9 Iulij,cla.]	49070
16, clear [Clar.]	51400
27, very clear [clar.vald.]	55950
August 2 [2 Auguſt.]	58875
17	66988
21	69334
31, clear [Clarus]	75360

	Chord of the distance from the zenith [chor.dist. à vertice.]
September 1, clear, careful [1 Septemb.clar.dil.]	75975
6, clear, careful [Clar.dilig.]	79090
7, careful [Diligens]	79713
8, clear, careful [Clar dilig.]	80313
9, clear, careful [Clar. dilig.]	80925
10, clear, careful [Clar.dilig,]	81550
11, clear, careful [Cla.dilig.]	82190
13, careful [Diligens]	83434
14, clear, careful [Clar.dilig.]	84067

	Chord of the distance from the zenith [chor.dist. à vertice.]
15, clear, careful [Clar.dilig.]	84690
18, clear, careful [Cla.dilig.]	86534
October 3, clear, careful [3 Octob.clar. dilig.]	95534
4, clear, careful [Cla.dilig.]	96100
7, fairly clear, careful [satis cla.dilig.]	97820
8, clear, careful [Clar.dilig.]	89350
26, clear, careful [Clar.dilig.]	107510
31, clear, careful [Cla.dilig.]	109675
November 2, clear, careful [2 Novēb.cla.dil.]	110490
27, clear [Clara]	117620
December 11, clear, careful [11 Decemb.cla.dil.]	118780
Year of Christ 1489, current [Anno Christ. 1489.cur.]	
January 6, clear, careful [6 Ianuarij,cla.dil.]	115360
7, clear, careful [Clar.dilig.]	115075
16, clear, careful [Cla.dilig.]	112190
22, clear, careful [clar.dilig.]	109880
February 12 [12 Februarij.]	99700
23, not entirely certain [non omnin.cert.]	93425
March 2, clear, careful [2 Martij,clar.dil.]	89188
3, clear, careful [Cla.dilig.]	88575
5, clear, careful [Clar.dilig.]	87325
8, clear, careful [clarus diligens]	85460
9, clear, careful [Cla.dilig.]	84860
10	84234
11, clear, careful [Clar.dilig.]	83625

	Chord of the distance from the zenith [chor.dist. à vertice.]
12, fairly clear, careful [satis cla.dilig.]	82980
13, clear, very careful [clar.dil.vald.]	82360
15	81100

	Chord of the distance from the zenith [chor.diſt. à vertice.]
19, clear, careful [Clar.dilig.]	78600
20, clear, careful [Clar.dilig.]	77963
23, clear, careful [Clar.dilig.]	76100
24, clear, careful [Clar.dilig.]	75480
29	72400
31, clear, careful [Clar.dilig.]	71200
April 4, clear, careful [4 Aprilis,cla.dilig.]	68834
5, clear, careful [Clar.dilig.]	68234
12, clear, careful [Clar.dilig.]	64234
23, clear [Clar.]	58400
28, clear, careful [Clar dilig.]	46200
June 2, clear, careful [2 Iunij,Clar.dilig.]	45480
4	45290
5	45200
7, clear, careful [Clar.dilig.]	45043
9, fairly clear [ſatis clara]	44975
June 10, clear, careful [10 Iunij,Clar dilig.]	44940
11	44900
12, clear, careful [Cla.dilig.]	44890
24, clear, careful [Clar.dilig.]	45710
29, clear, careful [Clar.dilig.]	46534
July 31, clear, careful [31 Iulij,cla.dilig]	57750

	Chord of the distance from the zenith [chor.diſt. à vertice.]
August 24, clear, careful [24 Auguſt.clar.dil.]	70950
September 7, clear, careful [7 Septemb.clar.dil.]	79550
8, clear, careful [Cla.dilig.]	80175
9	80810
11, clear, careful [Cla.dilig.]	82040
21, clear, careful [Cla.dilig.]	88240
27, clear, careful [Cla.dilig.]	91870
October 28, clear, careful [28 Octob.clar.dilig.]	108313
November 30, clear, careful [30 Novēb.cla.dil.]	118013
Year of Christ 1490, current [Anno Chriſt 1490.cur.]	
February 21, fairly clear [21 Februa.ſatis clar.]	94750
28, clear, careful [clarus diligens]	90550
May 2, clear, careful [2 Maij,cla dilig.]	54350
June 11, fairly clear [11 Iunij,ſatis clar.]	44900
12, clear, careful [clar.dilig.]	44900
15, clear, careful [clar.dilig.]	44940
21, very clear, careful [clar.vald.dilig.]	45325
August 5, clear, careful [5 Auguſt.cla.dilig.]	60140
September 12, moderate [12 Septēb. medioc.]	82513
December 6, clear, careful [6 Decemb.cla.dil.]	118600

	Chord of the distance from the zenith [chor.diſt. à vertice.]
7, clear, careful [Clar.dilig.]	118650
8, clear, careful [Clar.dilig.]	118675
12, very clear, careful [clar.valp.dilig.] [recte: vald.]	118790
13, clear, careful [Cla.dilig.]	118788
15, clear, careful [Cla.dilig.]	118760

	Chord of the distance from the zenith [chor.diſt. à vertice.]
19, clear, careful [cla.dilig.]	118560
26, clear, careful [cla.dilig.]	117760
Year of Christ 1491, current [Anno Chriſt.1491. cur.]	
January 6, clear, careful [6 Ianuar.cla.dilig.]	115490
11, clear, careful [clar.dilig.]	114040
12, clear, careful [cla.dili.]	113720
13, clear, careful [Clara dili.]	113400
17, clear, careful [Cla.dili.]	112000
21, clear, careful [cla.dili.]	110480
February 13, clear, careful [13 Febr.cla. dilig.]	99400
14, clear, careful [cla. dilig.]	98860
16, clear, careful [clar. dili.]	97750
25, clear, careful [Cla dilig.]	92500
March 2, clear, most careful [2 Martij, clara diligentiſſima.]	89490
11, not very clear, but fairly so [non valde clarus,ſed ſatis.]	83940
12, fairly clear [ſatis clarus.]	83325
13, clear, careful [clar.dil.]	82680
23, sky very clear, careful [cœlum val. cla.di.]	76425
24, fairly clear [clar. ſatis.]	75775
25, clear, careful [clar.dil.]	75188
April 5, fairly clear, most careful [5 Aprilis ſatis clara diligentiſſima]	68525
18, very clear, careful [cla. valde dili.]	61210

	Chord of the distance from the zenith [chor. diſt. à vertice.]
27, clear, careful [cla.dilig.]	56750
June 12, not the most certain, but sufficient [12 Iunij, non certiſſ. ſed ſuf.]	44900
14, fairly clear [Clar. ſatis.]	44910
17, clear, careful [clar.dilig.]	45010
July 18, clear, careful [18 Iulij,clar. dil.]	51925
September 9, clear, careful [9 Septemb.cla.dil.]	80550
14, fairly clear [ſatis clar.]	83680

	Chord of the distance from the zenith [chor. diſt. à vertice.]
15, clear, careful [Clar. dil.]	84234
December 14, moderate [14 Decēb.medioc.]	118790
15, very clear, careful [cla.vald.dili.]	118767
16, very clear, careful [cla.vald.dili.]	118734
Year of Christ 1492, current [Anno Chriſti 1492. cur.]	
June 4, clear, careful [4 Iunij, clar.dilig.]	45250
5, clear, careful [Clar.dilig.]	45160
6, clear, careful [Clar.dilig.]	45100
7, clear, careful [Clar.dilig.]	45040
8, clear, careful [Clar.dilig.]	44980
9, clear, careful [Clar.dilig.]	44934
10, clear, careful [Clar.dilig.]	44900
11, clear, fairly careful [cla. ſatis dilig.]	44888
12, as the preceding [ut præcedens]	44888
22, clear, careful [clar.dilig.]	45520
23, clear, careful [Clar.dilig.]	45634
24, clear, careful [Clar.dilig.]	45800

	Chord of the distance from the zenith [chor.diſt. à vertice.]
September 26, clear, careful [26 Septemb.cla.dil.]	91367
27, clear, careful [Clara dili.]	92020
Year of Christ 1493, current [Anno Chriſti 1493. cur.]	
September 13, very careful [13 Septemb.val.dil.]	83320
14, clear, at the same instant [Cla eodē inſtant.]	83934
17, clear, careful [Cla.dilig.]	85800
18, clear, careful. Base yourself on this one [Clar.dilig. Funda te in hanc]	86400
22, clear, careful. Base yourself on this one [Clar.dilig. Funda te in hanc]	88867
23, the sky very clear, hence a most careful and best observation; if others agree with it, let them all be judged certain [Cœlum ſereniſſimū,unde diligētiſſima optimaq; obſervatio, cui ſi alię correſpondent, certę omnes judicentur.]	89460
24, very careful observation [vald. dil.obſerv.]	90056
29, very clear, careful [Cla.vald.dil.]	93067
September 30, clear, most careful indeed [30 Septembr. clar diligentiſsim.vald.]	93650
October 1, clear, very careful [1 Octob.cla.dil.val.]	94245
2, clear, careful [Cla dilig.]	94640
14, very clear, careful [cla.vald.dili.]	101534
November 11, fairly clear, most careful [11 Novemb.ſatis clar. diligentiſsim.]	113650
18, clear, careful [clar dil.]	115688

	Chord of the distance from the zenith [chor.diſt à vertice]
Year of Christ 1494, running [Ann.Chriſt.1494 labēt.]	
January 4, clear, careful [4 Ianuar.cla.dilig.]	115940
5, clear, careful [Clar. dil.]	115688
13, clear, careful [Clar.dilig.]	113334
15, very clear, careful [cla.val.dil.]	11264[?]
February 13, very clear, careful [13 Febr.cla. vald.dil.]	99267
June 8, clear, careful [8 Iunij,clar. dil.]	45025
10, clear [Cla.]	4492[?]
12, very clear, careful [Cla.vald.dil.]	44900
13, very clear, careful [Clar.vald.dil.]	44910
14, clear, careful [Clar.dilig.]	44925
23, clear, careful [Clar.dilig.]	45588
24, very clear, careful [cla. vald.dili.]	45700
September 13, clear, careful [13 Septemb.cla.dil.]	83171
14, clear, fairly careful [cla ſatis dil.]	83785
December 13, clear, careful [13 Decēb. cla.dil.]	118800
14, fairly clear, careful [ſat.cla.dil.]	118790
Year of Christ 1495, running [Anno Chriſt.1495. lab]	
March 8, clear, careful [8 Martij, cla.dilig.]	85788
June 11, clear, careful [11 Iunij, clar.dilig.]	44920
13, clear, careful [clar.dil.]	44910
14, clear, careful [clar.dil.]	44925
September 6, very clear, careful [6 Septēb.cla.val.dil.]	78650
8, very clear, careful [cla.vald.dilig.]	79900
9, clear, careful [cla.dilig.]	80533

	Chord of the distance from the zenith [chor,diſt. à vertice.]
11, very clear, careful [cla. valde dili.]	81764
15, very clear, careful [cla. vald.dili.]	84280
16, very clear, careful [cla. vald.dili.]	84880
21, clear, fairly careful [cla. ſatis dilig.]	87940
29, very clear, careful [cla.vald. dilig.]	92770
30, very clear, careful [cla.vald. dili.]	93378
December 15, clear, careful [15 Decēb.cla.dili.]	118788
Year of Christ 1496, current [Anno Chriſt. 1496. cur.]	
June 8, very clear, careful [8 Iunij,cla.val.dili.]	45100
9, clear, careful [cla.dilig.]	45070
10, very clear, careful [cla. vald.dilig.]	45025
15, rays weak [Radij debiles.]	45000
16, very clear, careful [cla.vald. dilig.]	45025
17, clear, careful [cla.dilig.]	45088
August 30, very clear, careful [30 Aug.cla.val.dil.]	74800

	Chord of the distance from the zenith [chor,diſt. à vertice.]
September 5, fairly careful [5 Septēb ſatis dili.]	79144
9, careful [Diligens.]	81000
10, fairly clear, careful [ſatis cla.dilig.]	81612
13, very clear, careful [cla.vald.dili.]	83490
14, fairly clear, very careful [ſat.cla dili.vald.]	84125
15, clear, careful [cla.dilig.]	84750
17, very clear, careful, with a new instrument [cla.valde dili. cum novo inſtrumento.]	85975
18, fairly clear, very careful [ſatis cla.dil.vald.]	86575
29, clear, careful [cla.dilig.]	93240

	Chord of the distance from the zenith [chor. diſt. à vertice.]
30, very clear, careful [cla.valde dili.]	93840
October 1, very clear, careful [1 Octob cla.val.dil.]	94400
6, very clear, careful [cla. vald.dili.]	97300
7, very clear, careful [cla.vald.dil.]	97[?]88
December 10, fairly clear, careful [10 Decēb.ſat.cl.dil,]	118800
11, clear, very greatly careful; give credence [cla.valde multū diligens adhibe fidem.]	118800
Year of Christ 1497, running [Anno Chr.1497.labēte.]	
March 8, very clear, careful [8 Martij,cla.val.di.]	85480
28, very clear, careful [cla.vald. dilig.]	73080
29, very clear, careful [cla.vald.dili.]	72445
April 24, very clear, careful [24 April cla.val.dil.]	57940
May 7, clear, careful [7 Maij,cla. dili.]	52225
8, clear, careful [cla.dilig.]	51800
10, clear, careful [cla dilig.]	51075
28, very clear, careful [cla. vald.dilig.]	46240
June 10, very clear, careful [10 Iunij,cla.vald.dil.]	44925
14, fairly clear, careful [ſatis cla.dilig.]	44934
15, clear, careful [cla. dilig.]	44966
September 21, clear, careful [21 Septēb.cla.dilig]	88300
24, clear, very careful [cla.dilig.vald.]	90100
29, not the most certain [non certiſſima.]	93140
October 1, very clear, careful [1 Octob.cla.val.di.]	94300
2, very clear, careful [cla.vald.dili.]	94886
3, clear, most careful [cla.diligentiſ.]	95450

	Chord of the distance from the zenith [chor.diſt. à vertice.]
15, clear, careful [cla. dilig.]	102050
16, clear, careful [cla. dilig.]	102575
20, very clear, careful [cla. val.dili.]	104600
21, very clear, careful [cla. vald.dili.]	105100

	Chord of the distance from the zenith [chor.diſt. à vertice.]
27, very clear, careful [cla.vald. dil.]	107900
28, clear, fairly careful [cla.ſat.dilig.]	108340
Year of Christ 1498, current [Anno Chriſt. 1498.cur.]	
June 5, very clear, careful [5 Iunij,cla.vald.dil.]	45225
6, very clear, careful [cla.vald. dilig.]	45150
7, very clear, careful [cla.vald.dil.]	45090
9, very clear, careful [cla.vald.dili.]	44966
10, clear, very careful [cla.dilig.vald.]	44934
11, very clear, careful [cla. vald.dilig.]	44910
12, very careful [vald.dilig.]	44890
13, very clear, careful [cla.vald.dili.]	44900
16, clear, careful [cla dilig.]	44990
18, clear, most careful [cla.diligentiſ.]	45090
July 23, very clear, careful [23 Iulij,cla.vald.dil.]	53625
August 12, clear, fairly careful [12 Auguſt.cla.ſat.dil.]	63900
15, clear at the instant, very careful [cla.in inſtāt.va.di.]	65600
September 11, very clear, careful [11 Septēb.cla.val.di.]	81925
12, clear at the instant, most careful indeed [clar.in inſtanti valde diligentiſ.]	82566
15, clear at the instant, doubtful [cla.in inſtāt.dubit.]	84400
18, very clear, careful [cla.vald. dilig.]	86266

	Chord of the distance from the zenith [chor.diſt. à vertice.]
19, very clear, careful [cla.val.dil.]	86888
20, clear, most careful [clara diligentiſſim.]	87500
28, clear, careful [cla.dilig.]	92336
29, clear, careful [clar.dilig.]	92916
30, very clear, careful [cla. vald.dili.]	93525
October 1, clear, careful [1 Octob. cla,dilig.]	94110
16, clear, careful, most certain [clar.dil.certiſſima]	99775
24, clear, careful [cla.dilig.]	106400
November 10, clear, careful [10 Novēb.clar. dil.]	113225
15, clear, careful [cla.dilig.]	114788
23, very clear, careful [clar.vald.dil.]	116766
December 1, clear, careful [1 Decēb.cla.dilig.]	118100
Year of Christ 1499, running [Ann.Chriſt.1499 labēt.]	
January 22, clear, careful [22 Ianuarij,cla.dili.]	110040
26, clear, very careful [clar.dilig.vald.]	108350
31, very clear, careful [cla.valde dili.]	106066
February 3, cloud [?], dew [?] [3 Februa.nub.ror.]	104612
11, clear at the instant, very careful [cl.in inſtā.di.val.]	100466
12, very clear, careful [Cla.vald.dil.]	99917
March 14, very clear, careful [14 Martij,cla.val.di.]	82000
April 7, very clear, careful [7 April.cla.val.dil.]	67300

	Chord of the distance from the zenith [chor.diſt. à vertice.]
21, very clear, careful [cla.vald.dili.]	59640
23, very clear, careful [cla. vald.dilg.]	58625
29, very clear, careful [cla.vald.dilig.]	55750
30, very clear, careful [clar.vald.dil.]	55300

	Chord of the distance from the zenith [chor. diſt. à vertice.]
May 1, very clear, careful [1 Maij,clar.val.dil.]	54900
2, very clear, careful [cla.vald.dili.]	54420
11, fairly clear at the instant, most careful [ſatis clar.in inſtanti diligentiſsim.]	50875
12, fairly careful [ſatis dilig.]	50517
17, at the instant, very careful [in inſtanti val.dil.]	48925
29, very clear, careful [clar.valde dilig.]	46125
June 5, very clear, careful [5 Iunij,cla.val.dil.]	45267
7, clear, most certain [clar. ceriſſima] [recte: certiſſima]	45100
8, clear, most certain [clar.certiſs.]	45040
9, clear at the instant, very careful [cla.in inſtā.val.dili.]	45000
10, very clear, careful [clar. val. dilig.]	44990
11, clear at the instant, certain; corrects the preceding, because of the motion of the instrument [cla.in inſtan.cert. corri. præcedē.propter motum inſtrumenti]	44950
12, clear, most certain [clar.certiſſ.]	44925
13, clear, most certain [clara certiſſima.]	44925
14, clear at the instant, most careful indeed [cla.in inſtanti vald. diligentiſ.]	44925
17, fairly clear at the instant, careful [ſat.cla.in inſtā.di.]	45013
21, clear, most certain [clar.certiſsima]	45313
30, fairly clear, very careful [ſatis cla.dil.vald.]	46667
July 7, clear, most certain [7 Iulij,clar. certiſ.]	48310
11, clear, most certain [clar.certiſ.]	49500
16, clear, most certain [clar.certiſſ.]	50188

	Chord of the distance from the zenith [chor.diſt. à vertice.]
28, clear, most certain [clar.certiſſ.]	56148
August 4, clear, most certain [4 Auguſt.cla.certiſ.]	49520
13, clear, most certain [clar.certiſs.]	64350
September 30, clear, careful [30 Septemb.clar. dil.]	93375
November 3, very clear, careful [3 Novēb. cl.val.di.]	110600
December 7, very clear, but not the most certain [7 Decēb.clar.val.ſed non certiſſ.]	118634
Year of Christ 1500, running [Anno Chr.1500.labēte.]	
March 1, very clear, careful [1 Martij, cla.val.dil.]	89625
8, clear, most certain [clar. certiſsima]	85300

	Chord of the distance from the zenith [chor.diſt. à vertice.]
29, very clear, careful [Cla.vald.dil.]	72217
April 23, fair [23 April.mediocris]	58240
24, very clear, careful [clar.vald. dilig.]	57757
May 19, clear, most certain [19 Maij,clar.certiſſ.]	48140
23, very careful [valde dilig.]	47125
24, very clear, careful [clar.vald.dilig.]	46913
25, very clear, careful [cla.vald.dil.]	46734
26, very clear, careful [cla.vald.dilig.]	46525
28, very clear, careful [clar.vald.dilig.]	46183
June 1, clear, most certain [1 Iunij,clar.certiſs.]	45567
2, clear, most certain [clara certiſſ.]	45467
8, clear, most certain [clar.certiſs.]	44975
9, very clear, careful [clara vald. dilig.]	44934
10, clear, fairly very careful [cla, ſatis vald.dili.]	44900
11, clear, most certain [clar.certiſſima]	44890

	Chord of the distance from the zenith [chor.diſt. à vertice.]
12, brilliant, most certain [præc.certiſſima]	44883
13, very clear, careful [cla. vald.dilg.]	44890
14, very clear, careful [cla.vald.dilig.]	44917
15, brilliant, most certain [præc. certiſſima]	44957
16, clear, most certain [clar.certiſſima]	44990
July 26, clear, most certain [26 Iulij,clara certiſ.]	55580
28, brilliant, most certain [præc.certiſſima]	56488
September 2, clear, certain [2 Septemb cla.cert.]	76675
December 16, clear, fair [16 Decēb.cla.med.]	118700
30, very clear, careful [clar.vald.dil.]	116950
31, clear, most certain [clar.certiſ.]	116760
Year of Christ 1501, flowing [Anno Chriſt.1501.flu.]	
January 17, clear, certain [17 Ianuarij,cla.cert.]	111817
March 10, clear, certain [10 Martij, cla cert.]	84234
17, clear, most certain [clara certiſſima.]	79825
21, fairly clear, very [ſatis clar.vald.]	77300
April 14, clear, most certain [14 April.clar.certiſſ.]	63090
21, clear, most certain [clara certiſſ.]	59360
May 2, clear, most certain [2 Maij,clar.certiſſ.]	58875
6, clear, fairly careful [clar.ſatis dilig.]	52575
28, very clear, careful [clar.valde dilig.]	46210
June 5, clear, most certain [5 Iunij,clar.certiſ.]	45167
6, clear, most certain [clar.certiſſima]	45100
14, doubtful [Dubia]	44910
16, clear, most certain [clar. certiſsima]	44980

	Chord of the distance from the zenith [chor. diſt. à vertice.]
July 2, clear, most certain [2 Iulij,clar. certiſ.]	47190
3, clear, most certain [clar.certiſs.]	47425
4, clear, most certain [clar.certiſs.]	47667
September 4, clear, most certain [4 Septēb.cla.certiſ.]	77775
5, clear, most certain [clar.certiſsima]	78400
6, clear, most certain [clar.certiſſ.]	79020
8, brilliant, most certain [præc.certiſſ.]	80263
9, clear, careful [clar.dilig.]	80875
12, clear, most certain [clar.certiſſ.]	82734
13, brilliant, most certain [prẹc.certiſſ.]	83367
14, brilliant, most certain [præc.certiſſ.]	83990
15, clear, most certain [clar.certiſſ.]	84600
19, clear at the instant, careful [clar.in inſtant.dil.]	87050
22, clear, most certain [clar.certiſſ.]	88910
28, brilliant, most certain [præclar.certiſs.]	92500
December 6, clear, certain [6 Decēb.clar.cert.]	118590
10, clear, most certain [clar certiſs.]	118775
Year of Christ 1503, flowing [Anno Chriſt 1503. flu]	
March 15, in a new house, fair [15 Martij, in nova domo mediocris]	81325
16, clear, most certain [clar.certiſs.]	80675
17, clear, most certain [clar.certiſſima]	80080
18, clear, careful [clar.dilig.]	79467
20, dewy clouds [nubes roridæ,]	78220
22, clear, most certain [clar.certiſſ.]	76940

	Chord of the distance from the zenith [chor.diſt. à vertice.]
24, clear, most certain [clar.certiſſ.]	75700
27, dewy clouds, but careful [nubes rori.ſed dil.]	73850
28, brilliant, most certain [præc. certiſsima]	73240
April 1, clear, certain [1 Aprilis,clar.cert.]	70790
4, fair, or fairly [mediocris ſ. ſatis.]	69000
6, clear, most certain [clar.certiſſ.]	67834
8, clear, most certain [cla. certiſſ.]	66667
[?]8, clear at the instant, careful [clar.in inſtanti dil.]	61100
23, clear, most certain [clar. certiſſim.]	58567
24, dewy clouds, but careful [nub.rorid.ſed dil]	58080
April 25, clear, certain [25 Aprilis,cla.cert.]	57600
26, clear, most certain [clar.certiſſ.]	57100
27, clear, most certain [clar. certiſſ.]	56636
May 3, fairly clear, not the most certain [3 Maij,ſatis clar.non certiſsim.]	53980
5, clear at the instant, most certain indeed [clar.in inſtanti vald certiſſim.]	53113
6, clear at the instant, certain [cla.in inſtanti cer.]	52700

	Chord of the distance from the zenith [chor.diſt. à vertice.]
7, dewy clouds, careful [nubes roridæ dili.]	52313
9, brilliant, most certain [præc.certiſ.]	51560
10, brilliant, most certain [prę̨c.certiſ.]	51167
[?]1, brilliant, certain [præc. cert.]	50825
12, brilliant, most certain [præc.certiſ.]	50467
13, brilliant, most certain [præc. certiſ.]	50125
14, clear, most certain [cla.certiſſim.]	49788

	Chord of the distance from the zenith [chor.diſt. à vertice.]
16, clear, most certain [cla.certiſ.]	49160
17, clear, most certain [cla-certiſ.]	48860
18, fair [Mediocris.]	48590
19, at the instant, clear, certain [in inſtanti cla.cer.]	48300
20, clear, most certain [cla. certiſ.]	48034
21, clear, most certain [cla.certiſ.]	47775
22, clear, most certain [cla.certiſ.]	47500
23, clear, certain, trust [cla.cert confid.]	47250
24, clear, certain, trust [cla.cert.confid.]	47025
25, clear at the instant, certain [cla.in inſtanti cert.]	46817
26, fairly, at the instant [ſatis in inſtanti.]	46600
27, clear, most certain, trust [cla.certiſ.confid.]	46413
28, clear, most certain, trust [cla.certiſ.confid.]	46225
29, very doubtful [Dubia valde]	46067
30, brilliant, exceedingly certain [præc. præcertiſ.]	45890
31, brilliant, exceedingly certain [præcl. præcertiſ.]	45750
June 1, clear, most certain [1 Iuuij,clar.certiſs.] [recte: Iunij]	45634
2, brilliant, most certain, trust [præclar. certiſsima con fide.]	45500
3, brilliant, most certain [præcl.certiſs.]	45388
4, brilliant, most certain [præcl. certiſ.]	45280
5, brilliant, exceedingly certain, trust [præclar.præcertiſs.confide.]	45188
6, brilliant, most certain [præclar.certiſs.]	45113
8, brilliant, exceedingly certain, trust [præc.præcer. cōfi.]	44988

	Chord of the distance from the zenith [chor.diſt. à vertice.]
9, brilliant, exceedingly certain, trust [præclar.præcertiſs.confide.]	49934
10, brilliant, exceedingly certain, trust [præclar.præcertiſ. confide.]	44900
11, very clear, careful [cla.vald.dilig.]	44870

	Chord of the distance from the zenith [chor.diſt. à vertice.]
12, brilliant, exceedingly certain, trust [præclar.præcertiſſ.confide]	44840
13, brilliant, exceedingly certain, trust [præclar.præcertiſ. confide]	44850
14, brilliant, exceedingly certain [præc.præcertiſſi.]	44867
16, brilliant, exceedingly certain [prælc.præcertiſs.]	44913
17, brilliant, exceedingly certain [prælc.præcertiſs.]	44980
24, at the instant, very clear, careful [in inſtanti clar.vald.dilig.]	45599
25, clear at the instant, very careful [cla.in inſtā.val.di.]	45725
26, at the instant, brilliant, exceedingly certain [in inſtanti prælc. præcertiſſim.]	45880
27, not altogether clear, careful [non omnin.cl.dil.]	46040
28, clear, most certain, trust [cla.certiſſ.confid.]	46200
30, brilliant, exceedingly certain, trust [prælc.præc. conf.]	46580
July 2, brilliant, exceedingly certain, trust [2 Iul.prę̃cl.prę̃c.cō̃f.]	47000
4, brilliant, exceedingly certain, trust [prælc.præc.conf.]	47480
26, clear, most certain [clar.certiſſ.]	55200
27, clear, certain, trust [cla.cert.confid.]	55634
29, brilliant, exceedingly certain, trust [prælc.præc.conf.]	56550

	Chord of the distance from the zenith [chor.diſt. à vertice.]
30, brilliant, exceedingly certain, trust [prælc.præc,conf.]	57034
31, clear at the instant, certain [clar.in inſtāti cert.]	57517
August 1, not altogether clear [1 Aug.nō omni.cla.]	58000
2, fair [Mediocris.]	58500
5, clear at the instant, certain [cla.in inſtant.cert.]	59988
6, fair, but sufficient [mediocris ſed ſuf.]	60500
7, clear at the instant, certain [cla.in inſtant.cert.]	61020
10, brilliant, certain, trust [prælcla.cert.confi.]	62613
11, clear, certain, the instrument rectified by the gnomon [cla.cert.rectif. inſtrumēto per Gnomon.]	63163
13, fairly clear, certain, the instrument rectified, as throughout the summer, not for the gnomon [ſatis cla.cert.inſtrumēto rectificato, ut per æſtatē non pro Gnomo.]	64313
15, the instrument rectified by the gnomon [inſtrum. rectificat. per Gnom.]	65400
16, clear, certain, the instrument rectified, not by the gnomon, as throughout the summer [cla.cer.inſtru. rectif.nō per gno.ut per ę̣ſta.]	65980
25, brilliant, exceedingly certain, trust, the instrument rectified by the gnomon [præclar.prælcert.confid.rectificat.inſtrument.per Gnomo]	71250
26, clear, most certain [cla.certiſs.]	71800
28, by the gnomon [per Gnomonem]	73088
On the same day, not by the gnomon [eodē die nō per gn.]	73075
September 1, clear, most certain, by the gnomon [1 Septemb.cla.certiſ. per Gnomonem]	75510

	Chord of the distance from the zenith [chor.diſt. à vertice.]
On the same day, not by the gnomon but with the larger line placed on the arc [Eodem die non per gnomonē ſed majori linea ſuper arcu poſita.]	75534
5, fair, by the gnomon [medioc.per gnom.]	77990
8, by the gnomon [per gnomonem.]	79875
On the same day, joined [?] with thick, the same larger lines [Eodem die conjuncti groſſis idē maiorib.lineis]	79888
18, very clear, careful, by the gnomon, and in all the following by the gnomon [cl.val.dil.per gnom & in omnibus ſequētibus per gnomonem.][65]	81125
13, very fair [mediocris vald.]	83000
16, clear, exceedingly certain, trust [cla.prę̃cer.confid.]	84875
17, brilliant, exceedingly certain [præclar. præcert.]	85475
19, clear, most certain [clar.certiſſim.]	86700
21	87975
28, clear, most certain [clar.certiſsima.]	92200
Likewise by the armillary rings, di [?] Libra [Itē per Armillas di ♎]	13153
October 4, not altogether certain [4 Oct.non omni.cer.]	95688
5, clear at the instant, most certain; base yourself on this one [clar.in inſtanti certiſſima funda te in hanc]	96280
8, clear, fairly most certain [cla.ſatis certiſſim.]	97960
13, clear, most certain [clar. certiſſ.]	100700
24, fairly clear, careful [ſatis cla.dilig.]	106290
November 4, clear, certain [4 Novēb.cla.cert.]	110967
12, clear, most certain [cla.certiſſi.]	113780

	Chord of the distance from the zenith [chor.diſt. à vertice.]
6, clear, fairly careful [Clar.ſatis dil.]	114995
17, dewy clouds, very careful [nubes roridæ valde dilig.]	115267
December 6, clear, most certain [6 Decembris,clara certiſſima.]	118517
12, brilliant, exceedingly certain, trust [præclara præcertiſſima confide]	118750
4, a very little before the instant, very clear [valde modicum ante inſtans val.clar.][66]	118740
16, brilliant, exceedingly certain, trust [præcl.prę̃c.cōf.]	118690
23, not the most certain [non certiſſ.]	118150
Year of Christ 1504, running [Ann.Chriſti 1504. labē.]	
January 6, brilliant, most certain [6 Ianuarij, præclar. certiſsim.]	115490
8, clear, most certain [Clar.certiſſ.]	114934
9, clear, most certain [Clar.certiſſ.]	114650
10, clear, most certain [Clar.certiſſim.]	114340

[65] the page prints the date 18 here, between 8 and 13.
[66] the page prints the date 4 here, between 12 and 16.

	Chord of the distance from the zenith [chor.diſt. à vertice.]
20, clear, most certain, fairly, but with agitation [Cla.certiſſ.ſatis,ſed cum agitatione.]	110913
23, clear, most certain, trust [Cla.certiſ.conf.]	109700
24, brilliant, certain, trust [pręcl.cert.conf.]	109290
25, clear, most certain, trust [Cla.certiſs.conf.]	108880
26, brilliant, exceedingly certain [præcla.præcert.]	108440
February 4, very clear, careful [4 Februar.clara valde diligent.]	104167

	Chord of the distance from the zenith [chor.diſt. à vertice.]
6, somewhat dewy clouds [nubes aliqualiter roridæ]	103225
6, clear, fairly [Clar.ſatis]	102680
9, brilliant, most certain, trust [præclara certiſſima confide]	101620
10, very clear, careful [clar. valde dilig.]	101100
11, not very clear [non valde clarus]	100550
12, brilliant, most certain, trust [pręclar. certiſſima confide]	100000
13, brilliant, certain, trust [præcl. cert.conf.]	99450
15, clear, and more than enough [clarus pluſque ſat.]	98350
19, very fair [mediocris vald.]	96090
20, brilliant, exceedingly certain, trust [præcla.præcertiſſi. confide]	95500
25, fair, but enough [mediocris ſed ſat.]	92590
March 3, brilliant, exceedingly certain, trust [3 Martij, præclar.præcert. confide]	88325
12, clear, exceedingly certain, trust [clar.præcert.conf.]	82750
18, clear, exceedingly certain, trust [clar.pręcert.conf.]	78990
19, clear, most certain [clar. certiſſ.]	78390
23, clear, most certain [Clar.certiſſim.]	75867
25, clear, most certain [cla.certiſſi.]	74610
26, fair because of dewy clouds on that day before noon [mediocris propter nubes roridas eo die ante meridiem]	73988

	Chord of the distance from the zenith [chor.diſt. à vertice.]
27, clear, most certain [clar.certiſſim.]	73384
28, dewy clouds [nubes roridæ]	72784
29, clear, most certain [clar. certiſsima.]	72175
April 6, clear, most certain [6 April.cla certiſ.]	67400
7, clear, most certain [Clar.certiſſ.]	66790
8, fair [mediocris]	66213
20, clear, most certain [Clar.certiſſ.]	59690
26, very clear, careful [Clar. valde dilig.]	56734
27, clear, most certain [Cla. certiſſ.]	56275
28, clear, most certain [Cla. certiſs.]	55800
29, brilliant, most certain [præclar.certiſsim.]	55340

	Chord of the distance from the zenith [chor.diſt. à vertice.]
30, brilliant, exceedingly certain [præcl. præcert.]	54900 / 54910
May 1, brilliant, exceedingly certain, trust [1 Maij.præclar.præcertiſ. confid.]	54457
4, clear, most certain [Cla.certiſ.]	53213
7, very clear, careful [cla.valde dilig.]	52013
9, clear, most certain, trust [cla.certiſ.confid.]	51267
10, brilliant, most certain [præclar.certiſſ.]	50910
11, clear, most certain [clar.certiſſ.]	50567
12, a little after the instant [Modicum poſt inſtans]	50210
13, brilliant, exceedingly certain [præcla.præcertiſ.]	49900
14, fair [mediocris.]	49567
May 15, fair [15 Maij,mediocris]	49275

	Chord of the distance from the zenith [chor.diſt. à vertice.]
16, brilliant, exceedingly certain, trust [præclar. præcertiſſima confide]	48934
19, dewy but careful [rorida ſed dilig.]	48110
20, clear, most certain [clar.certiſſ.]	47825
23, clear, most certain [clar. certiſſ.]	47067
24, clear, most certain [clar. certiſſ.]	46850

	Chord of the distance from the zenith [chor.diſt. à vertice.]
25, brilliant, certain, trust [præcl.cert.confid.]	46650
28, brilliant, most certain [præcla.certiſſ.]	46090
29, clear, most certain [clar.certiſſ.]	45925
30, very fair [mediocris valde]	45800
June 3, very clear, most careful [3 Iunij, clarus valde diligentiſs.]	45280

Johannes Schöner's Notes on the Construction and Use of the Rectangle, or Astronomical Staff [IOHANNIS SCHONERI IN CONSTRVCTIONEM ATQVE VSVM RECTANGVLI, ſive radij Aſtronomici, annotationes.]

To construct the rectangular instrument [rectanguli inſtrumenti], or astronomical staff, make a staff [baculus], or four-sided rod [fuſtis quadrangularis], with flat faces, 6 or more cubits long, which I mean to represent here by the line AB. Divide it into any number of equal parts you like, for the more parts there are, the more commendable the work will be. Still, the favoured division of this one is into 1300 parts, in this way: first divide it into 13 equal portions, each of which will contain 100; then divide each of them into 10 small portions, each

of which will represent 10. Finally write in the numbers of the parts, as on the line AB, rising by 100s until you reach 1300, and the rod will be ready.

Then also make the arms [brachia], or vanes [pinnacidia], of various sizes. And if you wished to make them all, there would be, according to the division of the line AB, 21; for in this way the first and smallest vane would be worth 10 parts of the rod, the second 20, the third 30, so that the largest and last, and 21st, would have 210 parts equal to those divisions and parts of the rod AB. Now let them be pierced in the middle so that the rod can enter, and so that they make right angles with it, yet in such a way that they can be moved along it this way and that without hindrance. Near the end of each vane, moreover, set a fine little pin [claviculum], or a needle. Likewise, near A as well, set one eye of the centre [oculum centri], and this instrument will be ready.

On the Use of This Astronomical Triangle [Pro uſu hujus trianguli Aſtronomici.]

Diagram. The figure stands to the right of a narrow column of text. A graduated vertical staff runs from A at the foot up to B at the head. Two dashed lines rise from A and diverge to the two ends of a solid arc drawn across the top, above B, and each end of the arc carries a small drawn sign. A solid horizontal bar joins C, on the left dashed line, to D, on the right one, crossing the staff just below the tick labelled 800. The staff carries cross-ticks, one at each labelled hundred and an unlabelled one between each pair.

- A (foot of the staff, where the two dashed lines meet)
- B (head of the staff, below the arc)
- C (left end of the horizontal bar, outside the left dashed line)
- D (right end of the horizontal bar, outside the right dashed line)
- Scale printed to the right of the staff, top to bottom: 1500, 1200, 1100, 1000, 900, 800, 700, 600, 500, 400, 300, 200 [?], 100[67]
- Sign at the left end of the arc: a bar with an oblique stroke beneath it [?]
- Sign at the right end of the arc: a form like a cross, with a short stroke of the dashed line beside it [?]

Fit to the rod one of the vanes, and indeed the one that, by your estimate, will appear the more suitable for the distance of the stars to be considered. When this is done, move the vane this way and that along the staff until both stars are seen together from A through the points of the pins. For the lines proceeding in this way from A, the centre of sight, and ending at the stars, produce an equilateral triangle [trianglū æquilaterū]. And the number of parts of the arm, or vane, thus resting on the rod, the sine first indicates. The number on the rod, moreover, from the eye A all the way to the fiducial line [lineam fiduciæ] of the vane, where the pins are, will denote the second sine [Sinum ſecundum].

[67] the top label follows 1200 directly, one tick-pair above it; the scale below it rises by 100 at each labelled tick, and the preceding page gives 1300 as the top of the division.

To Take the Arc of Distance of the Great Circle Passing through Two Stars [Arcum diſtantiæ circuli magni per duas ſtellas tranſeuntis,capere.]

You will derive this arc by means of the Gnomonic table [tabulam Gnomonicam] given in the *Geometric Square* [Quadrato Geometrico] of Master Georg von Peuerbach [M. Georgij Beurbachij], and by the most common rule of proportions, the Rule of Three [regulam proportionum vulgatiſſimam de Tri], in this way. Multiply the largest number of the Gnomonic table, namely 1200, by the first sine just found, namely CD, and divide the product by the second sine, namely AE, cut off by the fiducial line of the vane. Finally, send this product into the Gnomonic table. For the arc of degrees and minutes, etc., found there will show you the arc of the distance between the two stars observed.

For an example: on 1475 October 17 [An.Chriſt.1475 fluente 17 die Octobr.], in the morning, between the second and third hours after midnight, the venerable old man Bernhard Walther, citizen of Nuremberg, observed with the triangle instrument the distance of Mars and Saturn, and found the first sine to be of 210 parts and the second sine of 807 parts. With these sines, proceed as follows according to the rule of proportions. Say: 807 parts of the rod, that is, the second sine, give 210 parts of the vane, that is, the first sine; what will the parts of the Gnomonic table, namely 1200, give? I therefore multiply the parts of the first sine, namely 210, by the parts of the Gnomonic table, namely 1200, which makes 252000. I divide these parts by the second sine, namely 807, and the result is 312 216/807. To these there correspond, from the Gnomonic table, about 14° 35′, the arc between Saturn [♄] and Mars [♂] at the time of the observation, etc. The diameter of a comet, of the Sun and of the Moon is also sought in this way.

Observations of Eclipses, Comets, Planets and Fixed Stars by Regiomontanus, Georg von Peuerbach, Bernhard Walther and Others [IOANNIS DE MONTEREGIO, GEORGII BEURBACHII, BERNARDI Waltheri, ac aliorum, Eclipſium, Cometarum, Planetarum ac Fixarum obſervationes.]

Master Georg von Peuerbach [Magiſter Georgius Beurbachius] and Regiomontanus [Ioannes de Mōteregio] observed, at Melk in Austria [in Mellico Auſtriæ] near Vienna, in the year of our Lord 1457, a total [univerſalem] eclipse of the Moon at the true opposition of September, namely on the third day of the month, after sunset. At the beginning of totality [in principio morę], the second-to-last of the Pleiades [penultima ex pliadibus] had an altitude before the meridian of 22°, and the Sun [☉], by reckoning [ſecundum numerationem], stood at 48′ of the 20th degree of Virgo. At the end of totality, the altitude of the same star was 36°. This observation [conſideratio] was made at Melk Castle in Austria, which lies eleven German miles west of Vienna. From these two

altitudes of the said star I shall derive the middle time of the eclipse, using the figures set out below, with a diagram suited to the purpose.

Diagram. A circle, with the text set in a narrow column to its right. A straight line runs across it from B on the left to D on the right. Two parallel oblique lines descend from upper left to lower right: A to G, crossing BD at E, and O to Y, crossing BD at S. A shorter line runs from R on the circle to T on the line OY. Three lines drop from the circle to BD: from R to the point labelled I, from A to N, and from O to P. The label Q stands just below the point where RT crosses the line OP.

- O (on the circle, above and to the right of A): small round letter
- A (on the circle, upper left)
- R (on the circle, left, below A)
- T (at the right end of the line from R, on OY)
- Q (below the crossing of RT and OP)
- X (beside OY, above S)
- B (left end of the cross line)
- I (below the cross line, under the line from R): the sort shows a stem and foot and no right-hand arm; the text overleaf cites this point as L
- N (below the cross line, under the line from A)
- P (below the cross line, under the line from O)
- E (below the cross line, where AG crosses it)
- S (below the cross line, where OY crosses it)
- D (right end of the cross line)
- Y (on the circle, lower right, end of the line from O)
- G (on the circle, lower right, end of the line from A)

Understand A B G D as the meridian, A G as the diameter of the equator, O Y as the diameter of the parallel of the observed star, arc B R [arcum B R] equal to the altitude of the star at the hour of observation. Let R L be the right sine [ſinus rectus] of the star's altitude, A N the right sine of the altitude of the equator, O P the right sine of the meridian altitude of the noted star, point X the centre of the star's parallel, line R T equidistant from the horizon, and O Q the difference of the sines of the star's meridian altitude and of the observed altitude.

Multiplication Table for Vienna [Tabula multiplicationis ad Viennam.]

150519	1
301038	2
451557	3
602076	4
752595	5
903114	6
1053633	7
1204152	8
1354671	9

1505190	10

Altitude of the star: 22° 0′

22° 0′ of Taurus [♉], with which the star itself culminates [cœlum mediat].

23° 30′: its northern declination. 19° 48′ of Virgo [♍]: the true position of the Sun.

48° 22′: the altitude of the pole at the town of Vienna, from which the place of observation is only a short distance away.

41° 38′: the complement of the altitude of the pole, and this is arc A B.

Minutes, seconds [mi. ſe.]

4′ 3″: the Sun's northern declination.[68]

39862: sine of arc A E.[69]

41° 38′

23° 30′

65° 8′: the meridian altitude of the star.

54437: the sine of this altitude.

22476: the sine of the altitude of the star.

31961: the difference of the two sines, and this is line O Q.

39862: the sine of the complement of the altitude of the pole, and this is line A N.

Line A N to A B, as

O Q to O T [o Q ad o T.]

39862	
31961	60000
1917660000	48107

Line O T, where A E is the whole sine, 60000 [Linea o T ut A E, eſt ſinus totus 60000].

23° 30′

66° 30′: the complement of the star's declination.

55024: the sine of this complement, and this is line O X, where A E is the whole sine, 60000.

Line O T is to be found where O X is the whole sine, 60000.

[68] the head over these figures is printed mi. ſe., and the figures themselves 4. 3. For a Sun at 19° 48′ of Virgo, as this page gives it, a northern declination near 4° is to be expected, so the figures may be degrees and minutes; the page does not say so.

[69] so in this copy; the Rome copy prints A B.

55024	
60000	48107
2886420000	52457

Line O T, where O X is 60000.

Line O T, moreover, is the versed sine [ſinus verſus] of the star's distance from the meridian. I set out the derivation of this plainly in the problems, book 2, near the end [cujus rei deductioné in problematibus lib. ſecundo circa finem apertum tradidi].

52457

7543: the right sine of the complement of the star's distance from the meridian [à meridie].

7° 13′ [gr. m. 7. 13.]

82° 47′: the star's distance from the meridian.

139° 33′: the right ascension of the star [Aſcenſ. re. ſtellæ].

260° 41′: the right ascension of the Sun [Aſcenſ. re. Sol.].

121° 8′: the difference of these ascensions.

360° 0′

82° 47′

277° 13′: the arc of the equator turned through from the instant at which the star was on the meridian above the earth.

277° 13′

121° 8′

156° 5′: the Sun's distance from the meridian at the hour under consideration, which makes, in time, $10^{h}\ 24^{m}$.

Therefore the beginning of totality came when $10^{h}\ 24^{m}$ had been completed after noon.

Now to the end of totality.

36° 0′: the altitude of the star at the end of totality.

35267: the sine of this altitude.

54437

19170: the difference of the sines of the star's present altitude and of its meridian altitude.

The reasoning, as before [Syllogiſmus ut ante hac].

39862	
19170	60000
1150200000	

28855: line O T, where A E is the whole sine, 60000.

55024	
60000	28855
1731300000	

31464: the versed sine of the star's distance from the meridian.

28536

28° 24′: the complement of the distance from the meridian [à meridie].

61° 36′: the star's distance from the meridian.

298° 24′: the arc of the equator turned through from the instant at which the star was on the meridian above the earth.

298° 24′

121° 8′

177° 16′: the Sun's distance from the meridian at the hour under consideration, which makes, in time, $11^h\ 49^m$.

Therefore the end of totality came when $11^h\ 49^m$ had passed after noon.

$11^h\ 49^m$

$10^h\ 24^m$

$2^h\ 25^m$: the time of the whole of totality.[70]

$0^h\ 42^m\ 30^s$: the time of half of totality.

$10^h\ 24^m$

$11^h\ 6^m$: the time of the truest opposition of the luminaries, in equated days [Tempus veriſſimę oppoſitionis luminariū diebus æquatis]. The computation by the Alphonsine Tables [tabulas Alfonſinas], however: $11^h\ 14^m$.

Year 1460

In the night following July 3 there was a partial eclipse of the Moon [Eclipſis Lunæ particularis]. It began when $7^h\ 16^m$ after noon had passed; its middle came at $8^h\ 13^m$ and its end when $9^h\ 10^m$ had passed; the ecliptic points [puncta ecliptica]: 2. 56.[71] These figures come from the tables, for the meridian of Vienna. But as I observed the middle of this eclipse in the sky, four digits [digiti quatuor], and something more, seemed to be eclipsed. At the end, I took the apparent altitude of the Moon: 15° 18′. My teacher Georgius [Georgius præceptor meus] was also present.[72]

0. 1. 31. 5.: the Moon's mean argument [Argumentum Lunæ medium].[73]

0° 52′: the Moon's parallax [Diverſitas aſpectus Lunæ] in the circle of altitude.

15° 18′

[70] the figure is printed 2 25. The two times just above differ by $1^h\ 25^m$, and the half stated next, $0^h\ 42^m\ 30^s$, is half of that.

[71] the figures 2. 56. carry no unit on the page.

[72] Georg von Peuerbach, on the strength of the observers named in the next observation of this year; the sentence itself gives only the first name.

[73] printed without units.

16° 10′: the true altitude of the Moon, which I shall use as the altitude of the point opposite the Sun, since in this position the difference between the one and the other is imperceptible.

20° 13′: the true position of the Sun.

21° 58′: the southern declination of the point opposite the Sun.

41° 38′

19° 40′: the meridian altitude of the point opposite the Sun.

20193: the sine of this meridian altitude.

16706: the sine of the altitude taken, of the point opposite the Sun.

20193

16706

3487: the difference of these sines.

150519

3487

makes [facit] 5248 | 58753[74]

5249: the versed sine of the distance of the point opposite the Sun from the meridian, where the semidiameter of the equator is 60000.

21° 58′

68° 2′: the complement of the declination.

55644: the sine of this complement.

55644	
60000	5249
	6
	31494

5660: the versed sine of the distance of the point opposite the Sun from the meridian, where the semidiameter of the parallel is 60000.

60000

5660

54340: the sine of the complement of the distance of the point opposite the Sun from the meridian.

64° 55′

25° 5′: the distance of the point opposite the Sun from the meridian at the end of the eclipse.

1^h 40^m.

10^h 20^m: the end of the eclipse.

9^h 10^m: the end of the eclipse by computation.

1^h 10^m: the difference between the observation and the computation from the tables.

[74] as printed. 150519 × 3487 comes to 524859753, which differs at one digit of the part after the stroke.

In the same year there was a total eclipse of the Moon [Eclipſis Lunę univerſalis] at the true opposition of the luminaries, which fell on December 27. By observation [per conſiderationem], at the beginning of the eclipse, the star they call Alramech had an altitude before the meridian of 7°. At the beginning of totality [moræ] its altitude was 17°, and at the end of totality 28°. At the beginning of the eclipse the Moon was, by sight, on one great circle passing through the Preceding Head of Gemini [caput ♊ antecedentem] and the brighter star of Canis Minor. At the end, however, it was on one circle passing through the Following Head of Gemini [caput ♊ ſequentis] and Canis Minor. The observers were Georg von Peuerbach [Georgius Puerbachius] and Regiomontanus [Ioannes de Monteregio], in the town of Vienna [in oppido Viennenſi].

Now, keeping the same reasoning as before [ſervato priſtino ſyllogiſmo], I shall derive the time of this true opposition.

0° 0′ of Scorpio [?]: the point with which Alramech reaches mid-heaven [Cum quo Alramech cœlum mediat].

22° 0′: its northern declination.

15° 7′ of Capricorn: the true position of the Sun.

41° 38′

22°

63° 38′: the star's meridian altitude [altitud. ſtel. mieriad.].

53758: the sine of this altitude.

7° 0′: the star's altitude at the beginning of the eclipse.

7312: the sine of this altitude.

53758

7312

46446: the difference of these two sines, that of the present altitude and that of the meridian altitude.

Since in the figure above one must often use the ratio of line NA to AE, for convenience I set line NA at 100000 and shall see how large AE is in these parts.

39862

100000 60000

150519

This will be a permanent multiplier for Vienna [multiplicator perpetuus ad Viennam]. For whenever we wish to find a star's distance from the meridian from its altitude, we shall multiply by this number the difference between the sine of the meridian altitude and the sine of any other altitude, and from the product we shall discard five figures toward the right, since the remainder gives the size of line OT, where AE, the whole sine, is 60000.

150519

46446
Makes 69910 | 05472.
69910: line OT, where AE is 60000.
22° 0′
68° 0′: the complement of the star's declination.
54813: the right sine of this complement; it is line OX, where AE is 60000. In this observation the point must be marked between X and S, for OT is greater than the semidiameter of the parallel, that is, the sine of the complement of the star's declination.
69910
54813
15097: the difference between line OX and the semidiameter of the parallel. This must again be determined where OX is 60000.

54813
60000 15097
905820000

16526: the right sine of the complement of the star's distance from the meridian. The star's distance from the meridian, moreover, is greater than a quadrant, for line OT was found to be greater than line OX.
15° 59′: the complement of the star's distance from the meridian.
90°
105° 59′: the star's distance from the meridian.
254° 1′: the arc of the equator turned through since the instant when the star was on the meridian.
16° 26′: the right ascension of the Sun.
297° 53′: the right ascension of the star.
297° 53′
16° 26′
281° 27′: the arc of the equator from the Sun to the star.
254° 1′
281° 27′
175° 28′: the Sun's distance from the meridian at the hour of the observation, which amounts in time to $11^h\ 42^m$.
The eclipse therefore began at $11^h\ 42^m$ past noon.
Now the beginning of totality.
17° 0′: the star's altitude.
17542: the sine of this altitude.
53758
17542
36216: the difference of the two sines, and this is the number to be multiplied.
150519

36216
54511 | 96104
54512: line OT, where AE is the whole sine, 6000 [recte: 60000].

54813
60000 54512
3270720000

59671: line AT, where OX is 60000, and the versed sine of the star's distance from the meridian.
329
0° 19′: the complement of the star's distance from the meridian. The star's distance from the meridian, moreover, is less than a quadrant.
89° 41′: the star's distance from the meridian.
270° 19′: the arc of the equator turned through from the meridian [à merid.revol.].
270° 19′
281° 27′
191° 46′: the Sun's distance from the meridian at the hour of the observation [hor. conſiderationis], which amounts in time to 12^{h} 47^{m}.
The beginning of totality therefore came 47^{m} after midnight.
Now to the end of totality.
28° 0′: the star's altitude before the meridian.
28168: the sine of this altitude [ſin.hu.altitud.].
53758
28168
25590: the difference of the sines, and this is the number to be multiplied.
150519
25590
makes 38517 | 81210
38518: line OT, where AE is 60000.

54813
60000 38518
2311080000

42153: line OT, where OX is 60000. And it is the versed sine of the star's distance from the meridian.
178137
17° 18′: the complement of the star's distance from the meridian.
72° 42′: the star's distance from the meridian.

267° 13′: the arc of the equator turned through from the star's meridian [a merid.ſtell.].

287° 18′

281° 27′

208° 45′: the Sun's distance from the meridian at the end of totality, which amounts in time to $13^h\ 55^m$.

The end of totality therefore came when $1^h\ 55^m$ had passed after midnight.

$13^h\ 55^m$

$12^h\ 47^m$

$1^h\ 8^m$: the time of the whole of totality [tempus to.mor.].

$0^h\ 34^m$: the time of half of totality.

The Year 1461 [Anno 1461.]

There was a total eclipse of the Moon at the opposition of the luminaries, which fell on June 22 [die 22 Iun.j]. At the beginning of totality the Flying Vulture [Vultur volans] had an altitude of 26°, and the apparent altitude of the Moon was then 6° 30′. At the end of the whole eclipse the altitude of the Vulture was 47° 30′, and the apparent altitude of the Moon 17° 30′. Master Regiomontanus observed this in the town of Vienna in Austria. The very true opposition [veriſſima oppoſitio] of the luminaries therefore took place when $1^h\ 21^m$ had passed after midnight. Reckoning by the tables [Numeratio per tabulas] gives it as $1^h\ 20^m$ after midnight, a difference of 1^m.

In the same year, on December 2, at the beginning of the night, Regiomontanus saw Mars and Saturn at Rome. By the numbers of the Almanac [ex numeris Almanach] they were held to be in conjunction according to the longitude of the zodiac, but this did not appear so to the sight. For at that time, as I observed, two fixed stars in the head of Capricorn [♑] were judged to lie in one straight line with the star of Mars. Each of these fixed stars was found at the end of the 27th degree of Capricorn, if the moderns' position [poſitio] on the motion of the eighth sphere is true. Saturn at that time had 29° of Capricorn, as calculation showed. The distance between Saturn and Mars, moreover, was equal to the distance said to lie between the two stars, which indeed comes to about 2°. If, therefore, the position of these two fixed stars was well taken, and likewise that of Saturn by a double judgement [gemino judicio], Mars must have been at the end of the 27th degree of Capricorn, although by reckoning it should have been found at the end of the 29th, as Saturn was. Here, then, is an error of 2°.

On December 5, turn your eyes to it [adverte oculos], for at that time they appeared to the sight to be in conjunction. I looked on that day, but clouds got in the way. But at the beginning of the night of December 6 I looked and saw that Mars had already passed Saturn by a degree and a half; for the distance between them was nearly in the sub-sesquialter ratio [ſubſeſquialtera] to the distance between the two stars in the head of Capricorn [♑]. To the sight, the

Moon at that time appeared to form an equilateral triangle with the two stars in the tail of Capricorn.

On December 14, after sunset, Venus and Saturn appeared to me to be in conjunction according to the longitude of the zodiac, or about to be in conjunction at once, as Venus approached Saturn. At that time Venus [♀] had about 1° 51′ of Aquarius [♒] by the numbers of Alfonso [per numeros Alfonſi], and Saturn [♄] 0° 24′ of Aquarius. Here is a difference of 15′. To the sight, therefore, Venus was slower than was thought from the number. Each of them, moreover, was south of the ecliptic, yet Venus was farther south than Saturn by the amount of the Sun doubled [quantitate Solis geminati], according to estimate, that is, by 1°, which the Alphonsine number also gave.[75]

At the beginning of the night following December 17, the Moon rose eclipsed by 10 digits [digitos] of its diameter, but I saw only 8. By the Alphonsine computation [ex computo Alfonſino], the end of the eclipse came when $1^h\ 56^m$ had passed after sunset. At the very end of the eclipse I found the altitude of the star Alhajoth before the meridian to be 38° 30′, and the altitude of the star Aldebaran before the meridian to be 2[?]°. The true position of the Sun, by computation: 5° 24′ of Capricorn. *All this at the city of Rome, whose latitude is 42° 2′, although others put it at 41° 50′. But for the present purpose I shall take exactly 42°, so as to stand midway between the opinion of others and my own observation.*

38° 30′: the star's altitude at the hour of the observation [in hora conſiderationis].

12° 0′ of Gemini [♊]: the point with which it reaches mid-heaven [cum quo mediat. cœlum].

The star's northern declination [declin. ſtellæ ſeptentriona.]:

45° 0′

48° 0′

93° 0′: therefore the star, having its greatest altitude, is between the zenith [ſummitatem capitum] and the Arctic pole; but this does not alter the method of working.

87° 0′: the star's greatest altitude.

59918: the sine of this altitude.

37531: the sine of the observed altitude [altitudinis cõſideratæ].

22567: the difference of the sines.[76]

But the permanent multiplier for Rome must be found.

44589: the sine of the altitude of the equator.

44589
100000 60000

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[75] the two positions as printed differ by 1° 27′; the page prints 15. m.

[76] 59918 less 37531 is 22387; the page prints 22567.

134562: the permanent multiplier for Rome [multiplicator perpetuus ad Rom.].

134502 [recte: 134562]	1
269124	2
403686	3
538248	4
672810	5
807372	6
941934	7
1076496	8
1211058	9
1345620	10

134562
22567
makes 30366 | 60654
30367: the versed sine of the star's distance from the meridian, where the semidiameter of the equator [ſemidiameter ęquitor.] is 60000.
42426: the sine of the complement of the star's declination.

42426	
60000	30367
1822020000.	

42946: the versed sine of the star's distance from the meridian, where the semidiameter of its parallel is 60000.
17054
16° 31′
73° 29′: the star's distance from the meridian [diſtantia ſtellę à mer.].
160° 29′: the right ascension of the star [aſcen.rect.ſtellæ].
5° 54′: the right ascension of the Sun [aſcenſi.re. ⊙.].
154° 35′: the distance of the Sun from the star [diſtantia ⊙ à ſtella.].
73° 29′
81° 6′: the distance of the Sun from the meridian [diſtantia ⊙ à merid.].
Now by the second star.
29° 0′: the altitude of Aldebaran.
3° 0′ of Gemini [♊]: the point with which it reaches mid-heaven [cū quo mediat cœlū.].
15° 40′: its northern declination [declin.ejus ſeptemt.].
48° 0′
63° 40′: the star's meridian altitude [Altitudo ſtellæ mer.].
53774: the sine of the meridian altitude.

29089: the sine of the observed altitude [altitud.conſider.].
24685: the difference of the sines.
134562
24685
makes 33216 | 62970
33217: the versed sine of the star's distance from the meridian, where the semidiameter of the equator [ſemidiameter ęquator.] is 60000.
15° 40′
74° 20′: the complement of the star's declination [complem.declin.ſtel.].
57771: the sine of this complement.

57771
60000 33217
199302000. [recte: 1993020000]

34499
25501: the sine of the complement of the star's distance from the meridian.
25° 9′
64° 51′: the star's distance from the meridian.
150° 56′
5° 54′
145° 2′
64° 51′
80° 11′: the distance of the Sun from the meridian by the second star, that is, Aldebaran [ſcil.Alde- (baran.].
81° 6′
80° 11′
0° 55′: the difference of the two distances, half of which I add to the smaller of them:
80° 38′: the distance of the Sun from the meridian. In time, therefore, we shall not err by more than 2^{m}, since one of the two stars gives testimony close to the other.
5^{h} 23^{m}
The time of the Sun's distance from the meridian at the end of the eclipse.
25° 34′: the ascensional difference [differentia aſcenſion.] of the Sun's position at latitude 45°.
25894: the sine of this difference.
44589: the sine of the complement of the altitude of the pole.
40148: the sine of the altitude of the pole in the city of Rome.

44589

25894	40148
1039592312	

23315

22° 52′: the difference between the equal semidiurnal and the differing semidiurnal [ſemid. diverſi.].

67° 8′: the semidiurnal arc [Arcus ſemidiurn.].

4^h 29^m: the semidiurnal time [Tempus ſemidiurn.].

5^h 23^m

4^h 29^m

0^h 54^m: the time elapsed from sunset to the end of this eclipse. But the numeration [numeratio] gives 1^h 56^m. Examine these matters carefully, then.

1^h 2^m: the difference between the computation and the sky.

On December 24, at the beginning of the night, Mars [♂] appeared to be in conjunction, in longitude along the zodiac, with the star found to be the brighter one in the tail of Capricorn [♑]. That star has 14° 29′ of Aquarius [♒]; Mars, by the numeration, 17° 20′ of Aquarius. Look into it, then, for Mars in the sky is slower than in the book by 2° 51′. But there is doubt about the star's position.

The Year 1462 [Anno 1462.]

On January 3, the Sun's meridian altitude was 26° 12′. Its position, 22° 30′ of Capricorn. Its southern declination [Declinatio ejus meridiana], 21° 40′. There results, therefore, the altitude of the equinoctial [altitudo æquinoctialis], 47° 52′, and the altitude of the Arctic pole, 42° 8′.

On January 10, Mercury [☿] appeared to me after sunset very noticeably, and also, after the beginning of the night, Venus appeared conjoined with the fixed star that is at the beginning of the water of Aquarius, and is 23 [& eſt 2 3]. Venus [♀], however, was farther east than this star by 45′, by estimate.

On January 11, the Sun's meridian altitude was 27° 50′. Its position, 0° 41′ of Aquarius; its southern declination, 20° 6′. There results, therefore, the altitude of the equinoctial [æquinoctialis], 47° 56′, and the altitude of the pole, 42° 4′.

At the beginning of the night of this same 11th day, I observed the Moon near the Hyades. At that time the two eyes of Taurus appeared to form with the Moon a triangle with two equal sides. For the Moon's distance from each of them was equal, and this equal distance was also the distance between the two remaining matched stars [duarum reliquarum parilium] among the Hyades, namely the twelfth and the thirteenth. The Moon had an apparent altitude of 61° 15′, Canis Major an altitude of 14° 30′, Canis Minor 24° 50′.

At the beginning of the night of January 12, when Canis Major had an altitude of 26° 40′ and Canis Minor 40° 20′, the Moon appeared by sight [ſecundum viſum] to be in conjunction with the nineteenth star of Taurus [ſtellæ decimonæ ♉], that is, the one situated at the tip of the southern horn. It

was in conjunction in longitude along the zodiac, yet the Moon was farther north than this star by 24′. For the star itself stood off from the Moon's southern limb, toward the south, by a quarter of the Moon's visual diameter [diametri viſualis].

On the morning of March 20, when the 11th hour of the night was complete, the Moon appeared as if in one straight line with the two stars of Scorpius, 12 and 13.

On the morning of March 21, I observed the Moon on the meridian with an altitude of 23°. Jupiter had an altitude of 24½°, and was thought to be on the meridian then as well. The Heart of Scorpius [Cor ♏] had at that time an altitude of 17° 15′. The Moon, with Jupiter and the seventh star of Sagittarius [ſtella ſeptima ♐], was thought to be in one straight line.

In the night following June 11, when 15^{h} 15^{m} had passed after noon, there was a partial eclipse. And 6 points 34′ [puncta 6. minut.34.] were eclipsed, this according to the tables, I observed this eclipse at Viterbo near Rome, which is believed to lie farther east than Vienna by 4°, as is drawn from the *Cosmography* [Coſmographia]. However, with clouds in the way, I could not note either the beginning or the end. But at the middle, taken by conjecture, the star of the Flying Vulture [ſtella Vulturis volantis] had a post-meridian altitude of 51°. Nearly 7 digits were thought to be eclipsed.

True Sun [Verus ☉]: 29° 8′ of Gemini [♊].

19° 0′ of Capricorn [♑], with which this star culminates [cum quo cœlũ mediat hæc ſtella].

7° 30′: its northern declination [declin. ejus Septemt.].

480

55° 30′: the star's meridian altitude [altitud. ſtel. merid.].

49448: the sine of the meridian altitude.

46629: the sine of the observed altitude [ſin. altit. conſid.].

2819: the difference of the sines.

134562

2819

makes [facit] 3793|30278

3793: the versed sine of the distance from the meridian [Sinus verſus diſtant. à meridie], with the semidiameter of the equator being 60000 [à ſemidiametur equat. eſt 60000].

7° 30′

82° 30′: the complement of the star's declination.

594687: the sine of this complement.

59487
60000 3793
227580000

3826: the versed sine of the star's distance from the meridian, as the semidiameter of its parallel is 60000.

56174

69° 26′

20° 34′: the star's distance from the meridian [diſtãtia ſtellę à meri d.].

20° 35′: the star's right ascension [20. 35 aſcenſ. rect. ſtellæ.].

179° 3′: the right ascension of the Sun [179.3 aſcen. rect. ☉.].

201° 32′: the difference of the ascensions.

20° 34′

222° 6′: the distance of the Sun from the meridian, 14^h 48^m of time [tempores]; [dil.] [?] of the Sun from the meridian at the middle of the eclipse, taken by conjecture.

0^h 27^m: the difference between the computation and the sky.

On September 15, in the morning, at the 10th hour of the night, Mars appeared between the seventh and eighth of Leo, as if in a line straight [recta] with them. It stood off from the eighth, that is, from the Heart of Leo, toward the north, by about the size of the Sun's diameter.

On September 19, at the 11th hour of the night, Venus, the Heart of Leo and Mars [♂] appeared to be in one straight line, Venus [♀] indeed farther south, but Mars farther north, than the Heart of Leo. The distance of Mars from the Heart of Leo appeared to stand to the distance of Venus from it in the ratio of one and a quarter to one [ſeſquiquarta].

On September 26, in the morning, at the 11th hour of the night, Venus, Mars and one star of Leo, of the fourth magnitude as I think, appeared as if in one straight line, each of the two farther north with respect to this star. For the eastern limb of Venus appeared to touch the straight line that would pass across through Mars and the named star. The distance of Venus from that star, moreover, appeared to be one and a half times [ſeſquialtera] the diameter of Venus.

On September 27, in the morning, at the 11th hour, the three named stars appeared to form an equilateral triangle, for Venus had drawn back from that star toward the east.

On October 3, in the morning, Mars appeared to twinkle.

On October 16, in the morning, at the 12th hour of the night, Mars had not yet reached the twenty-fourth of Leo [♌], for between it and the named star there was a space equal, by estimate, to 4 diameters of Venus. Mars was farther south than the named star. I conjectured a conjunction [☌] of Mars with the twenty-fifth of Leo.

On October 17, in the morning, at the 11th hour, I saw that Mars had already passed that star. The distance between them, moreover, appeared to be one and a half times yesterday's distance, Mars farther south.

On October 21, in the morning, when 12½ hours of the night were complete, Venus had not yet reached the sixth of Virgo [♍], but was dis- tant from it toward the west by an amount equal to the semidiameter of the Moon. Now

the Moon, then old [vetus], was in conjunction with Venus herself in longitude along the zodiac, but it was much farther north than Venus.

On October 25, in the morning, Venus appeared to be in conjunction in longitude with the seventh of Virgo. Venus was farther south than the star itself by two solar diameters, by estimate.

On November 21, around noon, I observed the eclipse of the Sun [☉]. I did not observe the beginning of the eclipse, but when I looked, two digits of the Sun's diameter appeared eclipsed, on the southern side. The Sun then had an altitude of 26½° [26.gradum & dimidij], and it was exactly noon. But at the end of the eclipse, which I noted carefully [dilgenter] [recte: diligenter], the Sun had an altitude of 24° 36′. The degrees of the Sun's azimuth [Azimuth] from the meridian toward the west, moreover, were 16° 15′ [16 & 15.m.]. And as far as I could then conclude by a fresh conjecture, a third part of the whole time of the eclipse appeared to have passed from the beginning of the eclipse to the instant of the first observation. For a little before the first observation, which was precisely at noon, I looked at the Sun not yet eclipsed. All this at Viterbo near Rome.

The Year 1464 [Anno 1464.]

There was a universal eclipse of the Moon [Eclipſis ☾ univerſalis], namely in that opposition which took place on April 21, when $12^h\ 59^m$ after noon were complete, according to time equated [tempus æquatum] to the meridian of the city of Padua [urbis Patavinæ], whose latitude is said to be 45° 24′. The true position of the Sun was 10° 52′ of Taurus [♉] by the Alphonsine numbers [per numeros Alfonſinos], and that of the Moon in the opposite point. The argument of latitude of the Moon [Argumentum latitudinis ☾] true [verum]: 5^s 25° 23′ [5. 25.23.]. The Moon's northern latitude [Latitudo ☾ ſeptent.] at mid-eclipse: 0° 24′ 5″ [0. 24. 5.]. The Moon's argument [Argumentum ☾], equated to the time of true opposition: 5^s 4° 30′ 40″ [5. 4. 30. 40.]. The Moon's visual semidiameter [Semidiameter viſualis Lunæ]: 17′ 49″ [17.49.]. The semidiameter of the shadow [Semidiameter umbræ]: 46′ 11″ [46.11.]. Points eclipsed [puncta eclipſata]: 13 points 27′ [13.27.].

		Time [hor. min.]	
Beginning of the eclipse [Initium Eclipſis]		$11^h\ 15^m$	
Beginning of totality [Initium moræ]		$12^h\ 33^m$	
Middle of the eclipse [Medium Eclipſis]	Day 12 [Die 12]	$12^h\ 59^m$	of April [Aprilis]
End of totality [Finis moræ]		$13^h\ 25^m$	
End of the eclipse [FinisEclipſis]		$14^h\ 43^m$	

77

[77] the table prints `Die 12`; the preceding page dates this opposition to April `21`. Both stand as printed.

Semidiurnal time of the Sun [Tempus ſemidiurnum Sol]: 7^h 5^m [7, 5.]. Duration of the whole eclipse [Duratio totius Eclipſis]: 3^h 28^m [3, 28.]. All this by the Alphonsine foundations [Omnia per fundamenta Alfonſina].

At the beginning of this eclipse I found the altitude of the Heart of Scorpius [cordis ♏] before the meridian to be 12° 45′ [grad. 12. min 45.]. At the same time I also found the altitude of Hydra [hydræ] after the meridian to be 9° 40′ [grad.9. min,40.], using the large quadrant [quadrantem magnum] with all possible care.

On October 6, at 3^h of the night [hora 3. noctis], at Rome, the Moon [☾] was to the eye in a straight line with the ninth and the twenty-second of Sagittarius [cum nono & vigeſima ſecunda ♐], equally distant from them.

On December 11, in the morning, namely at 13^h [hora videlicet 13.] reckoned from sunset, the star Mars [ſtella ♂] appeared to be in one straight line with two stars of Virgo [♍], namely 22 and 23. Mars, moreover, was more northerly than the twenty-third itself. For the distance between Mars [Mar.] and that twenty-third appeared to be one quarter [ſubquadrupla] of the distance between the two fixed stars just mentioned. By computation Mars had 26° 57′ of Libra [26 grad.& 57. minut.♎], and a latitude of 0° 40′ [0. 40.], northern and ascending. Star 22 of Virgo [22 ♍.] has in longitude 26° 20′ of Libra [26.20♎], and in northern latitude [In latitudine ſeptenttionali.] [recte: ſeptentrionali] 7° 30′ [7.30.]. Star 23 [23.] has in longitude 27° 0′ of Libra [27.0♎], while in latitude [in latitudine autem]

2° 40′ [2.40.], northern [Septentrional.]. Mars differs in latitude from the computation by 3° [per 3.grad.].

The Year 1465 [Anno 1465.]

On June 19, around the beginning of the night, Mars appeared almost in a straight line with stars 1 and 2 of Sagittarius [1.& 2.♐], for it was slightly more northerly than that line [borea-lcor] [recte: borealior]. And the interval between it and the second appeared to be one and a half times [ſeſquialterum] the interval between the first and the second [intervallum primæ ſecundæ]. Mars [Mart.] then had, in the computation, 6° of Capricorn [6. grad.♑].

The Year 1468 [Anno 1468.]

On April 26, at the beginning of the night, Mars [♂] appeared to have slightly crossed [parum trangreſſus] [recte: tranſgreſſus] the straight line on which Jupiter [♃] and the tail of Ursa Minor [cauda urſę minoris] stood. And since Jupiter was at the beginning of Cancer [Canc.], their conjunction is believed to have passed, which by computation was due to fall on Thursday [die Iovis].

On the second-to-last day of April [Die penultima Aprilis], Jupiter [♃], Mars [Mart.] and a certain fixed star, 10 of Gemini [10 ♊], appeared almost in one straight line. With the preceding northern head of Gemini [?] [cum capite geminorum antecedente Septentrionali], the fixed star was deeper in the zodiac than Mars, and Mars [♂] deeper than Jupiter. The distance between Jupiter and Mars appeared to be almost four-thirds [ſeſſiuitertia] [recte: ſeſquitertia] of

the distance between Mars and the fixed star. Mars departed very little from the straight line, toward the north.

The Year 1471 [Anno 1471.]

At Esztergom [Strigonij], on March 15, the star Jupiter [ſtella ♃] appeared between two stars of Virgo [inter duas Virginis], of which the brighter is around the middle of the left wing of Virgo, the other, dimmer, around her eye, toward Leo, and the distance of Jupiter [♃] from the second, dimmer star appeared to be about two-fifths [duæ quintæ] of the whole gap between the stars. But the star Jupiter [ſtella ♃] departed very little from this straight line, which runs between the fixed stars, toward the west.

On June 2 [Die 2. Iunij], during the night [in noct:], there was an eclipse of the Moon, at whose beginning the Heart of Scorpius [Cor Scorpionis] had a post-meridian altitude of 14° 15′ [14. 15.], and Delphinus or the Muzzle of Pegasus [Delphin autem vel Muſcida Pegaſi] an ante-meridian altitude of 22° 30′ [22.30.]. Four digits [quatuor digiti] appeared to be obscured, for after that the Moon appeared to fill out again. But the end did not appear, because clouds intervened, at Nuremberg [Norimbergæ].

On July 26 [Die 26. Iulij], in the morning, at 3^h after midnight [hora 3. poſt medium noctis], at Nuremberg, Mars appeared in a straight line with the two eyes, that is, stars 14 and 15 of Taurus [14. & 15. Tauri], that is, with the two uppermost Hyades [duabus Hyadibus ſupremis]. But it stood off slightly from this line, always toward the east, by about a quarter of the Moon's diameter. Its distance from the dimmer of the two fixed stars on the forehead of Taurus, that is, from star 15 of Taurus [â 15. Tauri], was equal to the gap between the two fixed stars 13 and 14 [13. & 14.].

By the Alphonsine computation [ſecundum Alfonſinum computum], the motion of the fixed stars from Ptolemy to the year 1471 is 17° 28′ [17. 28.]. If we add [adderimus] [recte: addiderimus] this to the positions of the stars that Ptolemy wrote down, star 13 of Taurus will have 28° 18′ of Taurus [28. 18. ♉], with southern latitude 5° 50′ [5.50.]; the fourteenth, that is, the southern eye, which in Arabic they call Aldebaran, 0° 8′ of Gemini [0. 8.♊], southern latitude 5° 10′ [5. 10.]; the fifteenth, that is, the northern eye, 0° 18′ of Gemini [0. 18. Gemin.], southern latitude 3° 0′ [3.0.]. So by the Alphonsine computation Mars had 0° 40′ of Gemini [0. 40 ♊], southern latitude 1° 5′ [meridi. 1. 5.]. Its true position in longitude was 1° 10′ of Gemini [1.10. ♊], southern latitude 0° 33′ [0.33.]. The difference in longitude is 0° 30′ [0. 30.], the difference in latitude 0° 32′ [0. 32.]. But if we borrow the positions of the fixed stars from Alfonso, the fourteenth of Taurus, that is, the southern eye, will have 2° 4′ of Gemini [2. 4.♊]. The others too will increase their positions by 1° 56′ [1. 56.], so by inspection [per inſpectionem] Mars would have been at 2° 36′ of Gemini [in. 2.36.♊]. In this way the computation, which previously exceeded by 30′ [30 ſexageſimis], would fall short by 1° 26′ [1. 26.].

So take care not to put too much trust in the empty calculation and, as it were, the Alphonsine dream, which fixed the radices of the motions [radices motuum] for

past times, and in those times also exposes its own lack of foresight. Rather, you will stand with Ptolemy, Hipparchus, Timocharide [Timocharis] and the other ancient philosophers, for these men weighed the motions of the stars with their own eyes. So if you take the positions that were obtained with instruments for the time of Ptolemy, above all those of the Sun and the Moon, you will see how great a discrepancy there is between Alfonso and the sky. And in this way you will more easily understand *how frivolous that framework of Alfonso's is.*

Alfonso also added more than was right to Ptolemy's positions of the fixed stars, by 1° 55′ [in uno gradu & 55,min.]. For he used Ptolemy's numbers just as if they had been established at the beginning of the years of Christ. So the excess of error in the positions of the stars found in Alfonso is about as great as the distance the starry heaven moved in the 140 years [140 annis] by which Ptolemy came after Christ. This, at any rate, is according to the Alphonsine computation.

On the ninth of August [Die nona Auguſti], in the evening, the distance between Venus [Ven:] and Jupiter, taken with the radius [per radium ſumpta], was 5° 13′ [5. 13.]. By the Alphonsine computation Venus had 28° 45′ of Virgo [28. 45. Virg.], Jupiter 3° 18′ of Libra [3. 18. Libr.].

On the morning of September 9 [Die 9. Septembris mane]: Mars from the Right Shoulder of Orion [ab humero dextro Orionis], 210. 674.; from the preceding and northern Head of Gemini [à capite Gemini præcedent. & ſeptentrionali], 210. 662. At the same hour: Mars from the fourteenth of Gemini [à decimaquarta Gemini], 30. 1297., and just as much from the fifteenth of the same [tantundem à quintadecima eorundem].

The Year 1472 [Anno 1472.]

At Nuremberg [Norìmbergæ], on January 20 [die 20. Ianuarij], at 10^h after noon [hora 10. à meridie], the comet appeared in a straight line with the fifth of Boötes [quinta Bootis] and the first of the unformed stars [prima informatarum] next to Ursa Major [juxta urſam majorem], and the distance of this comet from that fifth of Boötes was almost a third [ſubtripla fermè] of the whole interval between those stars. The tail stretched almost to the sixth of Leo [ad ſextum prope Leonis] and ended a little short of it [citraque parum deſijt]. A little below the first unformed star, declining toward the south [paulo ſub prima informata ad meridiem declinans], 953. 190. Distance of the comet from the Tail of Ursa Major [à cauda Vrſæ majoris], 953. 210. Distance of the comet from the first of those that are not in the figure [à prima earum, quæ non ſunt in forma].

The Year 1474 [Anno 1474.]

At Nuremberg [Nurnbergæ], on the seventh of March [die ſeptima Martij], Mars, farther east than the Northern Ass [Aſino ſeptentrionali] by a diameter of the Moon [per diametrum Lunæ], appeared about to pass beneath it, but it was beginning to go direct [ſed incipiebat dirigi].

The End [FINIS.]

Observations Made by the Most Learned Man Bernhard Walther at Nuremberg [OBSERVATIONES FACTÆ PER DOCTISSIMVM VIRUM BERNARDUM Waltherum Norimbergæ.]

The Year 1475 [Anno 1475.]

On September 1 [Prima die Septembris], at about 3^h after midnight [hora quaſi 3. poſt medium noctis], in the morning [de mane], I took the intervals with the rectangular instrument [rectangulo inſtrumento], as follows:

		First sine [Sinus pri.]	Second sine [ſin.ſec.]
Between [Inter]	Mars and the Preceding Head of Gemini [Mart.& caput ♊ antecedentis]	210	772
	Mars and the Following Head of Gemini [Mart.& caput ♊ ſequentis]	180	950
	The two Heads of Gemini [Duo capita Geminorum]	80	989

September 3 [3. Septembris], at the hour given above [hora ut ſupra].

Between [Inter]	Mars and the Preceding Head of Gemini [Mart.& caput ♊ antecedentis]	210	725½
	Mars and the Following Head of Gemini [Mart.& caput ♊ ſequentis]	210	1006 [?]
	The two Heads [Duo capita]	60	1118 *v*[?]
	Mars and Canis Minor, or Algomeysa [Mart.& Canem mino. ſ. Algomeyſ.]	210	623
	Mars and the first of Canis Minor [Mart.& primam Canis minoris]	210	626½
	Of the fixed stars between themselves [Fixarum inter ſe]	80	1085½

September 4 [4. Septembris], at the hour given above [hora ut ſupra].

Between [Inter]	Mars and the smaller in Canis [Mart.& minorem in cane]	210	610
	Mars and Algomeysa [Mart.& Algomeyſam]	210	614½
	Of the fixed stars between themselves [Fixarum inter ſe]	80	1079
	Mars and the Preceding Head of Gemini [Mart.& caput ♊ antecedentis]	210	705
	Mars and the Following Head of Gemini [Mart.& caput Gemini ſequentis]	210	960
	The two Heads [Duo capita,]	90	1134
	The two intervals [Duo intervalla]	80	1003½

September 5 [5. Septembris], between 2^h and 3^h after midnight [inter 2. & 3.poſt medium noctis].

		First sine [Sin.1.]	Second sine [Sin.2.]
	Mars and the Preceding Head of Gemini [Mart. & caput ♊ antecedentis]	210	683
	Mars and the Following Head of Gemini [Mart. & caput Gemini ſequentis]	210	920
Between [Inter]	Of the fixed stars between themselves, again [Fixarum inter ſe iterum]	90	1139
	The two intervals [Duobus intervallis]	80	1006½

September 6 [6. Septembris], in the morning, between 3^h and 4^h after midnight [mane inter 3. & 4. poſt medium noctis].

	Mars and the Preceding Head of Gemini [Mar. & caput Gemin. antecedentis]	210	662½
	Mars and the Following Head of Gemini [Mart.& caput Gemini ſequentis]	210	883½
	Of the fixed stars between themselves [Fixarum inter ſe]	90	1139
Between [Inter]	Mars and Algomeysa [Mar. & algomeyſam]	210	585
	Mars and the smaller of Canis Minor [♂ & minorem canis minoris]	210	593
	Of the fixed stars between themselves, I assumed as before [Fixarum inter ſe ſuppoſui ut prius.]		

September 7 [7. Septembris], between 2^h and 3^h after midnight [inter 2 & 3.poſt medium noctis].

	Mars and the Preceding Head of Gemini [Mart.et caput ♊ antecedent.]	210	638
	Mars and the Following Head of Gemini [Mart.et caput ♊ ſequent.]	210	844
Between [Inter]	Algomeysa and the Following Head of Gemini [Algom.& caput Gemin.ſequentis]	210	497½
	Mars and Algomeysa [Mart. & Algomeyſam.]	210	[?]81 ν[?]

September 16 [16. Septembris], at the hour given above [hora ut ſupra].

	Mars and the Following Head of Gemini [Mart.et caput ♊ ſequent.]	210	611
	Mars and Algomeysa [Mart.et Algomeyſam.]	210	493
	Saturn and Algomeysa [Saturn.& Algomeyſam]	210	489
Between [Inter]	Saturn and the Following Head of Gemini [Saturn.et caput ♊ ſequent.]	210	573
	The Following Head of Gemini and Algomeysa [Caput ♊ ſequent. et Algomeyſ.]	210	497
	Saturn and Mars [Saturn. et Mart.]	20	949

September 17 [17. Septembris], at the hour given above [hora ut ſupra].

	Mars and the Following Head of Gemini [Mart. et caput ♊ ſequentib.]	210	791
Between [Inter]	Mars and Algomeysa [Mart. et Algomeyſam]	210	484
	Mars and Saturn [Mart. et Saturn.]	10	667

Also, this distance between Mars and Saturn [inter ♂ & ♄] had been more a matter of latitude than of longitude. For I compared them with the Heart of Leo [Cor Leonis], and Mars seemed to stand a very little farther from the Heart of Leo than Saturn did. I therefore judged that they should come into conjunction on the following day, namely September 18 [18 Septembris], as they undoubtedly did. Although I did not see them on that day because of clouds [propter nubes], on the 19th I nevertheless saw them again, and Mars had become more easterly by as much (as it appeared to the eye) as it had been more westerly than Saturn on the 17th. Likewise on the 20th I saw them again, and Mars had by now become noticeably more easterly than Saturn. Yet according to the Almanac [ſecundum Almanach] their conjunction was due on the 21st.

September 21 [21. Septembris], before 3^h after midnight [ante 3. poſt medium noctis].

		First sine [Sin.1.]	Second sine [Sin.2.]
	Mars and the Following Head of Gemini [Mar. & caput Gemin. ſequentis]	210	523
	Mars and Algomeysa [Mar. & algom.]	210	448
Between [Inter]	Saturn and Algomeysa [Saturn. & algom.]	210	480
	Saturn and the Following Twin [♄ & Gemin. ſequentis]	210	560
	Saturn and Mars [Saturn. & Mar.]	20	679

September 23 [23. Septembris], between 2^h and 3^h after midnight, in the morning [inter 2. & 3.poſt medium noctis de mane].

	Mars and the Sixth Star of Leo [Mar.& ſextam Leo.]	210	739
	Mars and the Fourth Star of Leo [Mar.& quartam Leo.]	160	921½
	The Fourth and Sixth Stars of Leo [Quartam & ſextam Leo.]	140	910
Between [Inter]	Mars and the Heart of Leo [Mar. & Cor Leo.]	210	824
	The Fourth and Eighth Stars of Leo [Quartam & octavam Leonis]	210	916
	Mars and the Following Head of Gemini [Mar. & caput Gemini ſequentis]	210	495

September 26 [26. Septembris], at the hour given above [hora ut ſupra].

	Mars and the Sixth Star of Leo [Mar.& ſextam Leo.]	210	822
Between [Inter]	Mars and the Fourth Star of Leo [Mar. & quartam Leo.]	150	941

		First sine [Sin.1.]	Second sine [ſin.2.]
Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leon.]	210	948½
	The Eighth and Sixth Stars of Leo [Octavam & ſextam Leonis]	140	948½

October 13 [13. Octobris], at the hour given above [hora ut ſupra].

	Mars and the Sixth Star of Leo [Martem & ſextam Leonis]	140	1036½
	Mars and the Fourth Star of Leo [Martem & quartam Leonis]	200	1109
Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	60	1127
	Saturn and the Eighth Star of Leo [Saturn. & octavam Leonis]	210	761
	Saturn and the Fourth Star of Leo [Saturn. & quartam Leonis]	160	810

October 17 [17. Octobris], at the hour given above [hora ut ſupra].

	Mars and Saturn [Martem & Saturn.]	210	807
Between [Inter]	Saturn and the Eighth Star of Leo [Saturn. & octa.Leon.]	210	770
	Saturn and the Fourth Star of Leo [Saturn. & quartam Leon.]	190	907

October 30 [30. Octobris], at the hours given above [horis ut ſupra].

	Mars and the Eighth Star of Leo [Martem & octav.Leon.]	110	982 [?]/[?]
Between [Inter]	Mars and the Sixth Star of Leo [Martem & ſext. Leon.]	160	960
	Mars and the Fourth Star of Leo [Martem & quartam Leon.]	210	677

November 2 [2. Novembris], before sunrise [ante ortum Solis], at ¼ in ½ of an hour [?] [ad ¼ in ½ horæ].

Between [In-ter]	Mars and the Eighth Star of Leo [Martem & octa.Leon.]	140	1005
	Mars and the Sixth Star of Leo [Martem & ſext.Leon.]	190	1020

November 3 [3. Novembris], from 2^h until about 4^h after midnight [ab hor.2. uſque ad horam quaſi 4 poſt medium noctis].

	Saturn and the Fourth Star of Leo [Saturn.& quart. Leon.]	190	1001
	Saturn and the Eighth Star of Leo [Saturn.& octav. Leon.]	210	793
Between [Inter]	Saturn and the Seventh Star of Leo [Saturn.& ſeptim. Leon.]	210	872
	The Fourth and Eighth Stars of Leo [Quart. & octav. Leon.]	210	913½
	The Fourth and Sixth Stars of Leo [Quart. & ſext. Leon.]	140	908

		First sine [Sin.1.]	Second sine [ſin.2.]
	The Sixth and Eighth Stars of Leo [ſext.et octavam Leonis.]	140	948
	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	140	951½
Between [Inter]	Mars and the Sixth Star of Leo [Martem & ſextam Leonis]	190	983
	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	210	922

November 4 [4. November], between 5^h and 6^h after midnight [inter 5.& 6.poſt medium noctis].

Between [In-ter]	Mars and the Sixth Star of Leo [Martem & ſext. Leon.]	190	950
	Mars and the Eighth Star of Leo [Martem & octav.Leon.]	150	960

November 12 [12. Novemb.], between 2^h and 3^h after midnight [inter 2. & 3.poſt medium noctis].

	Saturn and the Eighth Star of Leo [Saturn.& octav. Leon.]	210	798
	Saturn and the Sixth Star of Leo [Saturn.& ſextam Leon.]	210	708
Between [Inter]	The Eighth and Twentieth Stars of Leo [Octavam & vigeſimam Leonis]	210	649
	The Sixth and Twentieth Stars of Leo [Sextam & vigeſimam Leonis]	210	931

Also on the same day, at 6^h after midnight [Item eodem die hora 6. poſt medium noctis].

	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	889 1/[?]
Between [Inter]	Mars and the Tail of Leo [Martem & caud. Leonis]	210	878

	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	210	956

November 28 [28. Novemb.], at about 7^h after midnight [hora quaſi 7.poſt medium noctis].

	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	582
	Mars and the Tail of Leo [Mart.& caud. Leonis]	180	1010
Between [Inter]	Mars and the Twentieth Star of Leo [Mart.& vigeſimam Leonis]	210	814
	The Twentieth Star and the Tail of Leo [Vigeſimam & caud. Leonis]	180	983

November 29 [29. Novemb.], at about 4^h after midnight [hora quaſi 4.poſt medium noctis].

	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	210	805
	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimamſeptimam Leonis]	180	1008½
Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	572
	The Eighth and Twenty-Seventh Stars of Leo [Octavam & vigeſimã ſeptimam ♌.]	210	457½

		First sine [Sin.1.]	Second sine [ſin.2.]
	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	210	784
Between [Inter]	Saturn and the Sixth Star of Leo [Saturn. & ſext. Leonis.]	210	695
	Saturn and the Fourth Star of Leo [Saturn. & quartam Leon.]	170	901

December 1 [1. Decembris], at 3^h after midnight [hora tertia poſt medium noctis].

	Saturn and the Eighth Star of Leo [Saturn. & octavam Leonis]	210	779 1/[?]
	Saturn and the Sixth Star of Leo [Saturnum & ſextam Leonis]	210	692
Between [Inter]	Saturn and the Fourth Star of Leo [Saturn. & quartam Leonis]	160	887
	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	549
	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimam ſeptimam Leonis]	140	797

December 29 [29. Decembris], at 3^h after midnight [hora 3.poſt medium noctis].

Between [In-] [ter]	Saturn and the Eighth Star of Leo [Saturn. & octa. Leon.]	210	698
	Saturn and the Fourth Star of Leo [Saturnum & quartam Leonis]	180	869

The Year 1476 [Anno 1476.]

January 3 [3. Ianuarij], at about 6^h after midnight [hora quaſi ſexta poſt medium noctis].

Between [Inter]	Mars and the Seventh Star of Virgo [Martem & ſeptimam Virginis]	210	837
	Mars and the Fifth Star of Virgo [Martem & quintam Virginis]	60	849

On January 24 [24. Ianuarij] the Fourth and Sixth Stars of Virgo [quarta & ſexta Virginis] appeared on the same circumference together with Mars [♂]. As if midway between the fixed stars, it seemed to stay in the same place for about three days.

February 5 [5. Februarij], at 4^h after midnight [hora quarta poſt medium noctis].

Between [In] [ter]	Mars and the Seventh Star of Virgo [Martem et ſeptimam Virginis]	170	835
	Mars and the Fifth Star of Virgo [Martem & quintam Virginis]	50	761

February 12 [12. Februarij], after noon, at 2^h of the night [poſt meridiem hora 2. noctis]

	Saturn and the Fifth Star of Cancer [Saturnum & quintam Cancri]	20	1022
Between [Inter]	Saturn and the Following Head of Gemini [Saturnum & caput II ſequentis]	210	675½
	Saturn and the Fourth Star of Leo [Saturnum & quartam Leonis]	170	671

February 19 [19. Februarij], at 2^h of the night after noon [hora ſecunda noctis poſt meridiem].

		First sine [Sin.1.]	Second sine [ſin.2.]
	Saturn and the Fifth Star of Cancer [Saturnum & quintam Cancri]	10	620
Between [Inter]	Saturn and the Following Head of Gemini [Saturnum & caput II ſequentis]	210	695

		First sine [Sin.1.]	Second sine [ſin.2.]
	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	210	554 [?]/[?]

Also on the same day, at 4^h of the night after noon [Item eodem die hora quarta noctis poſt meridiem,]

Between [Inter]	Mars and the First Star of Virgo [Martem & primam Virginis]	10	958½
	Mars and the Twenty-Seventh Star of Leo [Martem & vigeſimam ſeptimam ♌.]	140	926½

February 20 [20. Februarij], at 4^h of the night after noon [hora 4. noctis poſt meridiem.]

	Mars and the Twenty-Second Star of Leo [♂ & vigeſimam ſecundam Leonis]	180	888
Between [Inter]	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimam ſeptimam Leonis]	130	869
	Mars and the Twenty-Third Star of Leo [♂ & vigeſimam tertiam Leonis]	100	908

March 10 [10. Martij], at 2^h of the night after noon [hora ſecunda noctis poſt meridiem.]

Between [Inter]	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimam ſeptimam ♌]	160	897
	Mars and the Twentieth Star of Leo [♂ & vigeſimam Leonis.]	190	897½

March 25 [25. Martij], at 2^h of the night after noon [hora ſecunda noctis poſt meridiem.]

	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	890
Between [Inter]	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimam ſeptimam ♌]	200	889
	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis,]	180	889

At the same hour I saw Saturn near the First Star of Cancer, that is, the nebulous tangle [implicitatem nebuloſam]. Drawing a line from the Fourth Star of Cancer to its Fifth, I did not find Saturn [♄.] on that line; it was instead

a little to the west of this line, by the width of two fingers [ad latitudinem duorum digitorum tranſverſalium], as I saw it. It disagrees with the tables. Saturn was also on the same arc as the Fourth and First Stars of Cancer, that is, the nebulous tangle, and it was midway between them, as far from the one as from the other, as I made out by sight [ſicut viſui deprehendi].

March 26 [26. Martij], at 2^h of the night after noon [hora ſecunda noctis poſt meridiem.]

		First sine [Sin.1.]	Second sine [ſin.2,]
Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	902

March 29 [29. Martij], at 2^h of the night after noon [hora ſecunda noctis poſt meridiem.]

Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	931½
	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimam ſeptimam Leonis]	210	895
	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	180	882

March 31 [31. Martij], at 1^h of the night after noon [hora 1. noctis poſt meridiem.]

Between [Inter]	Mars and the Eighth Star of Leo [♂ & octavam Leonis]	210	939

April 3 [3. Aprilis], at 1^h of the night after noon [hora prima noctis poſt meridiem.]

Between [Inter]	Mars and the Eighth Star of Leo [♂ & octavam Leonis]	210	960 1/[?]
	Mars and the Twenty-Seventh Star of Leo [♂ & Vigeſimam ſeptimam Leonis]	210	866

April 4 [4. Aprilis], at the hour as above [hora ut ſupra.]

Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	960½
	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimamſeptimam Leonis]	210	864

April 6 [6. Aprilis], at the hour as above, carefully [hora ut ſupra diligenter,]

	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	960½
Between [Inter]	Mars and the Twenty-Seventh Star of Leo [♂ & vigeſimam ſeptimam Leonis]	210	860
	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	200	952½

April 7 [7. Aprilis,], at the hour as above [hora ut ſupra.]

	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	210	960½
Between [Inter]	Mars and the Twenty-Seventh Star of Leo [Mart. & vigeſimamſeptimam Leonis]	210	860
	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	200	952½

April 12 [12. Aprilis,], at the hour as above [hora ut ſupra.]

Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	200	901
	Mars again and the Eighth Star of Leo [Mart. iterum & octavam Leonis]	210	947

October 13 [13. Octobris,], a little before sunrise [ante ortum Solis modicum.]

		First sine [Sin.1.]	Second sine [ſin.2.]
Between [Inter]	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	30	1082

November 14 [14. Novembris], a little before sunrise [ante ortum Solis modicum]

	Saturn and the Eighth Star of Leo [Saturn. & octa. Leon.]	20	944½
Between [Inter]	Saturn and the Sixth Star of Leo [Saturn. & ſext. Leon.]	130	961
	The Eighth and Sixth Stars of Leo [Octavam & ſextam Leonis]	130	887

November 17 [17. Novembris,], as above in the hour [ut ſupra in hora.]

	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	20	937
Between [Inter]	Saturn and the Sixth Star of Leo [Saturnum & ſextam Leonis]	130	964

	The Eighth and Sixth Stars of Leo [Octavam & ſextam Leonis]	130	887

November 18 [18. Novembris], before sunrise [ante ortum Solis.]

Between [Inter]	Saturn and the Sixth Star of Leo [Saturn. & ſext. Leon.]	130	972½
	Saturn and the Eighth Star of Leo [Saturn. & octav. Leon.]	20	937

November 21 [21. Novembris], before sunrise [ante ortum Solis.]

Between [Inter]	Saturn and the Sixth Star of Leo [Saturnum & ſextam Leonis]	130	972
	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	20	937

The Year 1477 [Anno 1477.]

On September 5 [Quinta Septembris], in the morning, at about 3^h after midnight, I saw Mars and Saturn apart (as it appeared to the sight) by about a palm [ad modum palmi], having the same latitude, so that on that same day they were without doubt in exact conjunction [conjungebātur punctualiter]; and Saturn had been east of Mars by the distance just stated. For from this I [?] [ſup-pnſui] their latitude almost exactly the same [Latitudinem enim eorū ferè præciſe eandem inde]: because, on considering the arc of the transit of Mars before and after the passing, and likewise the pole of that same arc, seemed [videba-] [-tur] altogether that this distance was almost of longitude only, nor had it been difficult to tell by inspection alone at so slight a distance between them. *O with what desire I would have seen their meeting, since by a likely conjecture the one was eclipsing the other; and that is an exceedingly rare event.*

October 15 [15 Octobris,], in the morning, between the fourth and fifth hour after midnight [inter horam quartam & quintam poſt medium noctis,], I observed with the instrument of the Triangle [inſtrumento Trianguli] the distance of Mars and Saturn [Martis & Satnrni.] [recte: Saturni].

40	821

From this I took the arc of distance as about 2° 47′, by which Mars had become more easterly than Saturn. Consult the Tables, and you will find the error: 1° 36′ [Reſpice Tabulas, & invenies errorem, 1. grad. 36. minut.].

On the same day, between [Eodem die inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	190	834½
Between [Inter]	Mars and the Tail of Leo [Martem & caudam Leonis]	210	838

October 16 [16. Octobris], in the morning, between the fourth and fifth hours after midnight [inter horas quartam & quintā poſt medium noctis.]

	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	170	945
	Saturn and Mars [Saturnum & Martem]	50	874
Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	200	835
	Saturn and the Sixth Star of Leo [Saturnum & ſextam Leonis]	190	840
	Mars and the Twentieth Star of Leo [Martem & vigeſimam Leonis]	200	861

October 18 [18. Octobris], in the morning, at about 7^h after midnight [quaſi hora 7. poſt medium noctis.]

	Mars and Saturn [Martem & Saturnum]	70	940
Between [Inter]	Mars and the Eighth Star of Leo [Martem & octavam Leonis]	200	766
	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	170	933½

The Year 1478 [Anno 1478.]

February 19 [19. Februarij], at the hour of setting [hora occaſus,], between Jupiter and Venus [Inter ♃ & ♀.]. Jupiter had been still more easterly and more southerly.

40	889	

February 20 [20. Februarij], at the hour as above [hora ut ſupra,], between Jupiter and Venus [Inter ♃ & ♀.]. Jupiter had been still more easterly and more southerly.

30	814	

February 21 [21. Februarij], at the hour of sunset [hora occaſus Solis.]

	Jupiter and Venus [Iovem & Venerem.]	30	860
	Jupiter and the more westerly one [Iovem & occidentaliorem]	150	885
	Jupiter and the more easterly one [Iovem & orientaliorem]	190	877
Between [Inter]	Venus and the more easterly one [Venerem & orientaliorem]	160	872
	Venus and the more westerly one [Venerem & occidentaliorem]	120	892
	The fixed stars with each other [Fixarum inter ſe]	60	882

Likewise, when Jupiter had become more westerly, Venus herself, however, appeared noticeably more northerly, so much so, namely, that I judged that the whole distance would be, for the greater part, of latitude only.

February 22 [22. Februarij], at the hour of sunset [hora occaſus Solis.]

Between [Inter]	Jupiter and Venus [Iovem & Venerem]	30	740

February 24 [24. Februarij], at the hour as above [hora ut ſupra.]

Between [Inter]	Jupiter and Venus [Iovem & Venerem.]	50	780

On March 16 [Die 16. Martij], at 2^h after midnight, in the morning [hora ſecunda poſt medium noctis, de mane], I saw Mars with the star that is the middle of the three of Virgo in the left wing, namely the sixth [cum ſtella quæ eſt media trium virginis in ala ſiniſtra, videlicet ſexta]. They had virtually the same latitude; in latitude, however, Mars had been more southerly by over half a foot, judging by sight.

April 11 [11. Aprilis], at 8^h after noon [hora octava poſt meridiem,], I saw the Moon near the Heart of Leo [cor Leonis], and as far as I could grasp by sight, the Moon stood from that same star less than a degree and more than half a degree toward the east; in latitude, however, the Moon had been more southerly by a little more or a little less than a degree [modicum ultra vel citra gradum.].

April 18 [18. Aprilis], after sunrise [poſt ortum Solis.]

		First sine [Sin.1.]	Second sine [ſin.2.]
Between [Inter]	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	90	891

April 19 [19. Aprilis], shortly after sunrise [poſt ortum Solis modicum.]

Between [Inter]	Saturn and the Heart of Leo [Saturnum & cor Leonis]	90	892
	Saturn and the Sixth Star of Leo [Saturnum & ſextam Leonis.]	140	882

April 29 [29. Aprilis], at the hour as above [hora ut ſupra.]

Between [Inter]	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis.]	80	791½

May 8 [8. Maij], immediately after sunrise [ſtatim poſt ortum Solis.]

Between [Inter]	Saturn and the Eighth Star of Leo [Saturnum & octavam Leonis]	80	769

May 11 [11. Maij], after sunset [poſt occaſum Solis.]

Between [Inter]	Mars and Spica [Martem & ſpicam.]	80	878

May 19 [19. Maij], at the hour as above, 1^{h} after sunset [hora ut ſupra, hora prima poſt occaſum.]

	Mars and Spica [Martem & ſpicam.]	80	941
Between [Inter]	Mars and the one you take to be 10 of Virgo [♂, & eam quam 10. Virginis putas.]	160	941
	Likewise the fixed stars [Item fixas.]	200	772

July 26 [26. Iulij], about 1^{h} after sunrise, that is, not a full hour [una hora quaſi, ideſt non plene, poſt ortum Solis], I saw the Moon near Venus, and Venus was the more easterly. I took their distance with the instrument.

20	882

Likewise, the latitude that there was between them was certainly small: as I judged by sight, the Moon was the more southerly, by very little [in modico valde.].

July 29 [29. Iulij], at about 1^{h} after noon [quaſi hora prima poſt meridiem], namely while the Sun's altitude was 54 ν[?]°, the beginning of the eclipse of the Sun; its end, however, while the Sun [?] at an altitude of 41 ν[?]° [dum Sol in altitudine 41 ν[?] gradus con-tinebat.].

August 11 [11. Auguſti], at about 3^h after midnight, in the morning [hora quaſi tertia poſt medium noctis de mane], I saw Venus about midway between the two stars of Gemini [inter duas ſtellas ♊]. Venus was almost in one line with them, though standing slightly off to the west, and it seemed to be slightly farther from the southern one than from the northern [in modico plus diſtare à meridionali quam à ſeptentrionali.].

August 12 [12. Auguſti], at the hour as above [hora ut ſupra], I saw Venus again. It had become as far east of the straight line drawn through these two stars as it had appeared west of it the day before.

August 22 [22. Auguſti], at about 3^h after midnight [hora quaſi 3. poſt mediū noctis], Jupiter and the two Eyes of Taurus were in one line, and Jupiter was the more westerly, standing off by half the distance by which the two eyes stand from the more westerly eye [diſtans per medietatem diſtantię qua duo oculi diſtant ab oculo occidentaliori]. So it appeared to the sight.

August 24 [Vigeſimaquarta Auguſti], in the morning [de mane.]

		First sine [Sin.1.]	Second sine [ſin.2.]
Between [Inter]	Jupiter and the Right Eye of Taurus [♃ & dextrum oculum ♉]	70	811
	Jupiter and the Left Eye of Taurus [♃ & ſiniſtrum oculum ♉]	30	942
	The fixed stars [Fixas]	50	942

September 21 [21. Septembris], at about 5^h after midnight [hora quaſi 5. poſt noctis medium], I took, roughly [groſſo modo], between Venus and the Eighth Star of Leo [inter ♀, & octavam ♌]:

19	410

September 24 [24. Septembris], 40^m before sunrise [per 40 m. ante ortum Solis], I saw the Moon near Saturn, the two almost in conjunction [quaſi conjunctos]. The Moon stood slightly off to the north, so that between its circumference and Saturn there seemed to lie the space of one palm [ſpacium unius palmi.].

September 30 [30. Septembris], Jupiter was again in one line with the two Eyes of Taurus, namely in the same place as on August 22 [vigeſima ſecūda Auguſti] at the same hour.

October 20 [20. Octobris], in the morning, at a distance of 3 ♈[?]^h from the rising [per diſtantiam 3 ♈[?] horarum ab ortu] of the Sun, I saw the Moon near the Heart of Leo, about half a degree away [quaſi per medium gradum diſtantem]. And this distance lay more in the direction of the latitude that the Moon had toward the north. Half an hour before sunrise, however [Hora autē

media ante ortum Solis], while the Moon was near mid-heaven, I observed the distance with the instrument:

20	610

which makes 1° 52′ [facit 1. grad. 52. minut.].

The Year 1479 [Anno 1479.]

October 30 [30. Octobris]: there was a conjunction of Saturn and Mars in longitude [♂ ♄ & ♂ ſecundum longitudinem]. Saturn, however, was further north by about one degree; Mars was very close to the Sixth Star of Virgo [ſextæ virginis].

November 7 [7. Novembris]: Mars was in conjunction with the Seventh Star of Virgo [ſeptimæ virginis] in longitude, but further south than the fixed star by more than a degree [ultra gradum].

November 16 [16. Novembris.]

	Saturn and the Seventh Star of Virgo [♄ & ſeptimam Virginis]	60	859
	Saturn and the Tenth Star of Virgo [♄ & decimam Virginis]	130	884
Between [Inter]	Mars and the Seventh Star of Virgo [♂ & ſeptimam Virginis]	80	925
	Mars and the Tenth Star of Virgo [♂ & decimam Virginis]	130	925
	The Seventh and Tenth Stars of Virgo [Septimam & decimam Virginis]	90	865
	Mars and Saturn [♂ & Saturnum]	140	903

November 24 [24. Novembris], more exact than the one before [exquiſitor priore.] [recte: exquiſitior]

	Saturn and the Sixth Star of Virgo [Saturnum & ſextam Virginis]	30	796
	Saturn and the Seventh Star of Virgo [♄ & ſeptimam Virginis]	40	667
	Saturn and the Tenth Star of Virgo [♄ & decimam Virginis]	90	632
Between [Inter]	The Sixth and Seventh Stars of Virgo [Sextam & ſeptimam Virginis]	60	620
	The Seventh and Tenth Stars of Virgo [Septimam & decimam Virginis]	90	859
	Mars and the Seventh Star of Virgo [Martem et ſeptimam Virginis]	110	643
	Mars and Spica [Martem et Spicam]	80	867
	Mars and the Fifteenth Star of Virgo [♂ et decimam quintam Virgin.]	120	878

The Year 1481 [Anno 1481.]

October 22 [22. Octobris], about an hour before sunrise [ante ortum Solis ferè ad unam horam], I saw Saturn and Mercury apart, as I judged by sight, by no more than the diameter of the Moon [non ultra diametrum Lunæ]. I judged this distance to be in longitude only [tantum … ex parte longitudinis], for they seemed to have the same latitude; and Mercury was the more easterly.

October 23 [23. Octobris], at the same hour, I saw them again [vidi irerum cos,] [recte: iterum eos], and Mercury had become noticeably more easterly, so that it seemed to stand three diameters of the Moon from Saturn [per tres diametros Lunæ.].

October 28 [28. Octobris], half an hour before sunrise [ad mediam horā ante ortum ☉,], I took the distance between Saturn and Mercury.

		60	528

November 3 [3. Novemb.], half an hour before sunrise [media hora ante ortū ☉,], I again took with the instrument the gap between Saturn and Mercury [intercapedinem ♄ & ☿.].

Compare the positions with the times set down, and you will find a great difference between the truth and the tables: for on October 21 [vigeſima prima … die octobris] there was without doubt their conjunction [conjun. eorum], which you will by no means derive from the tables. The air was fairly clear [Aer ſatis clarus] on these days.

November 15 [15. Novembris], 1^h before sunrise [hora prima ante ortum Solis,]

	Spica and Saturn [Spicam & Saturnum]	80	706
	Spica and Mars [Spicam & Martem]	60	647
Between [Inter]	Saturn and Mars [Saturnum & Martem]	10	422
	Spica and Venus [Spicam & ♀]	40	562
	Saturn and Venus [♄ & Vencrem] [recte: Venerem]	40	496
	Mars and Venus [♂ & Venerem]	40	513

Likewise, Mars was the more easterly, after it Saturn, then Spica, but Venus the more westerly among all these stars [ſed ♀ occidentalior inter omnes has ſtellas]. And Mars seemed to have passed Saturn slightly [modicum], while the distance between them would be in the direction of the latitudes [?] [experte latitudinum fore.].

November 19 [19. Novembris], at the hour given above [hora ut ſupra.]

	Saturn and Venus [♄ & ♀.]	10	742
	Mars and Venus [♂ & ♀.]	30	615
	Saturn and Mars [♄ & ♂.]	20	489
	Spica and the Twenty-First Star of Virgo [Spicam & 21. ♍.]	110	570
Between [Inter]	Spica and Venus [Spicam & ♀.]	70	632
	Venus and the Twenty-First Star of Virgo [♀ & 21. ♍.]	100	660
	Saturn and Spica [♄ & Spicam.]	70	586

	Saturn and the Twenty-First Star of Virgo [♄ & 21. ♍.]	100	625
	Mars and Spica [♂ & Spicam.]	80	598
	Mars and the Twenty-First Star of Virgo [♂ & 21. ♍]	120	588

Also, Venus was further west than Saturn, and all the more so than Mars [& à fortiori Marte]; and Venus itself was also further south than Saturn.

November 25 [25. Novembris], about one hour before sunrise [quaſi una hora ante ortum ☉.]

	Saturn and Venus [Saturn. & ♀.]	70	720
	Saturn and Mars [Saturn. & ♂.]	60	655
	Mars and Venus [♂ & ♀.]	20	750
Between [Inter]	Spica and Saturn [ſpicam & Saturn.]	80	630
	Venus and Spica [♀. & ſpicam.]	130	597
	Spica and Mars [ſpicam & ♂.]	120	596
	Saturn and the Twenty-First [Saturn. & 21.]	100	590

Venus was also further north than Mars.

December 30 [30. Decembris], at 3^h before sunrise [ad 3. horas ante ortum ☉.]

Between [Inter]	Spica and Saturn, with Saturn lying to the east [Spicã & Satur.♄ exiſtente oriental.]	90	544
	Saturn and the Twenty-First Star of Virgo, carefully [♄ & 21. ♍. diligenter.]	110	535

The Year 1482 [Anno 1482.]

January 12 [12 Ianuarij], in the second half-hour [?] before sunrise [altera media hora ante ortum ☉.]: the Moon was eclipsing Saturn, for at that time it was not seen [tempore enim illo non videbatur]; but before and after the eclipse I noted the configurations set down below [habitudines infraſcriptas]. Also, when the Moon was at the last quadrature, or near it [aut circa], it was certainly wanting on its western side [utique deficiebat ex parte occidentis]. And when it was first observed, namely about $2\frac{1}{2}^h$ before sunrise [circa 2½ horas ante ortum ☉], Saturn was further east and, as it appeared, further south than the Moon, at a distance of two Moons [per duas Lunas]. Afterwards clouds came between, so that I could not see the beginning. I judged for certain, however, that the Moon was going to catch Saturn with its southern horn [cornu auſtrali apprehenſura fuerat ♄]. But after I saw Saturn again, it stood off along the diameter by two digits or less [ad duos digitos vel citra] from the northern horn, and then, conversely, it began to appear again; they had already passed the middle of the sky [trãſivere jam medium cœli].

At the time I judged to be the middle of this eclipse, I took the altitude of the Moon, which was nearly on the meridian line, and found 32° [32. grad.]. What I set down above, namely that the Moon would first catch Saturn with its southern horn, does not seem possible when the Moon's path is considered. But this at least was plainly seen: that Saturn stood off from the northern horn, along the Moon's diameter, by two digits or about that [per duos digitos, aut circa].

January 19 [19. Ianuarij], at 3^h before sunrise [ad 3 horas ante ortum ☉.]

	Spica and the Twenty-First Star of Virgo, exactly [Spicam et 21 ♍ exacte.]	110	580
Between [Inter]	Saturn and the Twenty-First Star of Virgo [♄ et 21 Virginis.]	110	520
	Saturn and Spica, carefully [♄ et Spicam diligenter.]	90	512

October 6 [6. Octobris], not quite 1^h before sunrise [non plene 1. hora ante ortum ☉], I saw Mercury.

October 7 [7. Octobris]: I saw Mercury, and it was further east and a little further south than a certain star [quadã ſtella], which I found nearly in longitude [quam reperi ferè in longitudine]. By estimate it stood off by the size of one man [diſtabat æſtimando ad quantitatem unius viri].

October 11 [11. Octobris], a little before sunrise, I saw Mercury near the Moon [apud ☾.]. Mercury was further south by the amount of the Moon's diameter, or more, but the longitude was nearly the same.

October 19 [19. Octobris], I saw Mercury again.

October 20 [20. Octobr.], half an hour before sunrise [media hora ante ortum ☉], I saw Mercury [vidi ☿.].

October 25 [25. Octobr.]: Mercury disappeared [diſparuit ☿]. Under a very clear sky it could not be seen, over an interval of 4 days, namely between October 20 and 25 [inter 20. et 25 dies Octobr.]. During that interval I made no observation [non conſideravi], because of clouds.

The Year 1484 [Anno 1484.]

January 16 [16. Ianuarij]: I observed Mercury with a well-corrected clock [horologio bene correcto], that is, one that had come back exactly from noon to the noon of the preceding day [de meridie ad meridiē diei præcedentis ad unguem redijt]. I saw Mercury in the morning at its contact with the horizon [in contactu horizontis], and at that same instant I hung the weight on the clock, which had 56 teeth, that is [?], the hour wheel [56.den ticulos id rota horaria]. That wheel turned once, and 35 teeth more [& inſuper 35. den ticuli], by the moment the center of the Sun appeared on the horizon. It follows that on that day Mercury had risen 1^h 37^m [una hora & 37. min.] before the Sun, which nearly agrees with the calculation.

September 17 [Die 17. Septembris]: I still saw Mercury in the morning [adhuc vidi Mercuriū matutinū.]. I do not know why I wrote "still" [adhuc], since I find nothing about Mercury in the short time before this day.

November 21 [Die 21. Novembr.], in the morning, I saw Jupiter and Saturn [Iovem & ♄.]; and Jupiter was noticeably further east than Saturn [♃ notabiliter orientalior ♄]. See the tables.

November 28 [Die 28. Novembris], at about the third hour of the night after noon [hora ferè tertia noctis poſt meridiē], the Moon was eclipsing Mars.

The Year 1485 [Anno 1485.]

January 8 [Die 8. Ianuarij], in the morning, I saw the Moon near Spica, so that in my judgment their visible conjunction was already past at 5^h after midnight [hora 5. poſt medium noctis]. I did not see Mercury that same morning.

March 3 [Die 3. Martij]: I saw Mercury in the evening [Mercurium veſpertinū] at the seventh hour after noon [hora ſeptima poſt meridiem]. Similarly, on the following day at the same hour, it stood quite far from the Sun [ſatis diſtabat à Sole].

March 12 [Die 12. Martij]: I saw Mercury in the evening, between the seventh and eighth hours after noon [inter ſeptimam & octavam horas poſt meridiem].

March 16 [Die 16. Martij]: an eclipse of the Sun. Its beginning came after noon, at the third hour and 26^m [tertia hora & 26. min.], and its end at 5^h 28^m [quinque hor. & 28. m.], and about 11 points [circa 11. puncta] were obscured. According to calculation, however, the Sun ought to have been totally eclipsed [debebat autem ſecundum calculum totus eclipſari], as also happened in the middle of the seventh clime [in medio ſeptimi climatis], for which the tables from which the eclipse described above was taken were composed.

August 5 [Die 5. Auguſti], in the morning, a little before the fourth hour after midnight [modicum ante quartā poſt medium noctis], I saw the Moon near the star that is the Twenty-First Star of Taurus [viceſima prima Tauri], namely on the northern horn, and it is the same as the Eleventh Star of Alhajath [undecima Alhajath]. The Moon was very slightly further east [valde modicū orientalior] but further south, not quite by the diameter of the Moon [non omnino per diametrum Lunæ].

August 14 [Die 14. Auguſti], 1^h before sunrise [una hora ante ortum Solis], I saw Mercury.

August 19 [Die 19. Auguſti]: I saw Mercury in the morning [Mercurium matutinum]. Likewise on August 21 as well [Item 21 die Auguſti etiam.]. Likewise on August 22, 24 and 29 [Item 22.24. & 29. die Auguſti] I saw Mercury again.

The Year 1486 [Anno 1486.]

August 11 and 13 [Die 11. & 13. Auguſti], at the fourth hour after midnight [hora quarta poſt medium noctis], I saw Mercury.

August 18 [Die 18. Auguſti], in the morning, at 4^h after midnight [hora 4. poſt medium noctis],

	Mars and the northern horn [Martem & cornu ſeptentrionale]	110	587
Between [Inter]	Mars and Aldebaran [Martem & Aldebaran]	70	635
	the fixed stars, with each other [Fixarum inter ſe]	170	556

Mars was to the west of the line drawn out to the fixed stars [occidentaliter à linea ad fixas protenſa.].

August 20 [Die 20.Auguſti], at the third hour after midnight, in the morning [hora tertia poſt mediū noctis de mane],

Between [Inter]	Mars and the northern horn [Martem & cornu ſeptentrionale]	109	580
	Mars and Aldebaran [Martem & Aldebaran]	70	559

Also, these three stars were in one line [Item erant in una linea hæ tres ſtellæ.].

August 26 [Die 26. Auguſti], in the morning, at the fourth hour after midnight [de mane hora quarta poſt medium noctis].

	Mars and the northern horn [♂ & cornu ſeptentrionale]	70	535
Between [Inter]	Mars and Aldebaran [♂ & Aldebaran]	100	571
	the fixed stars, with each other [Fixarum inter ſe]	170	560

Also, Mars was further east than the line drawn through the fixed stars [Item Mars fuerat orientalior à linea per fixas traducta.].

August 31 [Die 31. Auguſti], in the morning, at the fourth hour after midnight [de mane hora quarta poſt medium noctis].

	Mars and the southern horn [♂ & cornuMeridionale]	40	541
	Mars and the northern horn [♂ & cornu ſeptentrionale]	60	541
Between [Inter]	Mars and Aldebaran [♂ & Aldebaran.]	120	547
	the two horns [Duo cornua]	80	573
	the southern horn and Aldebaran [CornuMeridionale & Aldebaran]	160	58[?]
	the northern horn and Aldebaran [Cornu ſeptent. & Aldebaran]	180	593

Also, Mars was in a triangle through the three fixed stars, as having caused the angles of that triangle [?] [Item ♂ fuerat in triangulo per tres fixas, ut angulos ejuſdē cauſata.].

September 7 [Die7.Septemb.], at the fourth hour in the morning, after midnight, Mars was between the two Horns of Taurus, two Moons away from the southern horn [fuerat ♂ inter duo Cornua Tauri hora quarta de mane, poſt medium noctis diſtans à cornu meridionali per duas Lunas], and these three stars were in one line [& erant in una linea hæ tres ſtellæ.].

September 20 [20. Septemb.], in the morning, at 5^h after midnight [de mane, hora 5. poſt medium noctis], Venus was further east than the Heart of Leo by one Moon [fuerat ♀ orientalior corde Leonis per unam lunam]; its latitude appeared almost the same [latitudo apparebat ferè eadem.].

September 21 [21. Septemb.]: Venus had become further east than the same star, namely the Heart of Leo, by three Moons [facta fuerat Ven. orientalior eadem ſtella videlicet corde Leonis per tres lunas.].

September 22 [22. Septemb.]: Mars was further west of the unformed stars of Taurus by four digits, at almost the same latitude [fuerat ♂ occidentalior informatarum ♉ per quatuor digitos ferè in eadem latitudine.].

September 24 [24. Septembris]: there was a conjunction of the Moon and Venus [fuerat ☌ ☾ ac ♀] between the tenth and eleventh hours before noon [inter decimam & undecimam ante meridiem]. Venus was further north than the limb of the Moon by the Moon's semidiameter [fuerat ♀ ſeptentrionalior à limbo lunæ per ſemidiametrum lunæ.].

October 21 [21. Octobris], in the morning [de mane], when the Heart of Leo had an altitude before the meridian of 45° [dum cor Leonis in altitudine ante meridiana habuit 45. gradus], the Moon began to cover that same star [incepit luna operire eandem ſtellam], for it was touching it with its limb [limbo enim tangebat eam], roughly in the arrangement formed below [quaſi diſpoſitione infra formata]. Immediately after this it was not seen [ſtatim poſthac non videbatur]; the air was somewhat disturbed, so that I could not see the emergence [aër modicum turbabatur, quod exitum videre non potui], but afterwards it was seen in such an arrangement [ſed poſtea videbatur tali diſpoſitione]. A fair observation [mediocris conſideratio.].

Diagram. A disposition set in type only, with no drawn lines: South at the head and North at the foot, East on the left and West on the right, each of the side labels with a Moon sign on its inner side and a second label beneath it. The centre between the two sides is blank.

- A (top, centred): South [Auſter.]
- B (left): East, with Moon sign [Oriens ☾]
- C (left, beneath B): After the end [Poſt finem]
- D (right): West, with Moon sign [☾ Occidens.]
- E (right, beneath D): beginning [principium.]
- F (bottom, centred): North [Septentrio.]

The Year 1487 [Anno 1487.]

February 8 [8. Februarij]: I observed an eclipse of the Moon at about the second hour after midnight, in the morning [conſideravi Eclipſim Lunæ hora quaſi ſecunda poſt medium noctis de mane]; the Moon began to be eclipsed

[incepit Luna eclipſari]. When the nadir of the Sun had an altitude of 29° [& dum nadir Solis in altitudine habuit 29. gradus], it was the middle of the eclipse [fuerat medium Eclipſis], and at that time the clock showed 3^h 47^m [eo vero tempore horologium indicaverat tres horas & 47. minut.]. At the end of the total obscuration the nadir of the Sun had an altitude of 24°, the clock at 4^h 18^m [& in fine totius obſcurationis habuit nadir Solis in altitudine 24. gradus, horologium 4. horas 18. min.]. The end of the eclipse: 5^h 20^m after midnight [finis Eclipſis horas 5. minut.20. poſt noctis medium]. Examine the times by the altitudes, and conversely [examina tempora per altitudines & econverſo.].

At the time of the middle of the eclipse, between the Heart of Leo and the nadir of the Sun [In tempore mediæ Eclipſis inter Cor Leon. & nadir Solis.]: 60 | 635.

Also, the apparent latitude of the Moon was southern [Item Latitudo Lunæ viſa fuerat meridionalis.].

Also, by calculation, the true position of the nadir of the Sun at the time of the middle of the eclipse ought to have been 4^s 28° 39′ 44″ [Item locus verus nadir Solis tempore medij Eclipſis ex calculo habere debuit 4. 28. 39. 44.]. But the arc between the Heart of Leo and the nadir of the Sun was 5° 24′ [Sed arcus inter Cor Leon. & nadir Solis fuerat 5. graduum 24. min.] and according to this [penes hoc,], the position of the Heart would have been 4^s 23° 15′ 44″ [locus cordis fuiſſet 4.23.15.44.]. But it is not that great [Sed tantus non eſt.].

February 28 [28. Februarij], at 7^h 52^m after noon [hora 7. minut.52. poſt meridiem], that is, when the Moon in the midheaven had an altitude of 47° [videlicet dum Luna in medio cœli habuit 47. grad. in altitudine], and Canis Major, namely Alhabor, had an altitude of 23½° after the meridian [& Canis major videlicet Alhabor 23½ in altitudine poſt meridiana], the Moon was touching the northernmost of the Pleiades with its southern horn [tangebat Luna cornu auſtrali, borealiſſimam Pleiadum.].

March 7 [7. Martij], at exactly the seventh hour after noon [hor. præciſe ſeptima poſt meridiem.]. Between the Heart of Leo and the Moon [Inter cor ☌ & Lunam.]: 80 | 456.

The Year 1488 [Anno 1488.]

January 16 [16. Ianuarij], at 5^h 30^m after noon [hora 5. & min. 30 poſt merid.], between Jupiter and Mercury [inter ♃ & Mercurium.]: 10 | 40.

Between the western limb of the Moon and each of these, the same distance, namely [Inter limbum Lunæ occidentalem & utrumque horum eadem diſtantia, videlicet]: 80 | 401.

And Mercury was further north than Jupiter [Et fuerat Mercurius Septentrionalior Iove.].

January 17 [17. Ianuarij.].

Between Jupiter and Mercury, but Mercury further east and further north [Inter ♃ & ☿, ſed ☿ orientalior & Septen.]: 20 | 658.

January 19 [19. Ianuarij,].

Between Jupiter and Mercury [Inter ♃ & Mercurium]: 20 | 482.

Also, Mercury further east and further north than Jupiter [Item ☿ orientalior & Septentrionalior Iove:].

September 8 [8. Septembris], at 6^h after noon [hora 6. poſt meridiem,], that is, when 25° of Sagittarius was in the midheaven [videlicet dum in medio cœli fuerat 25.grad. ♐,], the position of the Moon by the armillary rings was 3° of Scorpius [locus Lunæ per Armillas 3. grad. Scorp.]. The Sun at 24° of Virgo [Sol 24. grad. ♍,]; I believe minutes are lacking in this observation [credo dificere minut. in hac obſervatione.] [recte: deficere].

September 13 [13. Septemb.], at 4^h after midnight [hora 4.poſt medium noctis,], I noted Mars near the star 11 of Gemini [?] [notavi Mar.circa ſtellam, 11. ♊.], and it stood off toward the north by not fully one Moon [& diſtabat verſus ſeptentr. non plene per unam Lunam.].

September 14 [14. Septembr.]: the Moon at sunset at 22½° of Capricorn [Luna in occaſu Solis 22½ ♑,], Jupiter at 16½° of Pisces [♃ 16½ ♓,], when 5° of Capricorn was in the midheaven [dum 5.grad. ♑. fuerat in Medio cœli,]; Saturn at 28° of Sagittarius [♄. 28. grad. ♐.]. The mid- [Medium] heaven, 1° of Capricorn [cœli, 1. ♑,]; its latitude 0° 15′ north [latitudo ejus 0. grad.15. min. Septent.]. Also, a fixed star was found at the first minute of Taurus [Item ſtella fixa reperiebatur in primo minut ♉,], having a northern latitude of 10° [habens latitudinem Septentr.10 graduum,], which must be the first of the unformed stars of Aries [quam oportet eſſe primam informatarum ♈,], of the third magnitude [de tertia magnitudine.].

September 15 [15. Septemb.]: Mars at 12° of Cancer [♂ in 12. ♋,]. Also the head of the Following Twin at 15° 20′ of Cancer [Item caput ſequentis ♊. 15.gra.20 min.♋.].

October 3 [3. Octobr.], in the morning [de mane], Mars and the two heads of Gemini were in one line [fuerant in una linea ♂ & duo capita ♊,]. Mars stood off from the following head toward the east by almost double the distance between the two heads [Diſtabat ♂ à ſequenti capite verſus orientem ferè in duplo diſtantiæ duorum capitum.].

October 7 [7. Octob.], at sunset, when the midheaven was at 9° of Capricorn [in occaſu Solis dum Medium cœli fuerat 9.gra. ♑]: the Sun [?] at 23° 31′ of Libra [o. 23.gra.31.min. ♎.]. The Moon at 25° of Scorpius, with the midheaven standing at 13° of Capricorn [Luna grad.25. ♏, Medio cœli exiſtente 13.grad. ♑.]. Jupiter at 1[?]° 20′ of Pisces [♃ 1[?].grad.20. m.♓.].

October 8 [8. Octobris], when the midheaven was at 8° of Capricorn [dum Medium cœli fuerat 8.grad. ♑,], that is, at sunset [videlicet in occaſu Solis,], the Sun had 23° 31′ of Libra [habuit Sol.23. gra.31. min. Librę,], the Moon 9° of Sagittarius [Luna 9. grad. ♐.].

Also, with the midheaven standing at 13° of Capricorn [Item Medio cœli exiſtente 13.gra. ♑,], Jupiter, as before, at 13° 20′ of Pisces [♃. ut prius 13.grad. 20. m. ♓.]. Its southern latitude 1° [Latitudo ejus Merid.1.grad.].

Also, the unformed star of Aries at the beginning of Taurus had a northern latitude of 10° 10′ [Item informata ♈ in principio ♉ habuit latitud. Septēt. 10

gra.10.m.]. Aldebaran at 1° 40′ of Gemini, with a southern latitude of 5° 0′ [Aldebaran 1.gra.40.m.♊ cum latitudine merid.5.gra.0.min.].

December 9 [9. Decemb.], when the midheaven was at 25° of Aquarius [dum medium cœli fuerat 25 gra. ♒,], that is, after sunset [videlicet poſt occaſum ☉,], I found the Moon by the armillary rings at 11° of Pisces [reperi ☽ per Armillas in 11.grad. ♓,]. When the midheaven was at 1° of Pisces [dū medium cœli fuerat 1.grad. ♓.], I found Jupiter at 17° 45′ of Pisces [reperi ♃. in 17.grad. & 45.m.♓,], with a southern latitude of 1° 45′ [cum latitudine merid.1.grad.45.min.].

The Year 1489 [Anno 1489.]

March 5 [Die 5.Martij], before sunset [ante occaſum Solis,], that is, when the midheaven occupied the 22nd degree of Gemini [videlicet dum medium cœli 22 gradum ♊ poſſidebat,], and the Sun, by sighting with the armillary rings and rulers, at 24° 15′ of Pisces [& Sol per aſpectum armillarū & regularum in 24. grad.& 15. min.♓,], Venus, by another circle, at 26° 8′ of Aries [♀ per alium circulum in 26. gradibus 8. minut.♈.], had been found [inventi fuerant,]; Canis Alhabor half an hour or more after sunset [poſt occaſum per mediam horam aut ultra], had [habuere] 7° 30′ of Cancer [7.grad.30.m.♋.], the Heart of Leo [Cor ♌] 23° 0′ of Leo [2;.gradus 0. m.♌][78]. Do not rely too much on this observation [non funda te nimis in hanc obſervationem.].

March 6 [Die 6. Martij], around sunset [circa occaſum Solis,], that is, when 25° of Gemini was in the midheaven [dum videlicet in medio cœli eſſet 25 ♊.], the Sun, by the armillary rings, was at 25° 15′ of Pisces [Sol per Armillas in 25. grad. 15. min. ♓.]. Venus, by another circle, with the ecliptic dividing the Sun, was found at 27° 15′ of Aries [Venus per alium circulum, ecliptica Solem dividente in 27 grad. 15. min. ♈ inventa eſt,]. But with the circle of latitude bisecting the Sun (as usually happens near the horizon) it was found in another position, namely at 25° 30′ of Aries [ſed circulo latitudinis Solem mediante (uti Solet circa horizontem) in alio loco, puta in 25. grad. 30. minut. ♈ reperta eſt,]. I will add the reason for this later [cujus cauſam poſtea ſubjungam.].

On the same day, after sunset [Eadē die poſt occaſum Solis], with the armillary ring adjusted by means of Venus placed in the position found through the ecliptic [Armilla rectificata mediante Venere in eo loco poſita, qui per Eclipticā inventus eſt,], I found, when the midheaven was 12° of Cancer [reperi dum Medium cœli 12. gradus ♋ foret.], the Heart of Leo at 23° 0′ of Leo [Cor ♌ in 23. grad. 0.min. ♌,], and Alhabor, as I believe, at 7° of Cancer [Alhabor, ut credo, 7. gradus ♋.].

March 7 [Die 7. Martij]: the Sun, by sighting with the armillary rings, 26° 15′ of Pisces [Sol per aſpectum Armillarum 26. grad. 15. min. ♓.]; Venus, from the ecliptic, 28° 15′ of Aries [Venus ex ecliptica 28 grad. 15. min. ♈], and from the circle of latitude, 27° 38′ of Aries [ex circulo latitudinis 27. grad. 38. min. ♈.].

[78] the second figure is broken in this copy; the Rome copy prints a 3.

Likewise, so that future readers may not be left for long in ignorance of how I proceeded, given that the position of Venus was found so inconsistently at what was practically the same instant [quod(locus ♀ quaſi in eodem inſtanti adeò difformiter repertus ſit.]: it should be noted that near the horizon the stars appear above the horizon because of refracted rays, although in truth they are below it. This has quite often appeared to me, perceptibly, with the instrument of the armillary rings, before I had seen the *Perspectives* [perſpectivas] of Alhacen [Ibn al-Haytham] and of Vitelio the Thuringian [Vitelionis Turingi] [Witelo], in which I afterwards found this set out precisely. But to avoid the Moon's parallax [Lunæ aſpectus diverſitatem], I also examined the method of Ptolemy in chapter 2 of Book 7 [capitulo ſecundo dictionis ſeptimæ]. And I determined the distance between the Sun and Venus around noon, or later, with the instrument of the armillary rings, after first taking the position of the Sun by the rulers or the armillary rings, or by both instruments.

But when, at sunset, I had seemed to be examining the positions of both, namely the Sun and Venus [Cum vero in occaſu ☉ loca amborū, videlicet ☉ & ♀ examinare viſus fuerā,], by turning the ecliptic of the armillary rings and the position [vertendo eclipticam armillarum & locum] of the Sun on it toward the Sun [Solis in eodē verſus ipſum], until both parts of the inner surface, namely the lower and the upper, were equally illuminated by the Sun [quoad interiori, ſuperficiei utraque pars videlicet inferior & ſuperior], and also by moving the circle of latitude [circulum latitudinis] until both parts of its inner surface, namely the right and the left, had likewise received equal illumination from the Sun: therefore, if the Sun's rays had reached the eye unrefracted [irrefractè], the circle of latitude would certainly have shown the position of the Sun.

But I found a notable difference, and one that varied. It was greater when the declination of the Sun had increased or decreased only a little, and smaller when the declination was changing notably, so that it was greatest at the solstices and smallest at the equinoxes.

Therefore, when at sunset I saw both circles illuminated by the Sun (as was said above), I by no means had the true position of the Sun, nor, from it, that of Venus [nequaquam Solis, neque ex eo Veneris locum verum habui.]. If, however, with the circle of latitude placed on the position of the Sun found by the noon observation and found by adding its intervening motion [per additionem motus ejus intermedij], I presented the same circle toward the Sun at sunset until, in the manner described, its inner surface was illuminated, I came closer to the truth; nor was that method sufficient.

For this reason I hung a plumb line from the hole near the eye in the sight-vane [ex foramine apud oculum pinnulæ appendi perpendiculū,], considering with special ingenuity that the point whose form is refracted [punctum cujus forma refrangitur], the center of vision [centrum viſus], the point from which the refraction occurs, and the perpendicular from the point of refraction lie in one plane [in una ſunt ſuperficie]. And I saw that when the intersection of the ecliptic and the circle of latitude had come into contact with the horizon, the

Sun, through the hole of the other sight-vane, still illuminated the thread of the plumb line. The things just described therefore lay in one plane: namely the center of the Sun, also the point whose form is refracted, the center of vision, the point of refraction and the perpendicular, and likewise the position of the Sun on the ecliptic. Therefore, in all the observations [obſervationibus obſervationibus] [recte: obſervationibus] preceding and fol- [præcedentibus & ſe-] lowing, made on the fixed stars [quentibus ad ſtellas fixas habitis,], greater trust is to be placed in those in which I used the plumb line (as was touched on above) [illis major fides adhibenda eſt, in quibus perpendiculo (uti prætactum eſt) uſus ſum.].

March 12 [12. Martij], at sunset [in occaſu Solis], Venus had 4° 18′ of Taurus [habuit ♀ 4. gra. 18. minut. Taur.]; Alhabor 7° 0′ of Cancer [Alhabor 7.gra. 0.m. ♋.]; the Heart of Leo 23° of Leo [Cor ♌.23. ♌]; the latitude of Alhabor 39½°, southern [latitudo Alhabor 39½. grad. meridionalis.].

March 13 [13. Martij], after sunset [poſt occaſum Solis], Alhabor had 6° 45′ of Cancer [habuit Alhabor 6.grad.45. min. ♋.]; latitude 39° 40′ [latitudo 39.grad.40.m.]; the Heart of Leo 22° 38′ of Leo [Cor ♌ 22.gr.38. m. ♌.]; Venus 5° 15′ of Taurus [♀ 5. grad.15.min. ♉.].

March 14 [14. Martij], Venus had 6° 13′ of Taurus at sunset [habuit Ven. in occaſu Solis 6. grad. 13. minut. Taur.].

March 15 [15. Martij], half an hour after noon [media hora poſt meridiem], Venus had 7° 23′ of Taurus [habuit ♀ 7.grad. 23. min. ♉], with the armillary rings regulated from the Sun's true position [ex vero Solis armillis regulatis.]. Likewise after sunset [Item poſt occaſum ☉], Alhabor was found, from the motion of Venus, at 7° 20′ of Cancer [Alhabor ex Veneris motu in 7.gra.20. min. ♋ repertus,]; the Heart of Leo 23° of Leo [cor ♌ 23.grad. ♌.].

March 16 [16. Martij], at 4^h after noon [hora 4. poſt meridiem,], the Sun had 5° 3′ of Aries [habuit ☉ 5.grad. 3.minut. Ari.], Venus 8° 40′ of Taurus [Venus 8. grad 40. minut. ♉.]. But at 7^h after noon [Sed hora 7. poſt meridiem], with Venus set on 8° 46′ of Taurus [Venere poſita ſuper 8.grad.46. minut.Taur.], Alhabor had 6° 45′ of Cancer [habuit Alhabor 6.grad.45. minut. Canc.], the Heart of Leo 22° 30′ of Leo [Cor ♌,·22·grad.30 minut. ♌.].

March 18 [18. Martij], when 25° of Gemini was in the midheaven [dum medium cœli fuerat 25.grad. Gemi.], Venus had 11° 15′ of Taurus [Ven. habuit 11. grad.15. minut ♉.]; the Sun 7° 5′ of Aries, by the rulers [☉ 7.grad.5. min. ♈, per regulas,], since the sine of the distance from the zenith was 79,2⅜ [quia ſinus diſtantiæ à vertice 79,2⅜,]; therefore at noon it had 6° 51′ of Aries [ergo in meridie habuit 6.grad.51. minut ♈.]. At 7^h after noon [Hora 7. poſt meridiem,], Venus 11° 20′ of Taurus [Venus 11.grad.20. min. ♉.], Alhabor 7° 0′ of Cancer [Alhabor 7.grad.0.min. ♋.], the Heart of Leo 22° 45′ of Leo [Cor ♌ 22.grad.45.min. ♌.].

March 19 [19. Martij,], when the first degree of Cancer was in the midheaven [dum in medio cœli fuerat primus grad. ♋,], and the Sun had 8° 3′ of Aries from the noon altitude [& ☉ habuit 8.grad.3. min. ♈. ex altitudine meridiana.],

Venus had 12° 27′ of Taurus [Ven. habuit 12.grad.27.min. ♉.]. When 25° of Cancer was in the midheaven [dum medium cœli fuerat 25. ♋], Venus had 12° 33′ of Taurus [Venus habuit 12.grad.33.min. ♉], Alhabor 7° 0′ of Cancer [Alhabor 7.grad.0.mi. ♋.], the Heart of Leo 22° 45′ of Leo [Cor ♌ 22.grad.45.min. ♌.].

March 23 [23. Martij], when 5° of Cancer was in the midheaven [dum in medio cœli fuerat 5.grad. ♋.], Venus had 17° 5′ of Taurus [♀. habuit 17.grad.5. min. ♉.]. The Sun, by the rulers, from the noon observation, 12° 0′ of Taurus [☉ per regulas ex obſervatione meridiana 12.grad.0.min. ♉.][79]. When 26° of Cancer was in the midheaven [Dum in medio cœli fuerat 26.gra. ♋.], Alhabor 6° 45′ of Cancer [Alhabor 6.grad.45. min. ♋.], the Heart of Leo 22° 45′ of Leo [Cor ♌ 22.grad.45.min. ♌.]. But I have doubts about the motion of Venus by 15′, by which I judge it to be lower than the true value [Sed dubito de motu Ven. in 15. minutis, quibus ipſam minus vero æſtimo.].

March 24 [24. Martij], at 5^h after noon [hora 5. poſt meridiem,], Venus had 18° 20′ of Taurus [habuit ♀ 18.gr.20.min. ♉,], the position of Venus being found from the noon observation of the Sun by the armillary rings [ex obſervatione ☉ meridiana per armillas,loco Vener. invento,], when 27° of Cancer was in the midheaven [dum medium cœli fuerat 27.grad. ♋.]. Alhabor, adjusted by Venus [Alhabor per Ven.rectificatus,], whose position (that is, Venus's) was set at 18° 23′ of Taurus [cujus locus ſcilicet Veneris 18.grad.23.m. ♉ ponebatur,], was found at 6° 45′ of Cancer, as often before [inventus eſt in 6.grad.& 45.min.Canc. ſicut antea ſæpius.].

March 24 [24. Martij][80], at noon [in meridie,], the chord of the distance from the zenith 72400 [corda diſtantiæ à vertice 72400.]. But the Sun was not clear [Sed ☉ non clarus,]; it would follow from this observation that the Sun was at 17° 42′ of Aries [ſequeretur ex hac obſervatione, Solem fuiſſe in 17.grad.42. min. ♈.]. But after noon, when 17° of Cancer was in the midheaven [Sed poſt meridiē,dum mediū cœli fuerat 17.grad. ♋,], and therefore at about 6^h after noon [ergo quaſi 6. poſt merid.], I set the Sun at 17° 50′ of Aries [poſui Solē 17.grad.50. min. ♈,] and found Venus at 24° 12′ of Taurus [reperi Venerem in 24. grad.12 min. ♉.]. But at 8^h after noon, I set the position of Venus at 24° 20′ of Taurus [Sed hor.8. poſt meridiem,poſui locū ♀ 24.gra.20.m. ♉.]. And yet I found Alhabor at 7° 0′ of Cancer [At reperi Alhabor 7.grad.0.min.Canc.].

March 31 [31. Martij,], the distance of the Sun from the zenith 71200 [diſtantia Solis à vertice 71200], the Sun being clear [Sole claro exiſtente,], and therefore at 19° 37′ of Aries [quare in 19.gra.37.min. ♈.]. But when 5° of Cancer was in the midheaven [Sed dum medium cœli fuerat 5.gra.Canc.], with the position of the Sun set on 19° 50′ of Aries [☉.locus ſuper 19.gr.& 50.m. ♈.poſitus], Venus was found on 26° 36′ of Taurus [Ven.ſuper 26.gra.& 36.min. ♉ reperiebatur,].

[79] the page prints the sign of Taurus here; the Sun stands in Aries on March 19 and in the second entry for March 24

[80] the page prints this date for two successive entries

At 7^h after noon [hor.7. poſt meridiem], Alhabor, by Venus, at 6° 55′ of Cancer [Alhabor,per Ven.in 6.gra,55.min.Canc.]; Canis Minor 18° 33′ of Cancer [Canis minor 18.gr.33. min.Canc.]; the Heart of Leo 22° 50′ of Leo [Cor ♌ 22.gr.50.min. ♌,]. Rely on these observations [funda te in has obſervationes.].

April 1 [1. Aprilis,], the midheaven 9° of Cancer [Medium cœli 9.gra. Canc.]; the Sun by the armillary rings 20° 50′ of Aries [Sol per armillas 20 grad.50.m. ♈,]; Venus 27° 45′ of Taurus [Ven.27.gr.grad.45.m. ♉.]. But when the midheaven was 5° of Gemini [Sed dum Medium cœli fuerat 5.gr. ♊,], Venus 27° 51′ of Taurus [Ven. 27.gra.51.m. ♉,], Alhabor 6° 55′ of Cancer [Alhabor 6.gra. 55. min. ♋.], Canis Minor 18° 33′ of Cancer [Canis minor 18.grad.33.m. ♋,], the Heart of Leo 22° 45′ of Leo [Cor ♌ 22.gr.45.minut.Leonis,]; a careful observation [diligens obſervatio,] April 5 [5. Aprilis], at 8^h after noon [hora 8. poſt meridiē], with the armillary rings rectified by Alhabor [rectificatis armillas per Alhabor], Mars was at exactly 29° of Cancer [Mars præciſe in 29. grad. ♋.].

April 11 [11. Aprilis,], the midheaven 28 of Taurus [Medium cœli 28 ♉,], the Sun by the armillary rings 0° 25′ of Taurus [Sol per armillas 0.gr.25.min.♉.]. Venus 9° 15′ of Gemini [Ven.9.grad.15.m.♊.].

The Year 1490 [Anno 1490.]

September 18 [18. Septemb.]. I saw Mars [♂] around the nebulous tangle of Cancer [circa implicitatem Caneri nebuloſam,] [recte: Cancri], and it was a little more to the west and to the south [modicum occidentalior & meridionalior.]. Likewise on the following day, namely September 19 [videlicet. 19. Septembris,], it had become more easterly by about as much as, or a little more than, it had been more westerly on the preceding day [orientalior ferè, aut modico plus quam pręcedenti die fuerat occidentalior,], with a latitude from the tangle that was very small indeed, of a palm by estimate [valde parvam admodum, palmi æſtimando.]. This inspection was made in the morning, at 4^h after midnight [de mane hora 4. poſt medium noctis.].

September 21 [21. Septemb.], at 3^h after midnight, in the morning [hora 3. poſt medium noctis de mane,], Mars was one diameter of the Moon away from the Fifth Star of Cancer [à 5. Canc. per diametrum Lunæ,]. Drawing a line from the fourth to the fifth [à quarta in quintam,], it stood off by estimate as far as half a palm [ęſtimando ad medium palmi], nearer the fifth than the fourth, and lying to the east of this line.

December 12 [12. Decembris,], Venus, from the noon observation of the Sun, at 14° 45′ of Aquarius [Venus ex Solis obſervatione meridiana in 14.grad.45.m.♒.]. Aldebaran 2° 35′ of Gemini [Aldebaran 2.grad.35.m.♊,], at 5^h after noon [hora qninta poſt meridiem.] [recte: quinta]. Likewise the angle of refraction at rising changed the position of the Sun by 8½° [in 8½. gradibus,], because the change of declination is slow [quia lenta declinationis mutatio.].

December 13 [13 Decemb.], Venus, from the noon observation of the Sun, 15° 45′ of Aquarius [Venus ex ☉ obſervatione meridiana 15.grad.45.m.♒.].

Aldebaran as before, 2° 35′ of Gemini [Aldebaran ut prius 2.grad.35.m.♊,], at 5^h after noon or past the fifth [hora quinta poſt meridiem, aut ultra quintam.].

The Year 1491 [Anno 1491.]

January 6 [6. Ianuarij], Mars [Mar.] in one line with two stars that [quas cre-] you believe [dis] are the Twenty-Second and Twenty-Third Stars of Leo [22 & 23 ♌.], and at that very place it began to retrograde [& ibidem incepit retrogradari,]; I did not perceive the station [ſtationem nō percepi.]. The same day, around sunset [Eodem die circa occaſum Solis], with the position set from the noon observation at 25° 15′ of Capricorn [ex obſervatione meridiana in 25 grad.15 min.♑ poſito,], I found Venus at 12° of Pisces [reperi ♀ in 12 grad.♓.], and an hour later at 2° 15′ of Gemini [& poſt horam in 2.gra.15.m.♊,]. I believe that Aldebaran falls short [credo quod deficiat Aldebaran,]. I used the plumb line [uſus ſum perpendiculo.].

January 11 [11 Ianuarij], around sunset [circa occaſum,], the position of the Sun from the noon observation 0° 20′ of Aquarius [locus Solis ex obſervatione meridiana 0 grad.20 m.♒,], Venus 17° 15′ of Pisces [♀ 17.gr.15 m.♓.]. An hour later, with the midheaven at 27° of Aries [Poſt horam medio cæli exiſtente 27 grad.♈.], Aldebaran 2° 35′ of Gemini [Aldebaran 2 grad.35.min.Gem.]. I used the plumb line [uſus ſum perpendiculo.].

January 17 [17 Ianuarij], the Sun from the noon observation 6° 30′ of Aquarius [Sol ex obſervatione meridiana 6.grad.30.min. Aquar.]. Venus 23° 15′ of Pisces [Venus 23.grad.15 minut.Piſc.]. Found by use of the plumb line, Aldebaran at 2° 35′ of Gemini [reperta uſu perpēdiculi Aldebaran in grad.2.35.m.Gem.]. A comet about the beginning of Aries, with southern latitude [Cometa circa principium ♈. cum latitudine meridionali], at an hour between 6^h and 7^h [hora inter ſextam & ſeptimam.].

January 28 [28 Ianuarij], with the position of the Sun set at 17° 35′ of Aquarius [loco Solis poſito ſuper 17 grad.35.min.♒.], Venus by the armillary rings 3° 10′ of Aries, at about the first hour of the night [Venus per armillas 3.gra.10 min. ♈ hor. quaſi prima noctis.]. Aldebaran 2° 23′ of Gemini [Aldebaran 2 grad.23 min.♊.]. See whether the position of the Sun is well set [Vide utrum locus Solis ſit bene poſitus.].

February 14 [14 Februarij], at 4^h after noon [hor.4 poſt meridiem], with the position of the Sun set from the noon observation at 4° 50′ of Pisces [loco Solis ex obſervatione meridiana ſuper 4.grad.50 min.♓ poſito,], I found Venus at 15° 34′ of Aries [reperi ♀ in 15.grad.34.min.♈]. At 7^h after noon [hor.ſeptima poſt meridiem,], from the position of Venus, at 2° 30′ of Gemini [ex loco ♀ in 2.grad.30 min.Gem.], by use of the new plumb line [uſu novi perpendiculi,]; but by adding the motion of Venus in the two hours that elapsed from the observation made of the Sun and of Venus [ſed addendo motum ♀ in duabus horis quæ fluxere ab obſervatione ad ☉ & Veneris habita,], the position of Aldebaran will be 2° 35′ of Gemini [erit locus Aldebaran 2.grad.35 min.♊.], as before, repeatedly [ſicut prius ſæpius]. The northern latitude of Venus 4° 45′ [latitudo Venus ſeptentrionalis 4.gra 45.minut.].

February 16 [16 Februarij], the Sun from the noon observation at 6° 30′ of Pisces [☉ ex obſervatione meridiana ſuper 6.grad.30 min.♓]; at 1^h after noon [hora prima poſt meridiem], Venus 16° 15′ of Aries [♀ 16 grad.15 min.♈.]. But at 5^h after noon [Hora autem quinta poſt meridiem], the Sun set at 6° 40′ of Pisces [☉ poſitus ſuper 6.grad.40.miu:♓], Venus 16° 25′ of Aries [♀ 16 grad.25 min.♈]. The same distance as before, and the same difference between tables and observations [Eadem diſtantia ut prius eademque differentia tabularum ac obſervationum.]. Aldebaran at 7^h after noon [hora ſeptima poſt meridiem], with the position of Venus set at 16° 30′ of Aries [loco ♀ ſuper 16 grad.30 mi.♈. poſito,], it was found again at 2° 35′ of Gemini [iterum reperea eſt in 2 grad.35 min.Gem.] [recte: reperta]. Likewise Jupiter at 28° of Taurus [Item ♃ in 28 grad.♉.].

March 23 [23 Martij], in the morning, between 2^h and 3^h after midnight [de mane inter ſecundam & tertiam poſt medium noctis], Mars was in one line with the Eighth Star and the Sixth Star of Leo [Mars in una linea cum octava & ſexta Leonis.]. But from the Eighth Star it had [?]/[?] of the whole interval between the eighth and the sixth [habuit vero ab octava [?]/[?] totius intercapedibis octavæ & ſextæ.] [recte: intercapedinis].

May 8 [8 Maij,], when the midheaven was 19° of Gemini [dum Medium cœli fuerat 19 grad.Gem.], the beginning of the solar eclipse [principiū Eclipſis Solaris,]; the end, when 26° of Cancer was at midheaven [finis, dum in medio cœli fuerat 26. grad.Canc.].

August 26 [26. Auguſti,], with the armillary rings rectified by Aldebaran, its position set at 2° 35′ of Gemini [Armillis rectificatis per Aldebaran loco ejus ſuper 2 grad.35.min.♊ poſito,], I found Mercury at 23° 10′ of Leo with no latitude, one hour before sunrise [reperi ☿ in 23 gr.10 m.♌ abſque latitudine, una hora ante ortum Solis.].

August 30 [30 Auguſti], the hour and everything else as above [hora & cæteris ut ſupra,], I found Mercury at 27° 10′ of Leo [reperi ☿ in 27 grad.10 min.♌,]. It had a northern latitude, which I could not take because of intervening vapors [latitudinem habuit Septen.quam accipere propter vapores intervenientes non potui,]; but it was beyond half a degree [fuerat autem ultra mediū gradum.].

August 31 [31 Auguſt.], the hour as above, with the armillary rings rectified as before [hora ut ſupra, rectificatis Armillis ut prius,], I found Mercury at 28° 3′ of Leo, having a northern latitude of 53′ [reperi ☿ in 28.grad.3.minut.♌, latitudinem habens Septentr.53 min.]. This observation is more certain than the earlier ones, because on the preceding days the instrument was not rectified as it is now [Hæc obſervatio certior prioribus propter inſtrumentum præcedentibus diebus, non ut nunc rectificatū,]. Mercury appeared bright [clarus apparuit Mercurius.].

September 2 [2 Septembr.], with the armillary rings rectified again by Aldebaran [Armillis rectificatis iterum per Aldebaran,], I found Mercury at 1° 13′ of Virgo, one hour before sunrise [reperi ☿ in 1.grad.13 m.♍, una hora ante ortum ☉,]; the northern latitude I found to be 1° 15′ [latitudinem Septent. reperi 1

grad.15 min.]. The sky very clear, everything else most careful, the observation, the position of the instrument certain; trust this one [Cœlum ſereniſſimū, omnia alia diligentiſſima, obſervatio, ſitus inſtrumenti certus, confide in hanc.]. Likewise Venus had a northern latitude of 4′ [Item ♀ habuit latitudinem Septent.4 minut.].

September 3 [3 Septemb.], the hour and everything else as before [hora & cæteris, ut prius,], I found Mercury at 3° 5′ of Virgo, having a northern latitude of 1° 20′ [reperi ☿ in 3.grad.5.min.♍ latitudinem habentem Septen.1 gra.20 m.]; careful [diligens,] but the latitude, changed so much in one day, made me doubtful about it [verum latitudo in uno die tantum mutata de ea me fecit dubium.].

September 9 [9. Septemb.], at 5^h after midnight [hora 5. poſt medium noctis,], I found Mercury at 13° 23′ of Virgo [reperi ☿ in 13.gr.23.m.♍,], northern latitude 1° 50′ [latitudo ſeptent.1.grad.50.m.]. See how great the difference from the tables [ecce quanta differentia à tabulis,]. Mercury appeared very faint [☿ apparuit valde tenuis,], and without doubt near the limit of occultation [& proculdubio circa terminum occultationis,], considering also the refracted ray [conſiderato etiam radium refractum,], because it stood a little distance from the horizon, as is plain [quia modicum diſtabat ab horizonte ſicut liquet.].

September 11 [11. Septembris,], Mercury still appeared, but most feebly, so that it was not to be observed under the clearest sky [adhuc apparuit ☿ ſed debiliſſime, ita quod obſervandus non fuerat ſub cœlo clariſſimo.].

The Year 1492 [Anno 1492.]

September 26 [26. Septemb.], in the morning, at about 5^h after midnight [de mane quaſi hora 5. poſt medium noctis], Mars was almost in the same line with the Sixth and Seventh Stars of Leo [fuerat Mars ferè in eadem linea cum ſexta & ſeptima ♌,], and more southerly than the Seventh Star [& auſtralior à ſeptima,], so that the seventh was, by estimate, exactly midway between the sixth and Mars [ita quod ſeptima fuerat æſtimādo pręciſe media inter ſextam & Mart.,]. But drawing a line through the sixth and seventh, Mars was west of this line by about the space of a digit's breadth [trahendo autem lineam per ſextam & ſeptimam, fuerat Mars occidentalis ab hac linea, quaſi ad ſpatium digiti tranſverſi.].

September 27 [27. Septemb.], in the morning [de mane,], Mars had become more easterly than that line by the amount of three digits [Mars factus fuerat orientalior, illa linea ad quantitatem trium digitorum,]

March 25 [25. Martij][81], in the morning [in mane,], Mars was more easterly than the Seventh Star of Virgo by more than the amount of the Moon's diameter [Mars fuerat orientalior 7.♍ ultra quantitatem diametri Lunæ,], having almost the same latitude [eandem ferè latitudinem habens.].

March 26 [26. Martij], in the morning, at 8^h after noon [mane horis 8, poſt meridiem], Mars was still more easterly than the Seventh Star of Virgo by the

[81] the page sets these two March entries after September with no new year heading

amount of 4 digits (that is, of a palm) [Mars fuerat adhuc orientalior ſeptima ♍ ad quantitatem 4 digitorum (id eſt palmi)] or a little beyond; I judged the latitude the same [aut modicum ultra eandem latitudinem judicavi.]. But if it was not the same, then not beyond the breadth of a digit [Si autem eadem non fuerat, tunc non ultra latitudinem digiti tranſverſi], with the Seventh Star of Virgo being the more northerly [,ſeptima,Virginis Septentrionaliore exiſtente.].

March 29 [29 Martij], in the morning, a little after 3^h following midnight [de mane,modicum poſt tertiam ſequentem medium noctis,], Mars had become more westerly than the Seventh Star of Virgo by less than the amount of the Moon's diameter [Mars factus fuerat occidentalior ſeptima ♍, minus quantitate diametri Lunæ,], judging the latitude as on the preceding day, namely the 26th [judicando latitudinem, ut die præcedenti, videlicet 26.]. But the distance of Mars and the Seventh Star of Virgo on the 25th had exceeded the space of the 29th by as much as that same space had exceeded the space of the 26th [ſed diſtantia Mart. & ſeptimæ ♍,25. die tantum exceſſerat ſpatium 29.diei quantum idem exceſſerat ſpatium 26. diei,], so that if the distance on the 25th was 8 digits, and on the 26th four, and on the 29th 16 digits [ut ſi diſtantia 25.die fuerit 8.digitorum & 26.quatuor,& 29.16. digitorum.].

October 10 [10. Octobris,]: there was an eclipse of the Sun [fuerat Eclipſis ☉,]. Its beginning was between 1^h and 2^h after noon [cujus principium fuerat infra primam & ſecundam horas poſt meridiem,], the beginning itself being taken fairly well [ipſo principio mediocriter accepto,]; but its end with the first point of Capricorn at midheaven, namely at 4^h 24^m after noon [ſed finis ejus medio cœli exiſtente,primo puncto ♑, videlicet hora 4. & min.24.poſt meridiem.].

The Year 1494 [Anno 1494.]

September 19 [19. Septemb.]: Venus was in conjunction with the Eighth Star of Leo [fuerat ♀ conjuncta octavæ Leonis,]. In the morning, at 5^h after midnight [de mane hora quinta poſt medium noctis,], Venus was more westerly by less than 3 digits, or about a sixth part of one degree [fuerat Venus occidentalior minus 3. digitis, vel quaſi ad ſextam partem gradus unius,], but more southerly by four digits, or about the measure of a palm [meridionalior vero, quatuor digitis, vel ad modū palmi.].

October 16 [16. Octob.]: three hours after sunset or nearly, the Moon more easterly than Aldebaran by about the Moon's diameter, both in the same latitude [per tres horas poſt occaſum Solis vel prope ☾ orientalior Aldebaran ad diametrum Lunæ in eadem latitudine amborum.].

The Year 1497 [Anno 1497.]

February 15 [15. Februarij], in the morning, at 4^h after midnight [de mane hora 4. poſt medium noctis,], Mars was distant from Jupiter by the Moon's diameter [diſtabat Mars à ♃ per diametrum Lunæ,], but this distance half on the side of latitude [ſed hæc diſtantia pro medietate ex parte latitudinis,]; Mars, however, more westerly than Jupiter and more southerly [Mars vero occidentalior Iove,& meridionalior,], although according to the Almanac the conjunction

had passed, which was still to come [licet ſecundum Almanach conjunctio præterijſſet, quæ adhuc futura erat.].

July 29 [29. Iulij]: the Sun was eclipsed [Eclipſabatur Sol,]. I took no note of the beginning of this eclipse, but of the end [cujus Eclipſis principium non conſideravi,ſed finem,], which was at about 3^h 24^m after noon [qui fuerat hora tertia m.24 ferè poſt meridiem,]; its magnitude agreed with the calculation [quantitas ejus calculo concordabat.].

The Year 1502 [Anno 1502.]

September 19 [19 Septemb.], after midnight, in the morning [poſt medium noctis de mane,]: Venus was in conjunction with the Heart of Leo by the Moon's semidiameter [fuerat ♀ conjuncta Cordi ♌ per ſemidiametrum Lunæ,]. I judged the longitude the same [longitudinem judicavi eandem,], for on drawing a line through Jupiter, Saturn and Venus, the distance seemed to be one of latitude only [trahendo enim lineam per ♃,♄,& ♀,videbatur diſtantia tantum latitudinis fore,]. They were also almost in one line with the Seventh Star of Leo, namely Venus and the Heart of Leo [fuerant etiam quaſi una linea cum ſeptima ♌,puta ♀ & Cor Leonis.].

October 20 [20. Octobr.], about 1½ hours before sunrise [quaſi 1,½ hor.ante ortum Solis,]: I saw Mercury not more than a degree from the horizon [vidi ☿ non ultra gradum diſtantem ab horizonte.].

The Year 1503 [Anno 1503.]

August 26 [26 Auguſt.]: Mars, observed with the armillary rings rectified by Aldebaran [♂ obſervatus per Armillas rectificatas per Aldebaran,], at about 3^h after midnight, in the morning [hora quaſi 3 poſt medium noctis de mane,], at 23° 53′ of Gemini [in 23 gr. 53 m.Gem.].

September 8 [8. Septembr.], in the morning, at 4^h after midnight [de mane hora 4 poſt medium noctis,], I saw Jupiter near the Eighth Star of Gemini, on the right side of the preceding one [vidi ♃ apud ſtellam,quæ eſt octava ♊, in latere dextro antecedentis,]. It was almost in conjunction with that star in longitude [fuerat quaſi eidem conjunctus ſecundum longitudinē,], so that if you were to imagine an arc through the pole of the zodiac and the star, it touched the western limb of Jupiter [ut ſi arcum imaginareris per polum zodiaci & ſtellam tangebat limbum Iovis occidentalem,]. In latitude, however, it stood from the star toward the north by about the measure of two digits' breadth [latitudinem vero habebat ab ea verſus boream ad modum duorū digitorū tranſverſalium,]. The star just mentioned is placed by Ptolemy at 2° 40′ north of the ecliptic [prædicta autem ſtella à Ptolomæo ponitur in Septent.2 graduum,& 40 min. ab ecliptica,]; yet observed with the armillary rings, it seems to have almost no latitude [quæ tamen per Armillas obſervata, nullam videtur quaſi habere latitudinem.].

September 11 [11. Septemb.], the hour as above [hora ut ſupra,]: I found Jupiter at the end of 12° of Cancer [reperi ♃, in fine 12 gra.Canc.], having a northern latitude of 0° 15′, or nearly [latitudinem habentem Septent.0 grad.15.min.ferè.].

September 16 [16. Septemb.], between 2^h and 3^h after midnight [inter 2 & 3.horas poſt mediū noctis,], with the armillary rings rectified by Aldebaran placed at 2° 35′ of Gemini [armillis rectificatis per Aldebaran ſuper 2 gra. 35.min.Gem.poſitam.].

Also Mars at 5° 15′ of Cancer, with a northern latitude of 0° 30′ [Item ♂ in 5 grad.15.m.♋, cum latitudine Septent.0 grad. 30 m.]. Also Jupiter at 12° 15′ of Cancer, without latitude [Item ♃ in 12 grad.15 m. ♋, ſine latitudine.]. Also Saturn at 16° 11′ of Cancer, with a southern latitude of 0° 15′ [Item ♄ in 16.grad.11 m.♋, cum latitudine Merid.0 grad.15 m.]. Because of the motion of Aldebaran, 10′ must be added to all stars observed by it, up to October 13 [Apponenda ſunt 10 min. propter motum Aldebaran, omnibus ſtellis obſervatis per ipſam uſque in 13. Octobris.].

September 19 [19. Septembr.], the hour as above [hora,ut ſupra.]. Also Saturn 16° 45′ of Cancer, without latitude [Item ♄ 16 grad.45. m. ♋,ſine latitudine.]. Mars 6° 45′ of Cancer, with a northern latitude of 0° 15′ [♂ 6 grad.45 m. ♋, cum latitud.Septent.0 grad. 15 min.]. Jupiter 12° 15′ of Cancer, without latitude [♃ 12 grad.15 m. ♋,ſine latitudine.]. Also Canis Minor 18° 23′ of Cancer [Item Canis minor 18.grad.23.min.Canc.].

September 22 [22 Septemb.], with 15° of Taurus at midheaven, I found Mars at 8° 5′ of Cancer, with a northern latitude of 0° 30′ [in medio cœli exiſtente 15 gra. ♉, reperi ♂ in 8.gr.5 min.♋, cum latitudine Septent.0 grad. 30 min.]; Jupiter 13° 0′ of Cancer, without latitude [♃ 13 grad.0 m.♋ ſine latitudiue,]; Saturn 17° 0′ of Cancer, with a southern latitude of 0° 15′ [♄ 17 gra.0 m.Canc.cum latitudine merid.0 gra.15 min.].

September 28 [28 Septem.], with the midheaven as above, I observed the following bodies [Medio cœli,ut ſupra,obſervaui aſtra ſequētia,]: Saturn 17° 0′, with a southern latitude of 0° 30′ [♄ 17.grad.0 min.cum latitudine merid.0 gra.30 min.]; Jupiter 13° 45′ of Cancer, without latitude [Iup. 13 grad.45 min.Canc.ſine latitudine,]; Mars 10° 45′ of Cancer, with a northern latitude of 0° 30′ [♂ 10 grad.45.min.♋ cum latitudine Septent.0 grad.30 min.]; the Heart of Leo 22° 25′ of Leo [Cor Leonis 22 gra. 25 min.♌.].

October 1 [1. Octobris,], at 3^h after midnight [hora tertia poſt medium noctis], Mars had been as far east of the Eighth Star of Gemini [fuerat Mart. tanto orientalior 8 ♊,] as on September 29 it had been west of that same star [quanto 29 die Septemb.fuerat eadē occidentalior,]. So their conjunction had taken place on September 30 [ita quod 30 Septembris fuerat eorum conjunctio,], although Mars was farther north by about half a degree [licet Mart.fuerit Septentrionalior circa medium gradum.].

October 6 [6. Octob.]: I judged by eye a conjunction of Jupiter and Mars in longitude [judicavi oculo ☌ ♃ & Mart.ſecundum longitudinem,]. Mars, however, was to the north by about one moon [fuerat autem ♂ Septent.per unam lunam ferè], two hours before sunrise [ante ortum Solis per duas horas.].

October 13 [13. Octobris], in the morning, at about 4^h after midnight [de mane quaſi hora 4 poſt medium noctis] with the armillary rings rectified

by Aldebaran placed at 2° 45′ of Gemini [Armillis rectificatis per Aldebaran ſuper 2.grad.45.min.♊. poſita,], on account of the motion intervening since its observation [propter motum ab obſervatione ejus intermedium.]. Jupiter 14° 15′ of Cancer, without latitude [♃ 14.grad.15.min.♋.ſine latitudine,]; Mars 17° 50′ of Cancer, with a northern latitude of 1° 0′ [Mart.17.gra.50.min.♋ cum latitudine ſepten.1.grad.0.min.]; Saturn 17° 0′ of Cancer, with a southern latitude of 0° 15′ [♄ 17.grad.0 min.♋ cum latitudine Meridio.0.grad.15.min.]; the Heart of Leo 22° 40′ of Leo [Cor Leonis 22 grad.40.min.♌.].

October 15 [15. Octob.], at 4^h after midnight [hora 4.poſt medium noctis,], there was a conjunction of Saturn and Mars in longitude, as I judged by eye [fuerat ☌ ♄ & Mart. ſecundum longitudinem.ſicut oculo judicavi,], but Mars was farther north by more than a degree [ſed Mars ſeptentrionalior ultra gradum.].

October 16 [16. Octob.], the hour as above: Mars was perceptibly deeper in the signs than Saturn [hora ut ſupra fuerat Mars ſenſibilitur profundior in ſignis quàm ♄.] [recte: ſenſibiliter].

October 23 [23. Octob.], the hour as above: Mars 20° of Cancer [hora ut ſupra,Mart.20 grad.♋.]; Saturn 17° 4′ of Cancer [♄ 17.grad.4.m.♋,]; Jupiter 14° 0′ of Cancer [♃ 14.grad.0 min.♋,]. Not the most certain observation [non certiſſima obſervatio.].

November 4 [4. Novemb.], with the midheaven at 15 in 20 of Cancer [?] [Medio cœli exiſtente 15.in 20.Canc.], and the armillary rings rectified as on October 13 [rectificatis Armillis,ut 13.Octobris,]: Jupiter 14° 20′ of Cancer, still without latitude [♃ 14.grad.20.min.Cancr. adhuc ſine latitudine,]; Mars 22° 24′ of Cancer, with a northern latitude of exactly 2° 0′ [Mars 22.grad.24.min.Canc.cum latitudine ſeptent.præciſe 2.grad.0 min.]; Saturn 17° 25′ of Cancer, with a southern latitude of 0° 10′ [♄ 17.grad.25.min.♋ cum latitudine Merid.0 grad.10.min.].

November 9 [9 Novemb.], in the morning, at about 6^h after midnight [de mane hora quaſi ſexta poſt medium noctis,]: Saturn 17° 15′ of Cancer, a fair observation [♄ 17.grad.15.m.♋,mediocris obſervatio.].

November 16 [16. Novemb.], after noon, when the midheaven was 16° of Aries [poſt meridiem,dum Medium cœli fuerat 16.grad.♈,], with the armillary rings rectified by Aldebaran placed at 2° 45′ of Gemini [Armillis rectificatis per Aldebaran ſuper 2.gra.45.min.♊ poſita,], I found the positions of the planets, most carefully investigated [reperi loca planetarum diligentiſſime inquiſita.]. Jupiter 14° 45′ of Cancer, still without altitude [♃ 14.grad.45.min.♋,adhuc ſine altitudine,] [recte: latitudine]. And when the midheaven was 20° of Aries [& dum mediū cæli fuerat 20 grad.♈], Saturn 17° 45′ of Cancer, with a southern latitude of 0° 27′ [♄ 17 gr.45 m.Canc.cum latitudine merid.0.grad.27.min.]. Also when the midheaven was 25° of Aries [Item dum medium cœli fuerat 25.grad.♈.], Mars 24° 30′ of Cancer, with a northern latitude of 2° 15′ [Mart.24.grad.30.min.Canc cum latitudine ſeptentrionali 2.gr.15.min.]. Canis Minor 19° 50′ of Cancer [Canis minor 19.gr.50.minut.Cancri.].

November 28 [28. Novemb.], in the morning, after midnight [de mane poſt medium noctis], with the armillary rings rectified by Aldebaran placed at 2° 45′ of Gemini [armillis rectificatis per Aldebaran in gr.2.minut.45.♊.poſitā,]: Mars 22 [Mart.22]

° 33′ of Cancer [gr.33.minut. Canc.], northern latitude 3° 0′ [latitudo ſeptentrionalis 3. gr. 0.min.], the midheaven precisely 22° of Leo [præciſe medium cæli 22 gra.♌.]. Also, with the armillary rings verified by the Heart of Leo, previously rectified by Aldebaran, at 22° 33′ of Leo [Item verificatis armillis per Cor ♌ prius rectificatam per Aldebaran in 22 grad.33 min. ♌]: Mars as before by Aldebaran [♂ ut prius per Aldebaran,]; Jupiter 12° 45′ of Cancer, with a northern latitude estimated at 0° 15′ [♃ 12 grad.45 min. Canc. cum latitudine ſeptentrionali æſtimatæ 0 grad.15 min.], midheaven 26° of Leo [medium cœli 26.gra.Leon.]. Also Saturn 16° 2′ of Cancer, with a southern latitude estimated at 0° 10′ [Item ♄ 16 grad.2 min. Canc.cum latitudine meridionali æſtimatæ 0 grad.10 min.], midheaven 27° of Leo [medium cæli 27 grad.♌]. Heart of Leo as before, 22° 33′ of Leo [Cor Leon. ut prius 22 grad.33.m.Leon.]. A most careful observation [diligent iſſima obſervatio.].

December 7 [7. Decemb.], in the morning, when the midheaven was 17° of Cancer [de mane dum mediū cæli fuerat 17 grad.Can.], I found by Aldebaran Mars at 20° 15′ of Cancer [reperi per Aldebaran ♂ 20 grad.15 min.Canc.]. I did not take the latitude [latitudinem non accepi.].

December 10 [10 Decemb.], after noon, when 0° of Pisces was at midheaven [poſt meridiē dum in medio cęli fuerat 0.grad.♓], with the armillary rings rectified by Aldebaran at 2° 45′ of Gemini [armillis rectificatis per Aldebaran in 2 gra.45 min.♊.], I found Venus at 2° 0′ of Aquarius [reperi ♀ 2 grad.0 min.♒.], but near the horizon, as is evident [ſed circa horizontem ut liquet,]. Jupiter 10° 48′ of Cancer, with a northern latitude of 0° 15′ [♃ 10 gr.48 m.Canc.cum latitudine ſeptentrionali 0 grad.15 m.]; midheaven 2° of Aries [mediū cæli 2 grad.♈.]. Saturn 15° 15′ of Cancer, with a southern latitude of 0° 30′ [♄ 15 grad.15 m.Canc. cum latitudine meridionali 0 grad.30 m.]; midheaven 8° of Aries [medium cæli 8 gr.♈.]. Mars 19° 42′ of Cancer, with a northern latitude of 3° 15′ [♂ 19.gra.42.m.♋ cum latitudine ſeptentrionali 3 gra. 15 m.]; midheaven 15° of Aries [mediū cæli 15 grad.♈.]. Right Shoulder of Orion 21° 33′ of Gemini [Humerus dexter Orionis 21.gr.33 min.♊.]. Canis Minor 18° 38′ of Cancer [Canis minor 18 grad.38 min.Canc.]. See the following one among the planets [aſpice ſequentem in planetis.].

December 11 [11 Decembris], after noon, with the armillary rings rectified as above and 18° of Pisces at midheaven [poſt merid.armillis rectificatis,ut ſupra,medio cæli exiſtente 18.grad.♓], I found Venus at 2° 0′ of Aquarius, with a northern latitude of 0° 22′ [reperi ♀ in 2 grad. 0 minut.♒. cum latitudine ſeptentrion.0 grad.22 m.]. When 5° of Aries was at midheaven, with the armillary rings as before [Dum in medio cęli fuerat 5 grad.♈. armillis ut prius,], Jupiter 11° 18′ of Cancer, without latitude [Iup.11.grad.18 minut. Canc.ſine latitudine,]; Saturn 15° 30′ of Cancer, with a southern latitude of 0° 18′ [♄ 15

grad.30.min.Canc.cum latitudine meridio.0 grad.18 m.]; with 8° of Aries at midheaven [medio cæli exiſtente 8 grad.♈.]; Mars 19° 23′ of Cancer, with a northern latitude of 3° 15′ [♂. 19 grad.23.m.Canc.cum latitud.ſeptent.3 grad.15 min.]; at midheaven 13° of Aries [in medio cæli 13 grad.♈.]; Right Shoulder of Orion 21° 45′ of Gemini [Humerus dexter Orionis 21.grad.45 m.♊.]; with 20° of Pisces at midheaven [medio cęli exiſtente 20 grad.♓.]. These observations were made most carefully, and I place firm trust in them [Hæ obſervationes factæ ſunt diligentiſſime,quibus firmā fidē adhibeo,], although from [licet ex] these and the earlier ones it would follow that Jupiter and Saturn would have turned direct [his & prioribus ſequeretur ♃ & Sat.facturos fuiſſe directos], the opposite of which is true [cujus oppoſitum verum eſt.]. In Mars, however, the truth is apparent, although on that day, according to the calculation, its conjunction with Saturn took place [In Marte autem apparet veritas, licet eo die ſecundum calculum eſſet ejus,& ♄ conjunctio,], the falsity of which is evident to the eye [cujus falſitas ad oculum manifeſta eſt.].

December 12 [12. Decemb.], after noon, when Venus was at midheaven [poſt meridiem dum in medio cœli fuerat ♀,], I took by the armillary rings its distance from the Sun (placed at the beginning of Capricorn) [accepi per Armillas diſtantiam ejus a Sole (in principium ♑ poſitam,] and found Venus at 2° 15′ of Aquarius [reperi Venerem in 2.grad.15.min.♒,], a position it held almost until sunset [quem locum retinuit ferè uſque ad occaſum Solis.]. And the inner circle, set on the Sun's position, was lit equally on both sides [Et circulus interior ſuper loco Solis poſitus, æqualiter in utraque parte illuminabatur,], but the zodiac was not, because of refraction [non aut Zodiacus propter refractionē.]. Also, during the half hour after sunset [Item per mediam horam poſt occaſum ☉,], I rectified the position of Aldebaran by Venus [rectificavi locum Aldebaran per ♀,] and found its position to be 2° 45′ of Gemini [& reperi locum ejus 2. grad.45.m.♊,], examining it repeatedly and most carefully [ſæpius & diligentiſſime examinando.].

Also, with the armillary rings set by Aldebaran and 21° of Aries at midheaven [Item Armillis per Aldebaran ordinatis medio cœli exiſtente 21.gra.♈], I found Jupiter at 10° 53′ of Cancer, still without latitude [reperi,♃ in 10.gra.53.minut.Canc.adhuc ſine latitudine,]; Saturn 15° 12′ of Cancer, latitude as before [♄ 15.grad.12.min.Canc.latitudo, ut prius]. Midheaven 22° of Aries [Medium cœli 22. ♈,]; Mars 18° 45′ of Cancer [♂ 18.grad.45.min.Canc.]; I did not take the latitude [latitudinem non accepi.]. Midheaven 23° of Aries [Medium cœli 23.♈]; Right Shoulder of Orion 21° 30′ of Gemini [Humerus dexter Orionis 21.gra.30.m ♊.]. These observations again, taking time and most carefully [Hæ obſervationes jterum cum mora & diligentiſſimc.]. But I see that the precision of the instrument is not to be sought to within 10′ or thereabouts [Sed video quòd pręciſio inſtrumenti captanda non eſt citra 10.min.aut circa.].

December 14 [14 Decemb.], after noon, with 4° of Aries at midheaven, by Aldebaran [poſt meridiem medio cœli exiſtente 4.gra.♈ per Aldebaran.]. Also Jupiter 10° 50′ of Cancer, having no latitude at all [Item ♃ 10.grad.50.min.Canc.nullam abſolute habens latitudinem,]; Saturn 15° 5′ of Cancer, with a southern latitude of 0° 22′ [♄ 15.grad.5.min.Canc.cum latitudine Merid.0 grad.22.m.]. Midheaven 5° of Aries [Medio cœli 5.gra.♈,]; Mars 18° 20′ of Cancer, with a northern latitude of 3° 37′ [♂ 18 gr.20.m.Canc.cum latitudine Septent.3.gra.37.m.]. Midheaven 13° of Aries [Medio cœli 13.grad.♈.]; Right Shoulder of Orion 21° 40′ of Gemini [Humerus dexter Orionis 21 grad 40.m.♊,]. Most careful observations [diligentiſſimæ obſervationes.].

December 29 [29. Decemb.], between 6^h and 7^h after noon [inter 6 & 7.poſt meridiem], I observed by the small triangle the following consideration, not to be given much weight [obſervavi per paruum triangulum conſiderationem ſequentem non multū ponderandam.].

Between [Inter]:

Mars and Jupiter [Mart.& ♃]	70	715
Following Head of Gemini and Saturn [Cap.♊. ſequens & ♄]	110	622
Following Head and Mars [Cap.ſequens & ♂]	50	634
Following Head and Saturn [Cap. ſequens & ♄]	80	624
Mars and Saturn [Mart.& ♄]	50	647
Saturn and Jupiter [♄ & ♃]	60	654

The Year 1504 [Anno 1504.]

January 3 [3. Ianuarij], in the morning, at 3^h after midnight [de mane hora 3. poſt medium noctis], with the armillary rings rectified by the Heart of Leo, placed at 12° 30′ of Leo [armillis rectificatis per Cor Leonis ſuper 12.gra.30.min. ♌ poſito.]. Also Mars 10° 45′ of Cancer [Item Mart.10.grad.45.minut.Canc.]; Jupiter 7° 58′ of Cancer [♃ 7.grad.58.minut.Cancri.].

January 5 [5. Ianuarij], when the midheaven had been 0° of Taurus, after noon, by Aldebaran [dum Medium cœli fuerat 0.grad.♉,poſt meridiem per Aldebaran,]: Mars 9° 48′ of Cancer, northern latitude 3° 57′ [♂ 9.grad.48.m.Canc.latitudo ſeptēt.3.gra.57.m.]. Midheaven 0° of Aries [Medium cœli 0.gra.♈,][82]; Jupiter 7° 50′ of Cancer, latitude 0° 0′ [♃ 7.grad.50.m.Canc. latitudo 0.grad.0.m.]. Midheaven 3° of Taurus [Medium cœli 3.grad.♉,]; Saturn 13° 15′ of Cancer, southern latitude 0° 15′ [♄ 13.grad.15.m.Canc. latitudo Mer.0.grad.15.min.]. Midheaven 5° of Taurus [Medium cæli 5 grad.♉,]; Canis Minor 18° 38′ of Cancer [Canis minor 18.gra.38.m.Canc.]; Right Shoulder of Orion 21° 38′ of Gemini [Humerus dexter Orionis 21.grad.38.min.Gemin.]; Canis Major 6° 33′ of Cancer [Canis major 6.gr.33.mi.Canc.]. These observations are most certain [Certiſſimæ hæ obſervationes.].

[82] the page prints the sign of Aries here, between midheaven values in Taurus

January 8 [8. Ianuarij], at night, midheaven 27° of Aries [de nocte medium cœli 27.♈,]; Mars 8° 38′ of Cancer [♂ 8.grad.38.min.Cancri.].

January 9 [9. Ianuarij], with 10° of Scorpio at midheaven, by the Heart of Leo [medio cæli exiſtente 10.gra.♏ per Cor ♌,]: Mercury 3° 15′ of Capricorn, with a northern latitude of 0° 45′, most carefully [☿ 3.grad.15.m.♑,cum latitudine Septent.0.grad.45.min.diligentiſſime,]; Mercury had been very faint [☿ tenuis valde fuerat.].

January 10 [10. Ianuarij], in the morning, with 12° of Scorpio at midheaven, by the Heart of Leo [de mane, Medio cœli 12.grad.♏ per Cor ♌,]: Mercury 4° 0′ of Capricorn, latitude as before [☿ 4.grad.0.m. ♑,latitudo prius,]; it again appeared very faint [iterum apparuit valde tenuis.]. Also on the same day, after noon, by Aldebaran [Item eadem die poſt merid.per Aldebaran,]: Mars 8° 5′ of Cancer, with a northern latitude of 4° 5′ [♂ 8.grad.5.min.Canc. cum latitudine ſeptent.4.grad.5.min.]. Midheaven 7° of Taurus [Medium cæli 7.grad.♉,]; Jupiter 7° 0′ of Cancer, with a northern latitude of 0 [♃ 7.grad.0.min.Canc. cum latitudine ſeptent.0.]

° 15′ [grad. 15.min.]. Midheaven 11° of Taurus [Medium cæli 11 grad.♉,]; Saturn 12° 45′ of Cancer, with a southern latitude of 0° 15′ [♄ 12 grad. 45.min. Canc.cum latitudine merid.0 grad. 15 min.]. Midheaven 14° of Taurus [Mediū cœli 14 gr.♉,]; Right Shoulder of Orion 21° 38′ of Gemini [Humerus dexter Orionis 21 gr.38 mi. ♊.]; Canis Minor 8° 38′ of Cancer [Canis minor 8 gr.38 mi.♋.][83]. All of those are most careful observations [Omnes illæ diligentiſſimæ obſervationes.].

January 19 [19 Ianuarij], in the morning, with the armillary rings rectified by the Heart of Leo and 10° of Libra at midheaven, I found, as below [de mane,armillis rectificatis per Cor ♌,medio cœli exiſtente 10 grad.♎,reperi,ut infra,]: Mars 6° 10′ of Cancer, latitude not taken [♂ 6 gra. 10 min.♋ latitudine non accepta,]; Jupiter 6° 25′ of Cancer [♃ 6 grad.25 min ♋,]; Saturn 12° 23′ of Cancer [♄ 12 grad.23.m. Canc.]. Midheaven 12° of Libra [Medium cœli 12 grad.♎,]; Venus 17° 15′ of Capricorn, with a northern latitude of exactly 7° 0′ [Ven.17 grad.15 min.♑,cum latitudine ſeptent.7 grad.0 min.præciſe,]. Midheaven 12° of Scorpio [Medium cœli 12 grad.♏.].

January 20 [20. Ianuarij], after noon, with the armillary rings rectified by Aldebaran [poſt merid.Armillis rectificatis per Aldebarā,]: Mars 5° 45′ of Cancer, with a northern latitude of 3° 55′ [♂ 5 grad.45 m.Canc.cum latitudine ſeptentr.3 grad.55.m.]; midheaven 9° of Taurus [medium cœli 9 grad.♉]. Jupiter 6° 8′ of Cancer, with a northern latitude of 0° 15′ [Iup.6 grad.8 min.Canc.cum latitudine ſeptent.0 grad.15 m.]. Midheaven 13° of Taurus [Medium cœli 13 grad.♉,]; Saturn 12° 10′ of Cancer, with a southern latitude of 0° 5′ [Saturn. 12 grad. 10 minut.Canc. cum latitudine meridian. 0 grad. 5 minut.]; midheaven 16° of Taurus [medium cœli 16 grad.Taur.]. Canis Minor 18° 38′ of Cancer [Canis minor 18 gra. 38.min.Canc.]; Canis Major 6° 40′ of Cancer [Canis

[83]so the page prints; Canis Minor stands at 18° 38′ on January 5 and January 20

major 6 grad.40 minut.Canc.]; Right Shoulder of Orion 21° 38′ of Gemini [Humerus dexter Orionis 21 grad.38 min.Gem.]. The whole most carefully observed [totum diligentiſſime obſervatum.].

January 22 [22. Ianuarij], after noon, with the armillary rings, by Aldebaran at 2° 45′ of Gemini [poſt meridiem armillis per Aldebaran 2.45 ♊,]: Mars 5° 24′ of Cancer, with a northern latitude of 3° 53′ [♂ 5.grad.24 min.♋,cum latitud.ſeptentr.3 grad.53 min.]; midheaven 5° of Gemini [medium cœli 5 gr.♊,]. Saturn 12° 5′ of Cancer; I did not take the latitude, and assumed it as before [♄ 12 grad.5 min.Canc.latitudinem nō accepi,præſuppoſui,ut prius,]. Midheaven 7° of Gemini [Medium cœli 7.grad.♊,]; Jupiter 6° 0′ of Cancer; I assumed the latitude as before [♃ 6. grad.0 m.♋,Latitudinem præſuppoſui,ut prius,]. Midheaven 8° of Gemini [Medium cœli 8 grad.♊]. The whole most carefully [totum diligentiſſime.].

January 24 [24 Ianuarij], in the morning, by the Heart of Leo 2[?], 23 [de mane per Cor Leonis 2[?],23,]: Venus 16° 30′ of Capricorn, with a northern latitude of 7° 15′ [♀ 16 grad.30. minut.♑ cum latitudine Septent.7 grad.15 min.]; midheaven 13° of Scorpio, most carefully [Medium cœli 13 ♏, diligentiſſime.]. On the same day, after noon, by Aldebaran at 2° 45′ of Gemini [Eodem die poſt meridiem per Aldebaran 2, 45 ♊,]: Mars 5° 8′ of Cancer, with a northern latitude of 3° 55′ [♂ 5 grad. 8 minut.Canc. cum latitudine Septent.3.grad.55.min.]. Midheaven 23° of Taurus [Medium cæli 23 grad.♉.]; Jupiter 5° 40′ of Cancer [♃ 5 gr.40 min.Canc.]. Midheaven 27° of Taurus [Medium cœli 27 grad.♉.]; Saturn 11° 53′ of Cancer [♄ 11 grad.53.mi Canc.].

Midheaven 29° of Taurus [Medium cœli 29 grad.♉.]. Corrected on account of Aldebaran, having been set 10′ less than the true value [Emendato propter Aldebaran 10 min.minus vero poſitum.].

January 25 [25 Ianuarij], after noon, by Aldebaran at 2° 45′ of Gemini [poſt meridiem per Aldebaran 2,45 ♊]: Mars 5° 0′ of Cancer, with a northern latitude of 3° 45′ [♂ 5 grad.0 min.,Canc.cum latitudine Septent.3 grad.45 min.]; midheaven 25° of Taurus [Mediū cœli 25 grad.♉,]. Jupiter 5° 30′ of Cancer, with a northern latitude of 0° 15′ [♃ 5 grad.30 min.Canc. cum latitudine Septent.0 grad.15 min.]; midheaven 30° of Taurus [Medium cœli 30 grad.♉,]. Saturn 11° 45′ of Cancer, with a southern latitude of 0° 8′ [♄ 11 grad.45 min.Canc.cum latitudine Merid 0 grad.8 minut.]; midheaven 2° of Gemini [Medium cæli 2 grad.Gem.]; taken most carefully [diligentiſſime ſumptæ.].

January 26 [26 Ianuarij.], after noon, with the armillary rings rectified as before [poſt meridiem Armillis, ut prius, rectificatis,]: Mars 4° 55′ of Cancer, with a northern latitude of 3° 42′ [♂ 4 grad.55 m.Canc., cum latitudine Septent.3 gra.42 m.]; midheaven 19° of Taurus [Medium cœli 19 grad.♉]. Jupiter 5° 32′ of Cancer [♃ 5.grad.32 min.Canc.,]; midheaven 23° of Taurus [Medium cæli 23 grad.♉.]. Saturn 11° 45′ of Cancer [♄ 11 grad.45.min. Canc.]; midheaven 24° of Taurus [Medium cæli 24.grad.♉.].

Likewise I again corrected the motions of Jupiter and Saturn by adding 10′, on account of the variation in the position of Aldebaran [Item emendavi iterum

motus ♃ & ♄ addendo 10 minut. propter variationem loci Aldebaran.]. Canis Minor 18° 38′ of Cancer [Canis minor 18 gra.38 min.Canc.]. Right Shoulder of Orion 21° 38′ of Gemini [Humerus dexter Orionis 21 grad.38 min.♊.]. Canis Major 6° 45′ of Cancer [Canis major 6 grad.45 min. Canc.]. Venus in the morning 16° 20′ of Capricorn [♀ de mane 16 grad.20 min.♑.]; northern latitude 7° 5′ [Latitudo Septent.7 grad.5 min.]; midheaven 20° of Scorpio [?], most carefully, by the Heart of Leo, as before [Medium cœli 20 ♏[?] diligentiſſime per Cor ♌, ut prius.][84].

February 3 [3. Februarij], after noon, with the armillary rings well rectified by Aldebaran at 2° 45′ of Gemini [poſt meridiem, Armillis per Aldebaran,2,45. Gem.benè rectificatis,]: Mars 4° 37′ of Cancer, with a northern latitude of 3° 45′ [♂ 4 grad.37 min.Canc.cum latitudine Septent.3 grad.45.min.]; midheaven 11° of Gemini [Medium cœli 11 grad.Gem.]. Jupiter 5° 15′ of Cancer, with a northern latitude of 0° 20′ [♃ 5 grad.15 min.Canc.cum latitudine Septent.0 grad.20 m.]; midheaven 15° of Gemini [Medium cœli 15 grad.♊.]. Saturn 11° 22′ of Cancer, with latitude 0° 0′ [♄ 11 grad.22 min.Canc.cum latitudine 0 grad.0 min.]; midheaven 23° of Gemini [Medium cæli 23 ♊.].

February 4 [4. Februarij], after noon, with the armillary rings as above [poſt meridiem Armillis,ut ſupra,]: Mars 4° 35′ of Cancer [Mars 4.gra.35 min.Canc.]; midheaven 1° of Gemini [Medium cæli 1 grad.♊,]. Jupiter 5° 7′ of Cancer [♃ 5 grad.7.mi.Canc.]; midheaven 2° of Gemini [Medium cœli,2 grad.Gem.]. Saturn 11° 22′ of Cancer [Saturn.11 grad.22 min.Canc.]; midheaven 3° of Gemini [Medium cœli 3 Gem.].

February 5 [5. Februarij], after noon, with the armillary rings well rectified as above [poſt merid Armillis, ut ſupra,bene rectificatis,]: Mars 4° 38′ of Cancer; northern latitude 3° [Mars 4 grad.38 minut.Canc.latitudo Septent.3. grad:]

45′ [45 min.]; midheaven 3° of Gemini [Medium cæli,3 grad.♊]. Saturn 11° 23′ of Cancer [♄ 11 grad.23 min.Canc.]; latitude 0° 0′ [latitudo 0, 0.]; midheaven 5° of Gemini [Medium cæli 5 grad.♊]. Jupiter 5° 0′ of Cancer [♃ 5 grad.0 m.Canc.]; northern latitude 0° 22′ [Latitudo Septentrionalis 0 grad.22.minut.]; midheaven 8° of Gemini [Medium cæli 8 Gemin.].

February 6 [6. Februarij], after noon, with the armillary rings as before [poſt merid. Armillis,ut prius,]: Mars 4° 45′ of Cancer [♂ 4 grad.45 m. Canc.]; midheaven 19° of Gemini [Medium cæli 19 grad. Gemini,]. Jupiter 4° 53′ of Cancer [♃ 4 grad.53 min. Canc.]; midheaven 21° of Gemini [Medium cæli,21 grad.♊]. Saturn 11° 23′ of Cancer [♄ 11 grad.23 min. Canc.]; midheaven 22° of Gemini [Medium cæli 22 ♊.].

Likewise, from the third day up to February 6, I could not see the Eighth Star of Gemini [Item à tertia die uſque in 6. Februarij,non potui videre 8.Geminorum,]. From this I judged that it was eclipsed by stationary Saturn; see what follows [ex eo judicavi eam eclipſatam à ♄ ſtationario, inſpice ſequentia.].

[84]the sign is an m-form, Scorpio or Virgo; neither copy shows its tail clearly.

February 8 [8. Februarij], after noon, with the armillary rings set by Aldebaran at 2° 45′ of Gemini [poſt meridiem, Armillis per Aldebaran 2.45 ♊.]: Mars 4° 53′ of Cancer, with a northern latitude of 3° 42′ [♂ 4.grad.53.min.Canc. cum latitudine Septent.3.gra.42 min.]; midheaven 9° of Gemini [Medium cæli 9.grad.♊]. Jupiter 4° 48′ of Cancer, with a northern latitude of 0° 18′ [♃ 4 grad. 48 min.Canc. cum latitudine Septentrional.0 grad.18 min.]; midheaven 5° of Gemini [Medium cęli, 5 grad ♊]. Saturn 11° 18′ of Cancer, with a southern latitude of 0° 2′ [♄ 11 grad.18 min.Canc. cum latitudine Merid.0 grad.2 min.]; midheaven 11° of Gemini [Medium cæli 11 grad.♊]. The Eighth Star of Gemini also appeared, distant from Saturn toward the east by about [?] digits, as if at the same latitude, most carefully [& apparuit etiam 8 Geminorum, diſtans à Saturn. verſus orientem ad modum quart. digitorum quaſi in eadem latitudiue diligentiſſime.] [recte: latitudine, for `latitudiue`].

February 9 [9 Februarij], in the morning, after midnight [de mane,poſt medium noctis,]: midheaven 15° of Libra, by the Heart of Leo at 22° 33′ [Medium cæli 15 grad.♎, per Cor ♌ 22.33,]; Mars and Jupiter 4° 53′ of Cancer [♂ & ♃ 4 grad.53 min.Canc.]. Spica, by the Heart of Leo, 16° 41′ of Libra [Spica per Cor ♌ 16 grad.41 min.♎.]. On the same day, after noon, by Aldebaran at 2° 45′ of Gemini [Eodem die poſt merid. per Aldebaran 2,45 ♊]: Mars 5° 0′ of Cancer [♂ 5 grad.0 min.Canc.]; midheaven 3° of Gemini [Medium cæli 3 grad.♊,]. Jupiter 4° 50′ of Cancer [♃ 4 grad.50 min.Canc.]; midheaven 4° of Gemini [Medium cæli 4 grad.Gemin.,]. Saturn 11° 8′ of Cancer [Saturn.11 grad.8 minut. Canc.,]; midheaven 7° of Gemini [Medium cæli 7 Gemin.].

February 12 [12 Februarij], after noon, by Aldebaran at 2° 45′ of Gemini [poſt Meridiem, per Aldebaran 2,45 Gemin.]: Mars 5° 7′ of Cancer, with a northern latitude of 3° 25′ [Mar.5 grad.7 min.Canc,cū latitudine Septentr.3 grad.25 minut.]; midheaven 15° of Gemini [Mediū cæli 15 ♊,]. Jupiter 4° 45′ of Cancer [♃ 4 grad.45 min.Canc.]; midheaven 20° of Gemini [Medium cæli 20 ♊,]. Saturn 10° 52′ of Cancer [Saturn.10 grad.52.min.Canc.]; midheaven 22 [Mediū cæli 22] of Gemini [Gemin.]. Canis Major 6° 45′ of Cancer [Canis major 6 grad.45 minut.♋.]. Canis Minor 18° 38′ of Cancer [Canis minor 18 grad.38 minut.Canc.]. Right Shoulder of Orion 21° 38′ of Gemini, very careful [Humerus dexter Orionis 21 grad.38 minut.Gemin.diligentiſſima,]. Heart of Leo 22° 42′ of Leo [Cor ♌ 22,42 ♌.]. *All the preceding observations, from 1503 September 11, made by the Heart of Leo, fall short by 10′* [*Omnes præcedentes,obſervationes ab 11 Septembris anni 1503.per Cor Leonis factæ, deficiunt in 10 minutis.*]

February 13 [13. Februarij], after noon, with the armillary rings, by Aldebaran at 2° 45′ of Gemini [poſt meridiem,Armillis per Aldebaran 2,45 Gemin.]: Mars 5° 18′ of Cancer [♂ 5 grad.18 min.Canc.]; midheaven 10° of Gemini [Mediū cœli 10 grad.Gem.]. Jupiter 4° 45′ of Cancer [♃ 4 grad.45 m.Canc.]; midheaven 12° of Gemini [Mediū cœli 12 Gem.]. Saturn 10° 57′ of Cancer [♄ 10 grad.57 m.Canc.]; midheaven 14° of Gemini [Mediū cœli 14 Gemin.]. Canis Major 6° 38′ of Cancer [Canis major 6 grad.38 m.♋,]; Heart of Leo 22° 40′ of Leo [Cor ♌ 22,40 ♌.].

February 14 [14 Februarij], after noon, with the armillary rings as before [poſt meridiem Armillis,ut prius,]: Jupiter 4° 47′ of Cancer [♃ 4 grad.47 min.Canc.]; midheaven 20° of Gemini [Medium cœli 20 Gem.]. Saturn 10° 57′ of Cancer [♄ 10 grad.57 mi.Canc.]; midheaven 22° of Gemini [Medium cœli 22 Gemin.]. Mars 5° 30′ of Cancer, with a northern latitude of 3° 23′ [Mart.5 grad.30 minut.♋, cum latitudine Septentrional.3 grad.23.min.]; midheaven 24° of Gemini [Medium cœli 24 Gemin.].

February 15 [15 Februarij], with the armillary rings rectified as before, after noon [Armillis,ut prius, rectificatis poſt meridiē]: Saturn 10° 57′ of Cancer [♄ 10 grad.57 minut.Canc.]; midheaven 14° of Gemini [Medium cœli 14 Gemin.]. Jupiter 4° 45′ of Gemini [♃ 4 gra.45 Gemin.][85]; midheaven 15° of Gemini [Med ū cœli 15 Gem.]. Mars 5° 38′ of Cancer [♂ 5 grad.38 mi.Canc.]; midheaven 18° of Gemini [Medium cæli 18 Gemin.].

February 16 [16 Februarij][86], with the armillary rings rectified as before, after noon [armillis ut prius rectificatis poſt meri.]: Saturn 10° 57′ of Cancer [Satur.10 grad.57.min.♋,]; midheaven 14° of Gemini [Medium cæli 14 Gem.]. Jupiter 4° 45′ of Cancer [♃ 4.grad.45 m.Canc.]; midheaven 15° of Gemini [Medium cæli 15 Gem.]. Mars 5° 38′ of Cancer [Mart.5 grad.38 min.Canc.,]; midheaven 18° of Gemini [Medium cæli 18 Gemin.].

February 16 [16 Februarij], after noon, with the armillary rings as before [poſt merid.Armillis ut prius]: Saturn 11° 0′ of Cancer [Saturn.11.grad.0 minut.Canc.]; midheaven 13° of Gemini [Medium cæli 13 ♊,]. Jupiter 4° 38′ of Cancer [♃ 4 grad.38 min.Cancr.]; midheaven 14° of Gemini [Mediū cæli 14 Gemin.]. Mars 5° 40′ of Cancer [Mart.5 grad.40 min.♋,]; midheaven 15° of Gemini [Mediū cæli 15 Gemin.]. Northern latitude 3° 23′ [Latitudo ſeptentr.3 grad.23 minut.]. Heart of Leo 22° 42′ of Leo [Cor Leon.22,42 ♌.].

February 20 [20 Februarij], in the morning, before sunrise, with the armillary rings rectified by the Heart of Leo, set at 22° 40′ of Leo [de mane ante ortum Solis, Armillis rectificatis per Cor Leon.22,40 ♌ poſita.]: Venus 26° 40′ of Capricorn [♀ 26 grad.40 minut.♑,]; northern latitude 4° 20′ [Latitudo ſeptent.4 grad.20 min.]; midheaven 25° of Scorpio [Mediū cæli 25 ♏.]. But one [Sed una] hour after sunrise, with the Sun's degree set at 10° 15′ of Pisces [hora poſt ortū ☉ poſito gradu Solis ſuper 10 grad.15 mi.♓.]. Venus appeared at 27° 10′ of Capricorn, with a northern latitude of 4° 10′ [Videbatur ♀ 27 grad.10 min.♑,cū latitudin.ſeptentr.4 gr.10 min.]. But the rays were not strong enough because of the presence of the Sun, but it is possible that rays refracted around the horizon produced that difference [Sed radij propter præſentiam Solis non ſatis fortes, ſed poſſibile eſt radios refractos circa Horizontē illam differentiam generaſſe.].

Likewise on the same day, after noon, with the armillary rings rectified by Aldebaran at 2° 45′ of Gemini [Item eodem die poſt merid.armillis rectificatis per Aldebaran 2.45 Gem.]: Jupiter 4° 53′ of Cancer, with a northern latitude of 0° 25′ [♃ 4 grad.53.min.Canc. cum latitud.ſeptent.0 grad.25 min.]; midheaven

[85]the page prints Gemini here; Jupiter stands in Cancer on February 14 and 16

[86]the page prints two entries for this date; this first one repeats the figures of February 15

15° of Gemini [Medium cæli 15 gr.♊,]. Mars 6° 20′ of Cancer, with a northern latitude of 3° 18′ [Mars 6 grad.20 min.Canc. cum latitud.ſeptent.3 grad.18.min.]; midheaven 18° of Gemini [Mediū cæli 18 ♊,]. Saturn 11° 0′ of Cancer, having no latitude [Saturn.11 grad.0 min.Canc.,nullam habens latitudinem,]; Heart of Leo 22° 42′ of Leo [Cor Leonis 22 grad.42 min.♌,]; all very carefully [totū diligentiſſime.].

February 26 [26 Februarij], with the armillary rings, by Aldebaran at 2° 45′ of Gemini [armillis per Aldebaran 2,45 ♊,]: Saturn 10° 45′ of Cancer [Satur.10 gr.45 min.Canc.]; midheaven 25° of Gemini [Mediū cæli 25 ♊,]. Mars 7° 33′ of Cancer, with a northern latitude of 3° 15′ [Mart 7 grad.33 min,Canc. cū latitudine ſeptentrionali 3 grad.15.min.]; midheaven 27° of Gemini [Mediū cæli 27.♊.]. Jupiter 4° 45′ of Cancer [♃ 4 grad.45.min.Canc.]; midheaven 2° of Cancer [Mediū cœli 2 grad.Canc.]. Heart of Leo 22° 40′ of Leo [Cor ♌ 22,40 ♌.].

March 1 [1. Martij], in the morning [de mane,]: I watched an eclipse of the Moon, but because of clouds I could see neither the beginning of the eclipse, nor of totality, nor even the end of totality [Conſideravi eclipſim Lunæ, ſed neque principiū Eclipſis,nec moræ,neque etiā finem moræ, propter nubes, videre potui:]. But I saw the end of the whole eclipse, and I rectified the armillary rings by the shadow of the Earth and found the midheaven 10° of Scorpio [finē autē totius eclipſis vidi,rectificavique armillas per umbrā terræ,& reperi Medium cæli 10 grad.♏.]. The Sun, moreover, from the preceding observations, had 20° 7′ of Pisces at that instant [Sol autem ex obſervationibus præcedentibus eo inſtanti habuit 20 grad,7.min.♓.]. The right ascension, therefore, beginning from Capricorn, is 80° 55′ [Aſcenſio igitur recta à ♑ incipiens 80 grad.55.min.]. But the ascension of the midheaven is 307° 35′ [Sed.aſcenſio Medij cæli 307 gra.35 min.]. Therefore the end of this eclipse was 3^h 6^m 40^s after midnight [Quare finis hujus eclipſis fuit tribus horis, ſex minutis,40 ſec.poſt medium noctis.]. Calculation gives 3^h 22^m [Calculus dat tres horas,22 minut.].

March 2 [2. Martij], after noon, with the armillary rings, by Aldebaran at 2° 45′ of Gemini [poſt meridiē,armillis per Aldebaran 2,45 ♊.]: Saturn 10° 45′ of Cancer [♄ 10 grad.45 m.♋.]; midheaven 2° of Cancer [Mediū cęli 2 Canc.]. Mars 9° 0′ of Cancer [Mars 9 grad.0 min.Canc.]; midheaven 3° of Cancer [Medium cæli 3 Canc.].

March 3 [3 Martij], in the morning, after sunrise, by the motion of the Sun, set at 22° 6′ of Pisces [de mane poſt ortum Solis,per motum Solis ſuper 22 grad.6 min.♓ poſitum,]: I found Venus 6° 15′ of Aquarius, while [reperi ♀ 6.grad.15.min.♒, dum] the midheaven was 17° of Capricorn [Medium cæli fuerat 17 grad.♑.]. On the same day, with the armillary rings rectified by Aldebaran at 2° 45′ of Gemini [Eodē die rectificatis armillis per Aldebaran 2,45 ♊.]: Jupiter 5° 0′ of Cancer [♃ 5 grad.0 min.♋,]; midheaven 2° of Cancer [Medium cæli 2 ♋,]. Saturn 10° 45′ of Cancer [♄ 10 grad.45.min.♋,]. Mars 9° 15′ of Cancer [♂ 9.15 Canc.]; midheaven 6° of Cancer [Medium cæli 6.gra.♋]; after noon [poſt meridiem.].

March 11 [11 Martij], in the morning, with the armillary rings rectified by the Sun set at 0° 3′ of Aries, while the midheaven was 12° of Capricorn [de mane, armillis rectificatis per Solem ſuper 0 gra.3 m.♈ poſitum,dum Medium cæli fuerat 12 grad.♑.]: Venus 13° 45′ of Aquarius, with a northern latitude of 2° 15′ [♀ 13 grad.45.min.♒, cum latitudine ſeptentrionali 2 gra. 15 min.]. Likewise on the same day, after noon, by Aldebaran at 2° 45′ of Gemini [Item eodem die poſt meridiem per Aldebaran ſuper 2,45 ♊.]: Mars 11° 48′ of Cancer, with a northern latitude of 1° 27′ [♂ 11. grad.48 min.♋, cum latitudine ſeptent.1 gr. 27 min.]; midheaven 6° of Cancer [Medium cœli 6 ♋,]. Jupiter 5° 23′ of Cancer [♃ 5 grad.23 min.Canc.]; midheaven 14° of Cancer [Medium cœli 14 Canc.]. Saturn 10° 48′ of Cancer [♄ 10 grad.48 min.Canc.]. Mercury 17° 30′ of Aries, with a northern latitude of 1° 51′ [☿ 17 grad.30 min.♈, cum latitudine ſeptentrionali 1 grad.51 min.]; midheaven 18° of Cancer [Medium cœli 18 grad.Canc.]; and it appeared bright and of notable size [& apparuit clarus & notabilis quantitatis.].

March 12 [12 Martij,], with the armillary rings adjusted by the Sun set at 1° 1′ of Aries [armil.ordinatis per Solem in 1 gra.1 min.♈ poſitum]: Venus 14° 45′ of Aquarius, with a northern latitude of 2° 15′ [♀ 14 gra.45 min.♒,cum latitud.ſeptent.2 grad.15 m.]; midheaven 21° of Capricorn [Med.cœli 21 ♑.].

March 17 [17 Martij], in the morning: midheaven 7° of Capricorn, with the Sun set at 5° 55′ of Aries [de mane Med. cœli 7 grad.♑,☉ poſito ſuper 5. grad.55.min.♈,]; Venus 19° 30′ of Aquarius, with a northern latitude of 1° 38′ [♀ 19 grad.30 min.♒,cum latitud.ſeptent.1. grad.38 minut.]. On the same day, after noon, with the armillary rings rectified by Aldebaran at 2° 45′ of Gemini [Eodem die poſt merid.armil.rectificat.per Aldebaran ſuper 2,45 ♊.]: Mercury 25° 30′ of Aries, with a northern latitude of 2° 53′ [☿ 25.30 ♈, cum latitud.ſeptentr.2. grad.53 m.]; midheaven 23° of Cancer [Med.cœli 23 Canc.]. Saturn 11° 5′ of Cancer, with a southern latitude of 0° 22′ [♄ 11 grad.5 min. Canc.cum latitud.merid.0. gr.22.min.]. Jupiter 5° 50′ of Cancer, with a northern latitude of 0° 7′ [♃ 5 gra.50 min. ♋ cum latitud. ſept.0 grad.7.m.]. Mars 14° 0′ of Cancer, with a northern latitude of 2° 30′ [♂ 14.gra.0 m.Canc.cum latitud.ſeptent.2 grad. 30 m.]; midheaven 6° of Leo [Med.cœli 6 ♌.].

March 18 [18 Martij], in the morning: midheaven 26° of Capricorn, with the Sun set at 6° 53′ of Aries [de mane, Mediū cœli 26 gra.♑,☉ poſito ſuper 6 grad.53.m.♈,]; Venus 20° 15′ of Aquarius, with a northern latitude of 1° 30′ [♀ 20 grad.15 min.♒,cum latitud. ſeptentr.1. grad.30 m.]. And on the same day, after noon, by Aldebaran at 2° 45′ of Gemini [Et eodem die poſt merid.per Aldebaran ſuper 2 gr.45.m.♊.]: Mercury 26° 30′ of Aries, with a northern latitude of 3° 0′ [☿ 26 grad.30 min.♈.cū latitud.ſeptent,3.gra. 0 m.]; midheaven 25° of Cancer [Med.cœli 25 Canc.].

March 19 [19 Martij], in the morning: midheaven 7° of Capricorn, with the Sun at 7° 55′ of Aries [de mane,Mediū cœli 7 grad.♑,☉ in 7 gr. 55. m. ♈,]; Venus 21° 23′ of Aquarius, with a northern latitude of 1° 23′ [Ven.21 grad.23.m. ♒.cū latitud. ſeptent.1,gr.23 minut.].

March 24 [24 Martij], after noon: midheaven 5° of Leo, by Aldebaran at 2° 45′ of Gemini [poſt Meri. Medium cæli 5 gra.♌,per Aldebaran 2,45 ♊,]: Mercury 0° 5′ of Taurus, with a northern latitude of 3° 30′ [☿ 0 grad.5 m.♉,cum latitudine ſepten.3 gra.30 m.].

March 27 [27 Martij], in the morning: with the Sun at 15° 50′ of Aries [de mane. Sole in 15,50 ♈,], Venus 29° 40′ of Aquarius [♀ 29, 40 ♒,]; midheaven 10° of Capricorn [Med. cœli 10 ♑.]. On the same day, after noon, with the armillary rings by Aldebaran at 2° 45′ of Gemini [Eodē die poſt merid.armillis per Aldebaran 2.45 ♊,]: Mars 17° 45′ of Cancer, with a northern latitude of 2° 15′ [♂ 17 gr.45 m.Canc.cum latit.ſeptent.2 gr.15,m.]; midheaven 5° of Leo [Med. cœli 5 ♌,]. Jupiter 6° 50′ of Cancer [♃ 6 gra.50 ♋,]; midheaven 19° of Leo [Med.cæli 19 ♌,]. Saturn 11° 25′ of Cancer [♄ 11,25 Canc.]. The fixed star which is as if at the same northern latitude: 10° 45′ [Stella fixa quæ quaſi in eadem latitudine ſeptent.10,45.]. Spica 16° 40′ of Libra, by Aldebaran [Spica 16 gra. 40 min.♎ per Aldebaran.].

March 28 [28 Martij], after noon, at 7^{h}, Saturn was very close to the Eighth Star of Gemini [poſt Mer.hor.7 fuerat.♄ propinquiſſimus octavę ♊,]. Saturn was at that time farther west and farther north than the fixed star, at a distance of 2 or 3 transverse digits [fuerat tum ♄ occidentalior & ſeptentrionalior fixa, ad ſpatiū 2 vel 3 digitorum tranſverſalium,], yet in such a way that the distance lay more in latitude than in longitude [ſic tamen quod diſtantia magis fuerat experte latitudinis quam longitudinis,] [recte: ex parte, for `experte`]. But on the following night it was still closer to the fixed star, so that their conjunction had to be judged at almost the same instant [Sed nocte ſequēte adhuc fuerat propinquior fixa,ſic quod ☌ eorum judicanda fuerat eodem inſtanti ferè.]. On other, following nights Saturn appeared farther east than the same star [Alijs noctibus ſequentibus apparuit ♄ orientalior eadem ſtella.].

April 23 [23 Aprilis], after noon, with the armillary rings rectified by the Heart of Leo at 22° 42′ of Leo [poſt meridiē armillis rectificatis per Cor ♌ 22, 42 ♌.]: Mars 1° 20′ of Leo, the midheaven being 15° of Virgo [♂ 1 grad.20 m.♌. medio cæli exiſtente 15 ♍.].

April 24 [24 Aprilis,], with the armillary rings rectified by the Heart of Leo at 22° 42′ of Leo [armillis rectificatis per Cor ♌ 22.42.♌.]: Jupiter 11° 0′ of Cancer, the midheaven being 15° of Virgo [♃ 11 gr. 0 m.♋,medio cœli exiſtente 15 grad.♍.]. Saturn 11° 0′ of Cancer [♄ 11 gra. 0 mi.♋]. Mars 0° 35′ of Leo, the midheaven 17° of Virgo [♂ 0 gra.35 m.♌,medio cæli 17 ♍,]. Spica 16° 30′ of Libra [Spica 16.30 ♎,]. The observations that night were doubtful [Dubiæ obſervationes illa nocte.].

April 29 [29 Aprilis], after noon, with the armillary rings by the Heart at 22° 42′ of Leo [poſt meridiem, armillis per Cor 22, 42 ♌,]: Jupiter 11° 20′ of Cancer [♃ 11, 20 ♋,]; midheaven 20° of Virgo [Mediū cæli 20 ♍.]. Saturn 13° 30′ of Cancer [♄ 13 gra.30 min.♋]. Mars 3° 15′ of Leo [♂ 3.15 ♌.]; midheaven 27° of Virgo [Mediū cæli 27 ♍.]. Spica 16° 40′ of Libra [Spica 16 grad.40 minut.Libr.]. Conjunction of Jupiter and the Eighth Star of Gemini in longitude, Jupiter,

however, being farther north by about ½° [♂ ♃ & octavæ Gemin. ſecundum longitudinem, ♃ vero Septentrionalior ad ½ grad.].

April 30 [30 Aprilis], after noon, with the armillary rings by the Heart of Leo at 22° 42′ of Leo [poſt meridiem armillis per Cor ♌ 22.42 ♌.]: Jupiter 11° 40′ of Cancer [♃ 11 40 Canc.]; northern latitude 0° 20′ [latitudo Septentrional.0 grad.20 min.]; midheaven 21° of Virgo [Mediū cæli 21 ♍.]. Saturn 13° 45′ of Cancer [Saturn. 13 grad.45 min.Canc.]. Mars 4° 3′ of Leo [♂ 4 grad.3 minut.♌]; northern latitude 1° 45′ [latitud.ſeptent.1 gr.45 min.]; midheaven 27° of Virgo [Mediū cæli 27 ♍,]. Spica 16° 40′ of Libra [Spica 16.40 Librę.][87].

May 9 [9 Maij], with the armillary rings by the Heart of Leo set at 22° 42′ of Leo [armillis per Cor Leonis ſuper 22.42 Leon.]: Jupiter 13° 18′ of Cancer [♃ 13.18 Canc.]; midheaven 4° of Libra [Mediū cæli 4 ♎,]. Saturn 14° 40′ of Cancer [Satur.14,40 Canc.]. Mars 8° 31′ of Leo [♂ 8,31 Leon.]; midheaven 10° of Libra [Medium cæli 10 Libr.].

May 18 [18 Maij], after noon, with the armillary rings rectified by the Heart of Leo set at 22° 42′ of Leo [poſt meridiem,armillis per Cor Leon.rectificatis ſuper 22,42 Leon.]: Jupiter 15° 2′ of Cancer [♃,15,2 Canc.]; midheaven 19° of Libra [Medium cæli 19 ♎.]. Saturn 15° 30′ of Cancer [♄ 15,30 Canc.]. Mars 15° 28′ of Leo [♂ 15.28 Leon.]; midheaven 20° of Libra [Medium cæli 20 ♎.].

May 22 [22 Maij], after noon, with the armillary rings rectified by the Heart of Leo set at 22° 42′ of Leo [poſt meridiem armillis rectificatis per Cor Leon.ſuper 22,42 Leon.]: Jupiter 15° 47′ of Cancer, northern latitude 0° 30′ [♃ 15.47 Canc. Latitudo ſeptentrionalis 0 grad.30.min.]; midheaven 23° of Libra [Medium cæli 23 ♎,]. Saturn 16° 2′ of Cancer, northern latitude 0° 15′ [♄ 16. 2 Canc. Latitudo Septentr,0 grad.15 min.].

May 23 [23 Maij], after noon, with the armillary rings as above [poſt meridiem armillis ut ſupra,]: Jupiter 15° 53′ of Cancer [♃ 15,53 Canc.]; midheaven 26° of Libra [Medium cęli 26 ♎,]. Saturn 16° 0′ of Cancer [Saturn.16,0 Canc.]. Mars 16° 5′ of Leo, northern latitude 1° 30′ [♂ 16.5 Leon. Latitudo ſeptentrionalis 1 grad.30 min.]; midheaven 29° of Libra [Medium cæli 29 ♎,]. Spica 16° 40′ of Libra [Spica 16 40 ♎.].

May 24 [24 Maij], after noon, with the armillary rings etc. by the Heart of Leo set at 22° 42′ of Leo [poſt meridiē, armillis &c. per Cor Leon.ſuper 22 42 Leon.]: Jupiter 16° 0′ of Cancer, northern latitude 0° 20′ [♃ 16.0 Canc.Latitudo ſeptentrionalis 0.20.]; midheaven 0° of Scorpio [Med. cæli 0 ♏,]. Saturn 16° 0′ of Cancer, northern latitude 0° 5′ [Satur.16,0 Canc.Latitudo ſeptentrion.0,5.].

May 25 [25 Maij], after noon, according to the armillary rings, as before [poſt meridiē ſecundum armillas,ut prius,]: Jupiter 16° 13′ of Cancer [♃ 16.13 Canc.]; midheaven 4° of Scorpio [Medium cæli 4 ♏,]. Saturn 16° 10′ of Cancer [Saturn.16.10 Canc.].

[87]the second minute figure supplied from the Rome copy.

May 28 [28 Maij]: Jupiter 16° 53′ of Cancer [♃·16,53 Canc.]; midheaven 5° of Scorpio [Medium cæli 5,grad.♏,]. Saturn 16° 28′ of Cancer [Satur.16,28 Canc.].

May 29 [29 Maij]: Jupiter 17° 3′ of Cancer [♃ 17.3 Canc.]; midheaven 14° of Scorpio [Medium cæli 14 ♏,]. Saturn 16° 45′ of Cancer [Sat.16.45 Canc.]. With the armillary rings rectified for Mars by Spica set at 16° 40′ of Libra [armillis ad ♂ rectific.per Spicā ſuper 16.40 ♎,]: Mars 19° 5′ of Leo [♂ 19.5 Leon.]; midheaven 29° of Scorpio [Medium cæl.29.♏.].

May 30 [30 Maij], after noon, with the armillary rings rectified by Spica set at 16° 40′ of Libra [poſt mer. armillis rectific.per ſpicam ſuper 16.40 ♎,]: Mars 20° 0′ of Leo, northern latitude 1° 10′ [Mart.20 0 Leon.Latitudo Septent.1.10.]; midheaven 8° of Scorpio [Medium cælj 8. grad.♏.].

THE END [FINIS.]

Johannes Schöner's Notes on the Construction and Use of Ptolemy's Great Ruler [IOANNES SCHONERI IN FABRICAM & uſum magnæ regulæ Ptolomæj annotationes.]

On the Construction of Ptolemy's Great Ruler, on the Model of the One Made of Brass by Master Regiomontanus, Which Is Found at Nuremberg [Pro fabrica regulæ magnæ Ptolemæi ad inſtar illius de aurichalco factæ per M. Ioannem de Monteregio,quæ Nurenbergæ reperitur.]

First have two flat rulers prepared for yourself [regulas planas], with faces in the form of parallelograms, four cubits long [quatuor cubitorum], yet of sufficient thickness. In the middle of the wider breadth of each of them draw a straight line: A C on the one, and A D on the other. Let the straight line A C be on the stronger, or thicker, ruler. Then you will also prepare a third ruler, C E, of proper breadth and thickness, but 6 cubits long [6 cubitorum].

With these three rulers thus prepared, accurately and as flat as possible, take the length of line A C, or A D (for they must be of the same length), as you please, from point A to its tip D. Apply that same length of line to the longest ruler, namely C E, and do this from point C toward E; at the end of which you will assign the number 100000 [numerum 100000]. Divide this length of line A C, applied to this longer ruler, on that side, which faces the upper part of the instrument, from point C as far as the assigned number 100000, into 10 equal parts. Then divide each of the divisions again into 10 equal parts. Proceed in the same way beyond the assigned number 100000 as well, to the end of the longer ruler. Write their numbers on these divisions, increasing them until you reach the end, so that on the first division, at point C of ruler C E [?], you put 1000, on the second 2000, on the third 3000, and so on.

When these have been accurately inscribed in this way, finally subdivide each of those portions again into 10 equal parts. These divisions, however, will remain without numbers, and each of them will be worth 100 parts. Finally,

join the rulers as is proper. Then let two little pins, or small axles, F G [calviculi ſive axiculi] [recte: claviculi] be fixed perpendicularly into the stronger ruler, so that they can turn freely in their holes. For the form of this instrument, see below.

This method of observing the stars by these rulers of Ptolemy works very well, in my judgement at least, provided that between the two vanes [pinnacidia] of ruler A D there is made a kind of paper structure [ſtructura quædam papyracea], in the manner of a square tube [canne quadratæ], of fourfold paper, to the width and height of the vaned ruler A D [pinnularis regulæ]. Near vane D, however, let there be a certain open hole, so that a ray of the Sun coming through the hole of vane A can be seen at vane D, since in this way the ray of the Sun will be seen stronger, not hindered by air or winds. See the image of these things immediately following.

Drawing of the Ptolemaic Ruler [DEFORMATIO REGVLÆ PTOLEMAICÆ.]

Diagram. A woodcut of the instrument. At the left stands a tall upright ruler, drawn with a double line down its right side, with a square tooth projecting from its top end and a rounded tooth projecting from its foot. Near the foot, a circle on the upright holds a pivot hole, from which a long graduated ruler rises to the upper right and runs off the edge of the leaf in this copy. Near the top, a second pivot on a rounded end carries a shorter ruler slanting down to the right. It bears two diamond-shaped vanes, one near each end, and comes to a point on the long ruler, where a cross-bar marks the number. The long ruler has nine ticks between the circle and the cross-bar, then the number, then nine more ticks before the edge of the leaf.

- A (near the top pivot, on the slanting ruler): label A
- D (near the lower tip of the slanting ruler, set sideways): label D
- c (inside the circle, below the pivot hole): label c, lower case
- G (below the tooth at the foot): label G
- Number along the long ruler, just below the cross-bar, set along the slope: 100000
- Above the tooth at the top: a heavy mark at a slant, not resolved as a letter [?]
- E (at the right end of the long ruler, between its lines and its lower edge; the end is cut off at the right in the copy used and stands whole in the Rome copy): label E[88]

The Use of This Ruler [VSVS HVIVS REGVLÆ.]

Apply the ruler in observations in such a way that it forms formal isosceles triangles [triangulos formales iſoſceles], so that the number cut off by point D on ruler C E [?] always indicates the size of the chord subtending the arc intercepted between the pole of the horizon and the star or the Sun. Half of

[88]supplied from the Rome copy

this number in the table of sines will always indicate half of that arc, so that the number of degrees found must be doubled. But since this ruler can by no means hold all numbers, since its line C E would have had to be divided into so many very minute portions, so here, in a figure of this kind, the longer ruler is divided [diviſa ſt] into 141421 equal parts, as required by a table of sines whose greatest sine has 100000 parts. For that reason, too, any part lying between two numbers will contain 100, since 10 multiplied by 10 makes 100, as will be clear in this second figure, where the letter A represents exactly 58400[89], B 58100, C 58200, D 58300, E 58400, G 58500.

If now the part A D of the ruler, in which the two vanes are fixed, falls with its point D on point F (a point that is not half of one division beyond E, namely between E and G, that is, between the two divided parts denoting these numbers, 58400 and 58500), I take point F, so touched, by estimate from the divisions, as 34 or nearly, of those parts beyond E, that is, beyond 58400, of which 100 are counted from E G. And so the number due to point F, marked by the point D of the other, upper ruler lying on it, comes to 58434. See the figure of this.

This number, found in this way, belongs to the chord subtending the arc of the Sun's distance from the pole of the horizon, as observed in 1475 August 2 at noon. To find the arc from the table of sines, take half of this chord, which is the right sine of the arc that is subduple, or half [ſubdupli, aut medij], with respect to the arc of that chord. This right sine, then, in the table of sines, shows the arc belonging to it. That arc doubled is the arc belonging to that chord, and the arc of the Sun's distance from the vertex of the horizon. Its complement is the Sun's meridian altitude. See an example of this.

58434	Chord of the distance from the zenith.
29217	Half of this chord.
16° 59′ 34″	Arc of half the chord.
33° 58′ 34″	Its arc doubled.
56° 1′ 26″	Complement of this doubled arc, and it is the Sun's meridian altitude.

To Find the Sun's True Position in the Zodiac from Its Meridian Altitude [Per altitudinem Solis meridianam locum ejus verum in Zodiaco capere.]

Look up the Sun's meridian altitude in the body of the following table. If you find it exactly, you will have ready at the right or left of the table the Sun's degree, and at the head or foot of the table the Sun's sign. For if the Sun's altitude is taken from the winter solstice to the summer solstice, that altitude of the Sun will belong to the signs Capricorn, Aquarius, Pisces, Aries, Taurus and

[89] the page prints the same figure for A and for E, while the values from B to G rise by 100 at each letter

Gemini [♑, ♒, ♓, ♈, ♉, ♊]. But if it is taken from the summer solstice to the winter solstice, the Sun's altitude will belong to the signs Cancer, Leo, Virgo, Libra, Scorpius and Sagittarius [♋, ♌, ♍, ♎, ♏, ♐].

If, however, the Sun's altitude is not expressed in the table, take the nearest number smaller than your altitude expressed there, noting outside the table the degree at the side and the sign at the head or foot of the table. Take also from the same place the next larger number, and find the difference of these; that difference will be the first number of the rule of three [regulæ de tri], and the divisor. Then subtract the northern altitude expressed there from the proposed altitude, and their difference will be the third number. Multiply it always by 60, which is the second number, and divide this product by the first number, that is, the divisor; but first reduce the differences to seconds, with the multiplication and division done. Subtract the result from the sign and degree of the Sun noted outside, if the altitude was taken from Cancer to Capricorn [à ♋ in ♑]; or add it, if the Sun's altitude was from Capricorn to Cancer [à ♑ in ♋].

By this rule I find for the Sun's meridian altitude, namely 56° 1′ 26″, the Sun's true position in the zodiac, 18° 5′ 43″ of Leo [18,5,43 ♌], for the time of the observation.

Table of the Sun's Meridian Altitudes, Presupposing a Polar Altitude of 49° 24′ and a Maximum Solar Declination of 23° 28′ [Tabula altitudinum Solis meridianarum præſupponens altitudinem poli 49,24. & maximam Solis declinationem 23.28.]

G.	♑ g. m. ſe.	♒ g. m. ſe.	♓ g. m. ſe.
0	17° 8′ 0″	20° 25′ 36″	29° 6′ 57″
1	17° 8′ 14″	20° 38′ 30″	29° 28′ 8″
2	17° 8′ 54″	20° 51′ 47″	29° 49′ 32″
3	17° 10′ 3″	21° 5′ 24″	30° 11′ 5″
4	17° 11′ 38″	21° 19′ 24″	30° 32′ 49″
5	17° 13′ 40″	21° 33′ 43″	30° 54′ 43″
6	17° 16′ 10″	21° 48′ 23″	31° 16′ 15″
7	17° 19′ 7″	22° 3′ 23″	31° 38′ 57″
8	17° 22′ 31″	22° 18′ 43″	32° 1′ 17″
9	17° 26′ 21″	22° 34′ 23″	32° 23′ 15″
10	17° 30′ 39″	22° 50′ 21″	32° 46′ 21″
11	17° 35′ 23″	23° 6′ 38″	33° 9′ 4″
12	17° 40′ 33″	23° 23′ 13″	33° 31′ 54″
13	17° 46′ 10″	23° 40′ 6″	33° 54′ 51″
14	17° 52′ 13″	23° 57′ 17″	34° 17′ 55″
15	17° 58′ 42″	24° 14′ 45″	34° 41′ 4″
16	18° 5′ 37″	24° 32′ 30″	35° 4′ 19″
17	18° 12′ 58″	24° 50′ 31″	35° 27′ 39″
18	18° 20′ 44″	25° 8′ 48″	35° 51′ 3″
19	18° 28′ 54″	25° 27′ 21″	36° 14′ 33″
20	18° 37′ 31″	25° 46′ 10″	36° 38′ 6″

G.	♑ g. m. ſe.	♒ g. m. ſe.	♓ g. m. ſe.
21	18° 46′ 32″	26° 5′ 13″	37° 1′ 43″
22	18° 55′ 58″	26° 24′ 31″	37° 25′ 23″
23	19° 5′ 47″	26° 44′ 4″	37° 49′ 6″
24	19° 16′ 2″	27° 3′ 50″	38° 12′ 52″
25	19° 26′ 39″	27° 23′ 49″	38° 36′ 40″
26	19° 37′ 40″	27° 44′ 2″	39° 0′ 30″
27	19° 49′ 5″	28° 4′ 27″	39° 24′ 21″
28	20° 0′ 53″	28° 25′ 5″	39° 48′ 13″
29	20° 13′ 3″	28° 45′ 55″	40° 12′ 6″
30	20° 25′ 36″	29° 6′ 57″	40° 36′ 0″
(foot)	♐	♏	♎

90

	♈ g. m. ſe.	♉ g. m. ſe.	♊ g. m. ſe.	G.
1	40° 36′ 0″	52° 5′ 3″	60° 46′ 24″	30
2	40° 59′ 54″	52° 26′ 5″	60° 58′ 57″	29
3	40° 23′ 47″	52° 46′ 55″	61° 11′ 7″	28
4	41° 47′ 39″	53° 7′ 33″	61° 22′ 55″	27
5	42° 11′ 30″	53° 27′ 58″	61° 34′ 20″	26
6	42° 35′ 20″	53° 48′ 11″	61° 45′ 21″	25
7	42° 59′ 8″	54° 8′ 10″	61° 55′ 58″	24
8	43° 22′ 54″	54° 27′ 56″	62° 6′ 13″	23
9	43° 46′ 37″	54° 47′ 29″	62° 16′ 2″	22
10	44° 10′ 17″	55° 6′ 47″	62° 25′ 28″	21
11	44° 33′ 54″	55° 25′ 50″	62° 34′ 29″	20
12	44° 57′ 27″	55° 44′ 39″	62° 43′ 6″	19
13	45° 20′ 57″	56° 3′ 12″	62° 51′ 16″	18
14	45° 44′ 21″	56° 21′ 29″	62° 59′ 2″	17
15	46° 7′ 41″	56° 39′ 30″	63° 6′ 23″	16
16	46° 30′ 56″	56° 57′ 15″	63° 13′ 18″	15
17	46° 54′ 5″	57° 14′ 43″	63° 19′ 47″	14
18	47° 17′ 9″	57° 31′ 54″	63° 25′ 50″	13
19	47° 40′ 6″	57° 48′ 47″	63° 31′ 27″	12
20	48° 2′ 56″	58° 5′ 22″	63° 36′ 37″	11
21	48° 25′ 39″	58° 21′ 39″	63° 41′ 21″	10
22	48° 48′ 15″	58° 37′ 37″	63° 45′ 39″	9
23	49° 10′ 43″	58° 53′ 17″	63° 49′ 29″	8
24	49° 33′ 3″	59° 8′ 37″	63° 52′ 53″	7
25	49° 55′ 15″	59° 23′ 37″	63° 55′ 50″	6
26	50° 17′ 17″	59° 38′ 17″	63° 58′ 20″	5
27	50° 39′ 11″	59° 52′ 36″	64° 0′ 22″	4
28	51° 0′ 55″	60° 6′ 36″	64° 1′ 57″	3
29	51° 22′ 28″	60° 20′ 13″	64° 3′ 6″	2

[90] The seconds at ♓ 6° and ♓ 9° are printed 15 and stand as printed; each breaks the even growth of the differences in that column, as the neighbouring rows show. The page carries one column of degrees, at the left, numbered 0–30 downward.

	♈ g. m. ſe.	♉ g. m. ſe.	♊ g. m. ſe.	G.
30	51° 43′ 52″	60° 33′ 30″	64° 3′ 46″	1
0	52° 5′ 3″	60° 46′ 24″	64° 4′ 0″	0
(foot)	♍	♌	♋	

[91]

If [Sic; recte: Si] you want to use this table for another region or place, find out that place's latitude. If it is less than this one, add the excess of this one to the altitude found here in the table; if greater, subtract. For example, this table is based on an elevation of the pole of 49° 24′, such as that of Nuremberg. But if you wanted to convert it to an altitude of the pole of 51° 40′, take the difference of the two poles, namely of 49° 24′ and 51° 40′, which is 2° 16′. And since the difference is larger than the Nuremberg pole [polo Norico], subtract 2° 16′ from any number placed in this table, and you will have it exactly for the pole of 51° 40′, and so on.[92]

To Find the True Position of the Sun Much More Easily Than Before, from the Chord of the Distance from the Zenith Alone [Verum locum Solis per ſolam chordam diſtantiæ à vertice multo facilius colligere, quam antea.]

This method is almost the same as the one that uses the table of meridian altitudes, so learn the use of this one from the following example. Likewise, in the running year of Christ, 1475 August 2, at noon, the chord found was 58434.

58902 Larger than this observation, from the following table.
58385 Next smaller than the observation, from the following table.

517 The difference, and the first number and divisor. 60 is always the second number.
584[?]4 The observed chord.
58385 The chord smaller than the observation, from the following table.

[91] The degrees at the left are printed 1–30 and then 0, with no 0 at the head, where the previous page numbers its column 0–30; the degrees at the right are printed 30–1 and then 0. The first row's ♈ value, 40° 36′ 0″, is the value printed at ♓ 30 on the previous page, and that page's ♑ and ♒ columns end on the values that begin the next column there. The degrees of ♈ at row 3 are printed 40, which falls below the 40° 59′ 54″ above it and stands as printed.

[92] the second figure of that last 51 is a sloping 1, read so in the Rome copy; in the copy used it shows as two joined slanting strokes, unlike the I-form 1 of the two 51 printed earlier in the passage.

49 The difference and third number.

93

Set these numbers out by the rule of proportions, saying: 517 give 60; what will 49 give? It comes to 18° 5′ ♌, approximately, the true position of the Sun for this observation.

The table follows.

Table for Extracting the True Position of the Sun from the Chord of the Distance from the Zenith Alone [Tabula pro extrahendo vero loco Solis per ſolam chordam diſtantiæ à vertice.]

G	♋	♌	♍	♎	♏	♐	G
0	44877	50456	64974	83572	101334	114104	30
1	44884	50822	65556	84204	101860	114404	29
2	44903	51196	66144	84834	102382	114694	28
3	44937	51578	66736	85460	102897	114976	27
4	44980	51972	67332	86089	103406	115247	26
5	45036	52375	67930	86714	103908	115508	25
6	45108	52784	68532	87338	104404	115761	24
7	45196	53204	69140	87960	104896	116003	23
8	45288	53637	69748	88578	105379	116235	22
9	45328	54074	70360	89195	105855	116459	21
10	45518	54520	70976	89810	106327	116670	20
11	45652	54987	71592	90418	106788	116875	19
12	45798	55441	72212	91030	107242	117068	18
13	45958	55913	72834	91636	107692	117252	17
14	46128	56392	73460	92237	108133	117412	16
15	46312	56879	74086	92838	108567	217588	15
16	46508	57374	74714	93434	108993	117740	14
17	46716	57876	75342	94026	109412	117881	13
18	46936	58385	75972	94614	109822	118012	12
19	47168	58902	76602	95200	110225	118134	11
20	47412	59422	77236	95782	110621	118246	10
21	47654	59953	77870	96357	111007	118348	9
22	47932	60488	78504	96929	111385	118438	8
23	48208	61028	79138	97498	111761	118516	7
24	48497	61574	79772	98060	112118	118586	6
25	48798	62128	80406	98619	112470	118645	5
26	49108[94]	62688	81040	99171	112815	118692	4
27	49430	63240	81674	99720	113151	118728	3

[93] The figure of the observed chord in the second block is printed with its fourth sort reduced to three small specks in a column; the same chord is printed 58434 in the sentence above the working.

[94] second figure supplied from the Rome copy

G	♋	♌	♍	♎	♏	♐	G
28	49762	63821	82308	100264	113477	118755	2
29	50106	64397	82940	100802	113795	118772	1
30	50459	64974	83572	101334	114104	118777	0
(foot)	♊	♉	♈	♓	♒	♑	

This table presupposes a maximum declination of the Sun of 23° 28′ and an elevation of the pole of 49° 24′, such as that of Nuremberg.[95]

But if you should happen to be making observations of the Sun in another place, and wanted to construct a very similar table for the elevation of the pole of that place, proceed in this way. In the northern signs, subtract half the declination of any given degree from half the elevation of the pole, and double the sine of what results: this will give you the chord of the distance from that same degree. In the southern signs, add half the declination of any given degree to half the elevation of the pole, and double the sine of what results, and you will have the chord of the distance from that same degree. An example for the preceding table, which was rooted [radificata] at the pole 49° 24′.

24° 42′		Half the pole of Nuremberg.
11′ 47″		Half the declination of degree 1 of ♈, northern [Septent.]
24° 30′ 3″		Remainder.
24° 31′	41495	Next smaller sine of this remainder [rema.], from the table of sines 100000
24° 30′	41469	Sine of this remainder
	26	the difference, and it is the second number
	3	of the remainder, and it is the third
	60	is always the first number and the divisor.

Apply this to the rule of proportions, saying: 60 gives 26; what will 3 give? It makes 1, to be added.

41469
1 to be added [I.A.]
41470
41470
82940 Chord for degree 1 of ♈ at Nuremberg.

[95] The head signs are read with the left-hand degrees going down, the foot signs with the right-hand degrees going up. At ♐ degree 15 the figure is printed `217588`, with a clear leading 2, between `117412` and `117740`. The last row's ♋ value is printed `50459`, where the first row's ♌ value, the same point of the ecliptic, is printed `50456`. At ♋ degree 9 the value is printed `45328`, which stands 40 above the row before it and 190 below the row after it. At ♌ degree 27 the value is printed `63240`, which stands 552 above the row before it and 581 below the row after it. Each of these stands as printed. At ♋ degree 26 the second figure has only a faint upper arc left.

96

THE END.

To illustrate the ingenious observation of Bernhard Walther on folio 35, by which he avoids the deception of refractions, I judged it would be worth my while to copy here a passage of the most learned Kepler, from his Paralipomena *to Vitello [Witelo].*

Bernhard Walther (he says), in the little book of observations appended to the *Torquetum* of Regiomontanus, testified to exactly the same thing: that experience had taught him that stars often appear above the horizon when in reality they are below it. That was almost 120 years ago. But the passage deserves to have light shed on it, so that that man's discoveries may be compared with those of our own Tycho. The author's words are these.

1489 March 6, around sunset, namely when 25° ♊ was at midheaven. The Sun by the armillary rings at 25° 15′ ♓. Venus, by another circle, with the ecliptic dividing the Sun, was found at 27° 15′ ♈. But with a circle of latitude bisecting the Sun, as is usual near the horizon, she was found in another place, namely at 25° 30′ ♈. I shall add the cause of this later. These things are explained a little further on. There follows:

March 7. The Sun, by sighting through the armillary rings, 26° 15′ ♓. Venus, from the ecliptic, 28° 15′ ♈. From the circle of latitude, 27° 38′ ♈. To these observations he at once adds the following. *Also, so that those who go on to read may not be left long in the dark about how I proceeded, in that the place of Venus was found so differently at virtually the same instant: it should be noted that near the horizon stars appear above the horizon because of the refracted rays, when in truth they are below it.* And this is plainly what the theory and doctrine of refractions as handed down until now required, and not, indeed, the contrary of this. For when the Sun's rays, falling obliquely on the surface of water, plunge beneath the water, they travel at an angle less inclined to that surface of the water, just as if the Sun were higher. In just the same way, the same rays of the Sun fall on the surface of the air, which covers us humans altogether, in the manner of a flood. If they went on along the path by which they fall on the surface of the air, they would never fall into our eyes but would be carried far above our heads. But once refracted at the surface of our air, they now descend toward us on a steeper slope, and to us they seem loftier [magis ardui]. And indeed, if we are dealing with water, the Sun can never be below the surface of the water, but is always above it, because the portion of the water's surface on which we make trial of this refraction is small, so much so that it looks completely flat to us. But since the air is round, no small part of it interposes itself between our sight and the Sun; and indeed a part so large that it already begins to curve toward the

[96] 24° 42′ less 11′ 47″ comes to 24° 30′ 13″. The page prints the remainder as 3 and uses 3 in the rule of proportions; 47 and 3 both stand as printed. The line carrying 41495 is printed *proximè minor*, "next smaller", although 24° 31′ lies above the remainder and 41495 is the larger of the two sines; it stands as printed.

Sun. Therefore, although some particular ray of the Sun touches the surface of the air at some point that hangs over our heads (in which case the Sun will be sticking on the horizon itself), or at a point already nearer the Sun than the one above us (in which case the Sun will already have set), nevertheless the parts of the sphere of air that stretch on past that point of contact toward the Sun will, because the air is massed into a globe, sink below that tangent. So the Sun that has already set for us is still raised for those points. In this way the same thing happens once again as in water too: the Sun is never below the point of the air at which its ray is refracted, and yet for us it has in truth already set. But Walther goes on. *This has quite often appeared to me, perceptibly, with the instrument of the armillary rings, before I had seen the* Perspectives *[perſpectivas] of Ibn al-Haytham [Alhazen] and of Witelo the Thuringian [Vitellionis Turingi], in which afterwards*

I found this set out precisely. The same thing happened to Tycho Brahe: he noticed the refractions of the lights [luminum] before he had read either these writers on optics or Walther's findings, as he attests in Book 1 of the *Progymnasmata*, folio 91. For the occasions on which he discovered them, see the same book, folio 15, and again folio 91. So each of the two deserves all the more trust, because they found this to be so without prior knowledge [ignari], and with their minds taken up by no prejudgments. For this is the mark of truth: to come together by different roads. Next in Walther comes the account of the occasions on which he himself came to know of this matter. *But to avoid the Moon's parallax [Lunæ diverſitatem aſpectus], I also examined the method of Ptolemy in chapter 2 of Book 7 [capitulo ſecundo dictionis ſeptimæ]:* that is, the occasion that showed me the refractions was this. I was engaged in exploring with instruments how far along the ecliptic the fixed stars had advanced [poceſſiſſent] [recte: proceſſiſſent] in my own time. The easiest way of exploring this is the following, if the truest position of the Moon from the Sun, or from the equinox, can be drawn from calculation for any moment at all: then one should look, at that moment, to see which fixed stars the Moon is meeting. Or conversely, if at some definite hour of the night the Moon covers some fixed star, the true position of the Moon from the equinox should be computed by the most certain calculation. For that will also be the true position of the star from the equinox. Or if anyone distrusts calculation, that person should carefully watch the middle of some lunar eclipse and note the distances of the Moon from the neighbouring fixed stars. For in this way that person will have the distance of the Sun from those fixed stars; and from the meridian altitude of the Sun and the latitude of the place will also have the distance of the Sun from the equinox, by way of its declination. Therefore the distance of those fixed stars from the equinox will also be given.

By these methods, certainly, the business would be easily dispatched, if the true position of the Moon could be had either outside an eclipse or during one. But it happens, besides everything else, that even though we know for certain the true position of the Moon, the one that anyone would see it occupy if

from the centre of the Earth [terræ][97] he were looking out; yet parallax, whose variation is incredible, puts it in one position after another. So the Moon's distance from the fixed stars is very different from what it would be if the Moon were seen in its true position. Therefore, so that the Moon's parallax should not give me trouble, I used the method that Ptolemy pioneered in Book 7, chapter 2. He did this with the Moon; I imitated it with Venus, whose parallax is smaller, and whose daily motion is smaller too. *And the distance of the Sun and Venus around noon or later, with the instrument of the armillary rings* (for its description see the *Mechanica* of Tycho Brahe) *I ascertained* (which Tycho Brahe in turn, unaware of Walther, imitated most carefully and many times, as you see in volume 1 of the *Progymnasmata*, folio 152) *having first taken the position of the Sun by means of the rulers, or the armillary rings, or by both instruments.* Regiomantanus [Regiomontanus] describes each [?] method [Modū utrum-] in that very booklet from which these things are transcribed. The order is as follows. First, from the observation of the fixed stars, the altitude of the pole and of the equator is obtained. Next the Sun's meridian altitude is observed, which, compared with the altitude of the equator, yields the declination. And to any given declination there corresponds a definite distance of the Sun from the cardinal points [punctis cardinalibus], or a position on the ecliptic, the maximum declination being presupposed. *When, however, toward sunset I seemed to be examining the positions of both, namely of the Sun and of Venus, by turning the ecliptic of the armillary rings, and the Sun's position on it* (that is, by turning the part of the ecliptic on which the Sun was found, by the noon observation, to rest) *toward the very* Sun, without, however, placing exactly on the same straight line the centre of the armillary ring, the Sun's position as found, and the centre of the true visible Sun, but by rolling that position of the Sun on the ring on this side and beyond the body of the Sun, and continuing *until* the inner *surface* of the armillary ecliptic *in both its parts,* each limit of that circle, since material circles have breadth, *namely the lower and the upper,* or southern and northern, *were lit equally by the Sun,* now setting, *and by moving the circle of latitude* [circulum latitudinis] *also, until both parts of its inner surface as well, namely the right and the left,* or the eastern and the western, *had received equal illumination from the Sun. So if the Sun's rays had reached the eye,* or the instrument, *unrefracted, the circle of latitude,* at its intersection with the ecliptic, *would certainly have shown the Sun's position,* which had earlier been found at noon and corrected by adding the hourly motion due. *But I found a notable difference.* The Sun was found in one position by the noon observation and in another by the evening one: *and this* difference, *moreover, varied,* not always being the same: *larger while the Sun's declination had grown or shrunk only modestly, but smaller when it was changing noticeably, so that it was largest at the solstices and smallest at the equinoxes:* not because there was so great a variation in the refractions themselves, but because, even though the Sun's declination was falsified equally on either side, yet since

[97] terræ is printed only at the foot of p. 232, where a catchword stands; p. 233 opens proſpiceret.

the longitude is obtained from the declination, and from a faulty declination a faulty longitude, this aberration in the declination therefore misleads more where only 1′ of declination corresponds to 1° of longitude, as happens toward the solstices, than where 24′ of declination correspond to 1° of longitude, as at the equinoxes.

When, therefore, at sunset I saw both circles, the ecliptic and that of latitude, *lit by the Sun, as was said before, I by no means had the true position of the Sun, nor from it that of Venus* [Solis neq; ex eo Veneris locum veram habui] [recte: verum]. For it has already been said that, if this happened, the apparent position differs from the true one, and that this one is refracted [?] [viſum eſſe differre, verū & hunc refractiorium]. *But if, with the circle of latitude placed over the position of the Sun found by the noon observation, and reduced by the addition of its intermediate motion, I presented the same circle at sunset toward the Sun* [verſus Solis], that is, if I found some position of the Sun at noon by another and certain method, and by adding the portion that answered to the time from noon to sunset, I had corrected it; if, I say, I applied the circle of latitude to that position, and, with the two thus fixed to each other, turned them down toward the setting Sun, *until its,* the circle of latitude's, *inner surface was lit in the manner described,* without troubling that the same should happen on the ecliptic: *I came nearer to the truth* in investigating the position of the Sun's longitude. For the circle of latitude, especially at the spring equinox with the Sun setting, almost fell on the vertical circle, and so the refraction, which normally takes place in the vertical circle, went almost entirely into latitude, with the longitude little corrupted. *And yet that method was not sufficient,* because the circle of latitude and the vertical, or refracting, circle [verticalis ſeu refractorius] did not coincide exactly. *For this reason, from the hole near the eye,* which represented the true opposite position of the Sun, found by the noon observation and reduced to the hour of this evening observation, *I hung a plumb line on the sight-vane, with special ingenuity* (and that plumb line represented the vertical circle), *considering that the point whose form is refracted* (its part here is played by the intersection of the circle of latitude with the ecliptic), *the centre of vision* (represented by the said hole), *the point* on the surface of the air *from which the refraction takes place, and the perpendicular from the point of refraction lie in one surface,* which we here imagine as the plane of the vertical circle. *And I saw, when the intersection of the ecliptic and the circle of latitude,* representing the true position of the Sun, *had come to touch the horizon,* a situation that corresponded to the true setting of the Sun, *that the Sun, through the hole of the other sight-vane,* toward the Sun, a hole I otherwise used only for stars, *still lit the thread of the plumb line.* He means to say: I took care that the Sun should light equally, not the circle of latitude and not the ecliptic, but the thread of the plumb line hanging from the hole of one vane, through the hole of the vane diametrically opposite: *so that the things just described were in one surface, namely the centre of the true Sun, that is, the point whose form is refracted; the centre of vision,* here the hole from which the thread hangs, or rather the lower place on the thread, where the Sun lights it; *the point of refraction in the*

air, and the perpendicular; likewise the true position of the Sun on the ecliptic of the instrument; and finally the position of the image, or the visible Sun.

For since the holes are diametrically opposite, and the thread hangs from one hole, the plane passing through the thread and the holes therefore bisects the instrument. And since the visible Sun lights the thread through the other hole, the visible Sun too is therefore in the same surface, which because of the thread is perpendicular to the horizon, and therefore in the plane of the vertical circle; and therefore the true position of the Sun is in that plane as well, since the true position of the image is always in the same surface. When this happens with the instrument (provided that the other hole, or the intersection of the ecliptic and the circle of latitude, represents the truest position of the Sun, as is assumed), it is proof that the instrument is so directed that the centre, the holes or the said intersection, and the truest position of the Sun in the sky fall on one straight line, and that for this to happen it cannot be placed in any other way. It is certainly an ingenious shortcut: to eliminate the refractions from longitude and latitude instrumentally, without calculation, by observation, and to make longitude and latitude secure; indeed, even to measure the refractions themselves through all three sides of the right-angled triangle [rectanguli]. It could also be transferred to parallaxes. I at any rate, now that I have helped myself by explaining the passage, doubt Walther's care a little less than Tycho Brahe does, folio 91 of the *Progymnasmata*.

Sixteen Problems of Regiomontanus, a German and a Man Most Learned in Every Field, on the Size of a Comet and on Its True Position [IOANNIS DE MONTEREGIO GERMANI, VIRI UNDECUNQUE DOctiſſimi, de Cometæ magnitudineq;, ac de loco ejus vero Problemata XVI.]

Problem One [Problema Primvm.]

To adapt certain preliminaries to investigating the distance of a comet from the Earth. [Diſtantiæ Cometæ à terra inveſtigandæ preambula quædam accomodare.]

Since the centre of the observer's eye is distant from the centre of the world, while the centre of a comet is removed from both of them, the three straight lines joining these three points must always meet at angles, unless any one of the points lies directly in line with the other two, that is, when one and the same straight line takes in all three. This happens when the comet stands above the crown of our heads, since then too the comet's true position in the sky and its apparent position [locus viſus] are the same. For when the comet is anywhere else, these two positions always differ, and all the more as the comet

Diagram. A large circle with a small circle drawn around the same centre E. A vertical straight line runs from A at the top of the large circle through E to D at the foot. Two lines leave E for the large circle on its right side, one ending at B and one at K. A third line runs from C on the large circle leftward

across the line from E to B, near the label G, and reaches the top of the small circle where the vertical crosses it, at H, then runs on a little past it to the left, ending short of the large circle. All nine letter labels are listed below, and a small open circle also stands inside the large circle, upper left of the vertical. It is set like a printed o, with no line attached.

- A (top of the large circle): A
- B (upper right, on the large circle): B
- C (right, on the large circle, below B): C
- K (right, on the large circle, below C): K, the sort clogged with ink
- G (below the crossing of the lines from C and from E to B): G
- L (at the crossing of the line from E to B with the small circle): L, a swash form
- H (left of the vertical at the top of the small circle): H
- E (left of the centre): E
- D (foot of the large circle): D
- o (upper left inside the large circle): small open circle, a letter o or a bare point-mark: not decided on either copy itself is found to be farther from the top of our heads. You will easily be shown that the true position of a comet declining from the crown of our heads is closer to that crown than its apparent position is, if you first draw two straight lines from the centre of the world and the centre of vision, converging at the centre of the comet, and extend them beyond it [porre-eduxexeris][98] until they end at two points of the primum mobile [primi mobilis]. For although the line that leaves the centre of the world is lower, before it meets the comet, than the other line, which leaves the centre of vision, you will nevertheless understand that once they pass beyond the comet they have exchanged places.

This will be worked out more conveniently with the help of a drawing. Let the circle ABCD stand for a great orb [orbis magni], with respect to which the bulk of the Earth is taken as imperceptible. On its centre, which is to be E, let a great circle in the sphere of the Earth be drawn, to be represented by two characters, H and L; and let H be, as it were, the centre of vision on the surface of the Earth. Finally, when EH, the Earth's semidiameter, is extended in both directions until it meets the circumference of circle ABCD in two points, A the higher and D the lower, A will be the point set above the crown of the head.

Let the centre of the comet be placed off the diameter AD, at point G, and let two straight lines be drawn from the marks E and H through that point G, to meet the circumference of the said circle at points B and C. B, the comet's true position, will therefore be nearer to point A than C, its apparent position, is. If we had placed the comet on the diameter AD, no one would think it doubtful that its true position does not differ from its apparent position.

[98] the page prints this form, which is not a Latin word; its two halves, *porre-* and *edux-*, are both verbs of extending, and the sense does not depend on choosing between them

But if the semidiameter EK is drawn parallel to line HG, point K will lie an imperceptible distance from point C, because it has been assumed that the whole Earth, relative to orb ABCD, holds the place of a point, just as Ptolemy too reasoned [ratiotinatus eſt] concerning the parallax of the Moon in the fifth book of his *Great Compilation* [magnę compilationis][99]. So, not without justification, of the two points C and K, one for the other may be taken. And although the centre of the comet takes point C in advance [præoccupet] when the eye is at H, only point K becomes known to the observer through the instrument. For angle AHC, found by means of the instrument, equals angle AEK. Since the vertex of that angle rests at the centre of circle ABCD, its known ratio to four right angles will not let the ratio of its arc to the whole circumference remain hidden. Now point A is given in position, and therefore point K too will have a known position. But no one will investigate point C, even though angle AHC is established, unless he has first learned the ratio of the Earth's semidiameter EH to the semidiameter EA. So whether you take point C or point K under the name of apparent position, it will make no difference that could keep us from achieving our purpose. For mortals are not granted to empty nature's treasuries entirely, but in most things that can be known, to taste what is close to truth itself.

Likewise, even if arc BC is defined as the comet's parallax, because it spans the comet's true and apparent positions, arc BK will nevertheless deserve to be called by the same name, parallax [eodem vocabulo diverſitatis aſpectus], since it both differs imperceptibly from arc BC itself and gives us the means of reaching our goal, as will be explained below. Now it is worthwhile [opere-precimum][100] for us to discuss how the said parallax of the comet is to be investigated. For if it is neglected, it will not be possible to measure [meriri] [recte: metiri] either the distance between the comet and the centre of the world, or the comet's bulk [corpulentiam], or anything else of the kind.

Problem Two [Problema Secundum.]

To ascertain the parallax of a comet on a circle of altitude. [Diverſitatem aſpectus Cometæ in circulo altitudinis percontari.]

First, two altitudes of the comet are to be observed with all possible care, together with their azimuths, both of them, that is, either before noon or after noon. Once these have been found, we will proceed in this way. Let ABCD be the meridian circle, and beneath it, chosen at will, let BED be the half of the eastern horizon [medietas horizontis orientalis]. Let the comet be understood to be in truth at point G. With quadrant ZK let down from Z, the pole of the horizon, through the comet's true position in the sky, let the comet's apparent position be marked on that quadrant by the letter O. For both positions, namely the true and the apparent, must always be found on the same circle of altitude. Let the comet's true semidiurnal arc [arcus ſemidiurnus] be

[99] the *Almagest*

[100] the page prints this form, with the sense of *operae pretium*

AE, and the semidiurnal arc of point O be QS. Finally, from H, the northern pole of the world, let two arcs of great circles be drawn, HG and HO. This much concerns the first observation [conſiderationem].

In the second observation, however, let the letter L represent the comet's true position, and through it let quadrant ZLR of a great circle descend from Z, the pole of the horizon. And with arc HL of a great circle drawn, which will be equal to arc HG,

Diagram. Set to the right of the text in the lower part of the page: a large circle, open by a short gap at its foot. Inside it a shallow arc crosses from B on the left to D on the right. A long arc runs from A through G, crosses the B–D arc at E, and reaches the large circle at lower right. A second, shorter arc parallel to it starts on the large circle below the m-shaped label, passes through N and near O, and stops above the B–D arc; a short detached stroke continues it just above S. Several arcs descend from Z to the B–D arc, ending at R, P and K. Arcs from H run leftward to a point under the 1-shaped label, toward N with a gap before reaching it, to G, and past the crossing below G to the foot near K. A short stroke joins the m point to N.

- Z (top of the large circle): Z
- H (upper right, on the large circle): H
- A (upper left, outside the large circle): A, a swash capital with a long leading stroke
- 1-shaped sort [?] (upper left, inside the circle, below A): a stem with a flag at the head and a foot, shaped like the numeral 1
- m (upper left, inside the circle, below the 1-shaped sort): a slanted lowercase m
- N (left of centre, right of the crossing): N, slanted
- G (centre, right of the arc from A): G
- O (lower left of centre, left of the crossing): O
- B (left, outside the large circle): B
- R (below the B–D arc, near B): R, slanted
- P (below the B–D arc, right of R): P, with a looped head
- K (below the B–D arc, at the foot of the arc through G): K
- S (below the B–D arc, right of K): a swash sort lying nearly on its side, taken as S
- E (below the B–D arc, at its crossing with the arc from A): E
- D (right, outside the large circle): D, the sort heavily inked
- C-like sort [?] (lower right, outside the large circle, at the end of the arc from A): a curling swash sort, resembling C let angle LHN be constructed equal to angle GHO, by also drawing arc HN equal to arc HO itself. It is therefore evident that, just as in the time between the two observations point G of the primum mobile [primi mobilis] is carried to position L, so point O is carried to mark N, since the two angles GHL and OHN are indeed equal to each other, and we imagine the comet to move, in so short a time, only with the motion of the primum mobile. So, with the

great quadrant ZP let down from the pole of the horizon through point N itself, let the comet's apparent position in the second observation be marked by point M; and finally let two arcs of great circles, LN and MN, be added.

Now we will come down to the argument. By the first observation arc ZO is known, that is, the distance of the apparent position from the zenith [ſummitate capitum]; angle BZK is also found; and ZH, the complement of the region's latitude, is known. Triangle ZOH therefore has two sides known together with one angle, so arc HO will become known, along with angle ZHO, which is the distance of point O from the meridian; angle HOZ too will not remain unknown. And since the time between the two observations can be known, angle GHL will be known, and so will NHO, which is equal to it; therefore the remaining angle ZGN [recte: ZHN] will by no means stay hidden. Each of the arcs ZH and HN is known, and so arc ZN too will become known, together with angles ZNH and NZH. Likewise, by the second observation arc ZM is learned, together with angle BZR. So, when angle BZR is subtracted from angle BZP, which is known because of angle NZ[?], angle MZN will remain, known; and since the two arcs ZM and ZN are known, arc MN too will be known, together with the two angles ZMN and ZNM. The two triangles LHN and GHO, moreover, are equilateral and equiangular, and angle GOH was known earlier, to which LN[?] is equal. Angle ZNH, likewise, was shown to be known; so the whole angle MNH, made up of two known angles, will become known. If you subtract angle LNH from it, angle LNM will remain, known. Triangle LMN therefore has side MN measured, together with the two angles LMN and LNM, from which each of the two arcs LM and LN is proved to be known. Now arc LN is equal to arc GO, which was the comet's parallax in the first observation; and arc LM is the comet's parallax in the second observation. It is for the sake of these that we have labored up to this point.

As we warned above, however, all this assumes that in the time between the two observations the comet does not move except with the motion of the primum mobile. Even if the comet does move meanwhile, in so short a time its proper motion will not be very perceptible. And arc HG, that is, the comet's distance from the pole of the world according to the truth, will vary far less perceptibly still.

Problem Three [Problema Tertivm.]

To accomplish the same thing another way. [Aliter idem abſolvere.]

The comet's altitude before noon or after noon is to be noted, together with its azimuth arc, and the moment of an observation of this kind is to be marked. But the moment when the comet itself occupies the meridian is not to be neglected either; this will be done easily by observing some small fixed star whose position is known. So the time between the two observations will be known. Now, therefore, let the meridian circle be ABGD, under which the

half-horizon eastern, BED, and the half of the equator [medietas æquatoris] ABC.

Let the comet in the observation before noon, moreover, be marked at point G according to the truth. With a great quadrant ZM let down from the pole of the horizon Z through point G, let the comet's apparent position be marked on it at point O. Finally, let the north pole of the world, H, be the common starting point of two great quadrants, HK and HL, passing through the two points G and O.

Diagram. A circle (the meridian) with its interior arcs, set at the left of the text, which runs beside it. An arc runs across the lower half of the circle from B through M to a junction above E and on to D. A second arc runs from A down through that junction to C. A further arc leaves the neighbourhood of A beside it and stops in the interior of the circle, with no letter at its end. An arc rises from M through the points beside O and G toward the top of the circle, ending just short of it near Z. Two close arcs run from H leftward, past G and O, to end near the letters below A. Labels as cut on the block:

- A (upper left, on the circle)
- X (inside the circle, below A): X; the text names K for the end of one arc from H
- L (below that letter, at the end of the lower arc from H)
- G (above the upper arc from H, on the rising arc)
- O (below the lower arc from H, on the rising arc)
- Z (top, right of the apex)
- H (upper right, on the circle)
- B (left, on the circle)
- D (right, on the circle)
- M (lower left, under the arc BD)
- E (below the junction, under the arc BD)
- C (lower right, on the circle)

Since, therefore, the time comprising the two observations mentioned is known, angle GHZ will be known; and because the azimuth is known, angle GZH will be recognized too. Arc ZH, moreover, which is the complement of the region's latitude, will not be unknown. Triangle GHZ, therefore, having one side ZH known together with its two angles, will yield the other side GZ for measuring. Arc OZ, however, must have been learned by means of the instrument, since it comprises the comet's apparent distance from the zenith; and so the remaining arc GO will not stay hidden, which is the comet's parallax in the circle of altitude. The reasoning would be no different if we were using the observation after noon.

But if you suspect that what is proper to the comet brings in some error during the time between the two observations, you will satisfy your mind by this rule. Find the comet's proper motion in one natural day; from this, learn how great its proper motion is for the time between the two observations, to which finally how much of the equator corresponds you will easily find; and

according to its size you will set angle GHZ either larger or smaller, if the matter itself requires it. The comet's proper motion in a natural day, moreover, you will obtain close to the truth in this way. Note the comet's true position at the beginning of its appearance and its true position at the end of its appearance, and divide the distance the comet has traversed by the number of mean days; for you will then have approximately the comet's daily motion that you were seeking.

Problem Four [Problema Qvartvm.]

To establish by other arguments what the preceding ones have set out. [Quod præcedentes tradiderunt, alijs argumentis concludere.]

A comet sometimes occupies the meridian while the Sun is above the horizon and prevents its being detected by the eye. If, however, it is seen both before sunrise and after sunset, even though it by no means holds the meridian, we shall use these methods. We shall observe two equal altitudes of the comet, namely one before noon and one after noon, together with the degrees of azimuth. Then we shall set to the figure, in which the circle of the horizon is to be ABCD, and above it the half meridian DZB. Let the comet's diurnal arc, namely the one it describes by the sweep of the primum mobile, be CKA. And let the comet's true position be understood to be first at G, a point before noon, and then at point M, after noon, with two great quadrants ZL and ZK let down from the pole of the horizon Z through the two points G and M. Let us imagine point O, the position of the comet as seen before noon, and point N, likewise its apparent position after noon, the two arcs OL and NK being equal, as was advised above. It must then finally follow that the two arcs GL and MK too are found equal to each other, and on that condition neither of the two arcs GK and KM can exceed the other.

Diagram. A large circle fills the right of the upper page, with the text set in a narrow column to its left. A nearly vertical line runs from the top of the circle to its foot, passing through H, Z and K. A second, inner arc rises from M on the left, crosses the vertical line at H and descends to G on the right. Two curved arcs run down from Z, one to M and on to the circle's edge beside N, the other to G and on to the circle's edge beside O. A shallow arc, bowed downward, runs from A on the left through M, K and G to C on the right.

- D (top of the circle, above the vertical line): D, a swash form
- H (on the vertical line, just above the crossing of the inner arc): H
- Z (on the vertical line, at the meeting of the two arcs from above): Z
- K (on the vertical line, at its crossing with the shallow arc): K
- B (foot of the circle, under the vertical line): B
- A (left, on the circle, at the end of the shallow arc): A
- C (right, on the circle, at the end of the shallow arc): C
- G (right, on the shallow arc, where the arc from Z meets it): G
- O (right, below G, inside the circle): O

- m (left, on the shallow arc, where the arc from Z meets it): m, italic lower case
- N (left, below M; a swash form): N
- P (lower left, outside the circle): P, a swash form

If you extend two arcs of great circles from H, the north pole of the world, to the two marks G and M, a learned geometer will acknowledge that they are equal. You will now also need to know the time between the two observations, and with the help of any known fixed star this will not be difficult to determine. Once it is known, both arc GM and angle GZM will emerge as known. From this, angle GHK, or GHZ, will also become known, since each of them is half of angle GZM. Angle GZK, moreover, must be taken by means of the instrument, as in the preceding; its size is determined by the arc of azimuth. And so the remainder from two right angles, namely angle GZH, will not be unknown. And since arc ZH is the complement of the altitude of the north pole, triangle GZH will have two angles, GZH and GHZ, known together with side HZ; therefore each of the arcs HG and ZG will emerge as known.

But arc ZO was also known by observation, so the remainder GO will not be unknown, and this is the sought parallax of the comet in the circle of altitude. Here again, however, it is assumed that during the time between the two observations the comet does not move perceptibly by its proper motion. So if, on account of its proper motion, you wish to make this business more accurate, do as we advised in the preceding one. From this procedure, moreover, the comet's true declination from the equator will also be established. For arc HG is the complement of this declination. And because of the known angle GHK, together with the very instant of the observation, the point of the ecliptic with which the comet itself culminates [cælum mediat] will be drawn out as known; from this the comet's true position in the ecliptic, together with its latitude, will also be obtained.

Problem Five [Problema Qvintvm.]

To determine the comet's true position in the ecliptic with the aid of an instrument. [Locum verum Cometæ in Ecliptica inſtrumenti adjutorio cognoſcere.]

Observe the comet when it is distant from the rising point, along the longitude of the ecliptic, by a quarter part of the circumference, for then its true position will not differ from its apparent position. Therefore, once its apparent position has been taken with the instrument of armillary rings or another of the kind, its true position will also be obtained. But since it is difficult to ascertain the situation of a comet of this kind, I think it should be noted that the distance between the ninetieth degree from the ascendant [nonageſimum gradum ab aſcendente] and the meridian, according to the divisions of the horizon, is as great as the amplitude of rising [amplitudo ortus] of the ascen- dant; but if you want this demonstrated geometrically, you must go elsewhere. You will therefore observe when the comet's distance from the meridian, according to the degrees of the horizon, will be equal to the amplitude of rising of the

ascendant. For then, with the instrument fitted by means of any known star, the comet's true position, which was being sought, will be established.

Problem Six [Problema Sextum.]

To measure the comet's parallax in longitude. [Diverſitatem aſpectus Cometæ in longitudine dimetiri.]

From the preceding one you have the comet's true position. So observe the comet when it stands anywhere other than at the ninetieth degree from the ascendant, for the instrument will give its apparent position. In this way the interval between the two positions, namely the true and the apparent, will become known, and this is what they call the parallax in longitude. But if the comet should seem to have moved perceptibly by its proper motion in the time between the two observations, you will need to remember what we advised above. For by means of the comet's proper motion owed to the time between the observations, its true position will be known in the other observation, either by addition or by subtraction.

Problem Seven [Problema Septimvm.]

To find the comet's apparent latitude, if it has any. [Latitudinem Cometæ viſam, ſi quam habeat, explorare.]

With the instrument set up by means of some fixed star, as is usual, you will easily learn the latitude of the comet that is being sought, if you have paid enough attention to the precepts of Ptolemy on lunar observations. If, however, you would like to achieve this with a simpler observation, observe the comet's apparent distance from the zenith together with the degrees of azimuth, and the altitude of some known fixed star, so that the instant of the observation may be evident. So let the meridian circle ABHZ be drawn, and under it the eastern half of the horizon ALB. Let the comet's apparent position be point O, through which let the horizon's quadrant ZL descend from the pole Z. Let the north pole of the world [polus mnndi ſeptentrionalis] [recte: mundi] be H, around which let the arctic circle be traced, and on its circumference let the pole of the ecliptic, K, be marked, and let the three arcs OK, OH and HK be drawn.

Diagram. A woodcut set at the left of the text block, with a narrow column of text running beside it. A large circle carries a curved line bowed downward across it, from A at the left to B at the right. A second curve runs up from L on that line, past O, toward the top of the large circle at Z. From the neighbourhood of O, lines run to the right to a small circle at the upper right of the large circle. The small circle is drawn around H, with K on its right-hand edge, and a short line joins the region of H to K. The large circle passes through the small circle.

- Z (top of the large circle): label Z, in a swash form
- G (on the large circle, upper left, between A and Z): label G
- O (upper left, inside the large circle, where the lines from the right meet the curve from L): label O

- H (inside the small circle): label H
- K (right edge of the small circle): label K
- A (left end of the bowed line): label A, in a swash form
- L (on the bowed line, near its left end): label L, in a swash form
- B (right end of the bowed line, faintly inked): label B

From arc ZO, then, known by observation, together with angle OZH and ZH, the complement of the altitude of the pole, arc OH will be known, which is the complement of the apparent declination of the comet itself. Angle ZHO will also become known. Moreover, because the instant of the observation is known, the point of the ecliptic standing on the meridian will be established. And since arc HK, extended toward K, passes through the beginning of Capricorn, the right ascension corresponding to the arc of the ecliptic intercepted between the beginning of Capricorn and the midheaven will be known. This right ascension determines angle ZHK and makes it known; when it is joined to angle ZHO, the whole angle OHK will come out known. Moreover, arc HK is equal to the greatest declination of the Sun, and arc OH, long since was known; therefore arc OK too will not remain unknown, and its complement is the comet's latitude itself, which we were seeking. Angle HKO will also be known, and to it corresponds the distance of the comet's own apparent position on the ecliptic from the beginning of Cancer; so at last the comet's apparent position on the ecliptic will not remain hidden. Although the pole of the ecliptic, K, can be placed in various ways on the circumference of its circle, this will not make it harder to find angle OHK: for sometimes angle ZHK will have to be subtracted from angle OHZ, so that angle OHK is left known. In the present figure, however, the two angles just named had to be added together.

Problem Eight [Problema Octavum.]

To investigate the comet's parallax in the circle of altitude in another way than above. [Diverſitatem Aſpectus Cometæ in circulo altitudinis aliter quàm ſuperius inveſtigare.]

To this end, let the meridian circle ABGD[101] be drawn, and under it the eastern half of the horizon, BED, and half of the ecliptic, AEC. Let the comet's true position be G and its apparent position O, and let both these positions lie in the quadrant ZN, descending from Z, the pole of the horizon. Let the north pole of the world be H, around it the arctic circle, and on its circumference let point K represent the northern pole of the ecliptic. From K, through the two points G and O, let two great quadrants, KL and KM, run to the ecliptic and end there. L will therefore be the comet's true position on the ecliptic and M its apparent position, and for that reason arc LM, which is parallax of the comet in longitude, will be known from what was recorded above. This arc

[101] on the figure overleaf, G stands inside this circle, on the quadrant ZN, and the letter on the circle between D and A is C [?]

LM determines the size of angle GOK [recte: GKO]. So that angle itself is known too.

Diagram. A woodcut set at the left of the text block, with a narrow column of text running beside it. A large circle carries a line bowed across its middle from B at the left to D at the right, with E on it right of centre. A second line runs from A at the upper left, down to the right through the region of M to E, and on to C at the lower right. A curve runs up from X (the text's N) on the B–D line, past O and G, to Z at the top of the large circle. A small circle drawn around H stands at the upper right of the large circle, whose arc passes through it, with K on the small circle's right-hand edge. From K one curve runs left over the top of the large circle, past G, to L near A. A second, heavier curve runs from K to O and on to the line at M. A third line runs from H to O, and a short line joins H to K.

- Z (top of the large circle): label Z, in a swash form
- G (just below Z, beside the curve from Z): label G
- K (right edge of the small circle): label K
- H (below the centre point of the small circle): label H
- A (upper left of the large circle): label A, in a swash form
- L (just below A, at the left end of the curve from K): label L, in a swash form
- O (left of centre, where the curves from Z and from K cross): label O
- M (below O, by the line from A to E): label M, in a swash form
- B (left of the large circle, heavily inked): label B
- E (centre, above the crossing of the two lines): label E
- D (right of the large circle): label D, in a swash form
- X (below the B–D line, at the foot of the curve from Z): a swash italic X with a long tail to the lower left, on both copies; the text calls this point N (`quadrant ZN`)
- C [?] (lower right of the large circle): a swash sort with a bowl and a stem descending below it; the copies disagree whether the bowl is closed (a q- or 9-like form) or open (a G-like form). The text calls this point C.

Further, when arc HO has been drawn, with arc ZO, which is the distance of the comet's apparent position from the zenith, known by observation, and likewise angle OZH known by the instrument, each of the angles ZOH and ZHO will be known, along with arc H [?] O. From this, in triangle OHK, because the two sides OH and HK are known together with angle OHK, angle HOK will become known, as in the preceding one, along with arc OK, that is, the complement of the apparent latitude. By subtracting angle HOK from angle ZOH, then, angle GOK will be left known. But angle GKO was known earlier. So triangle GOK will have two known angles, together with side OK, and from these arc GO also will not remain hidden, which is the parallax of the comet in the circle of altitude that was being sought. From this arrangement, finally, arc GK will be known, and therefore also arc GL, namely the comet's true latitude from the ecliptic. That, indeed, with the fi- gure at hand: for if

arc GK were found to be a quadrant, it would be certain that the comet's true position is contained in the ecliptic, with no latitude.

Problem Nine [Problema Nonvm.]

To determine the comet's apparent position precisely. [Locum Cometæ viſum ſubtiliter agnoſcere.]

Two fixed stars near the comet are to be observed [conſiderandæ], and the distance of the comet's apparent position from each of them determined. We must then turn to the figure, in which one of the two observed stars is A and the other B. Let the part of the ecliptic in which the positions of those stars lie be DG, with its pole H, and from H let two great quadrants, HD and HE, descend through points A and B.

Diagram. A woodcut set at the lower right of the text block, with a narrow column of text running beside it. Two heavy arcs descend from an apex at the top, one to the left and one to the right, in the shape of a pointed arch, and a shallow curve closes the foot, running a little beyond both arcs. A third arc runs down from the apex between them to the foot. An arc joins the point on the left-hand arc to the point on the right-hand arc, crossing the central arc. From each of those two points another arc runs down to the point on the central arc below the crossing. The arc from the left-hand point continues a short way past that lower point, down to the right. No label stands at the crossing.

- H (top, to the left of the apex): label H, small and heavily inked
- A (left, outside the left-hand arc): label A, in a swash form with a tail to the lower left
- C (right, outside the right-hand arc): a rounded swash sort with a spur rising from its foot and no cross-bar, read as C
- B (below the lower point on the central arc): label B, in a swash form
- D (below the left end of the foot curve, at the foot of the left-hand arc): label D, in a swash form
- E (below the foot of the central arc): label E
- G (below the foot curve, at the foot of the right-hand arc): a rounded swash sort with a short bar to the right, read as G

Let the comet's apparent position be at point C, and through it let a quadrant of a great circle, HG, be dropped from the pole of the ecliptic. G will therefore be the comet's apparent position on the ecliptic, which we are seeking, and arc GC its apparent latitude. When the three arcs of great circles, AB, AC and BC, have been drawn, since the two stars A and B are supposed to have known positions on the ecliptic, with their latitudes known, arc DE will be known, which determines the size of angle DHE, or AHB. Finally, the two latitudes AD and BE, being known, their com- plements, namely the two arcs AH and BH, will make known. Therefore, since triangle AHB has the two sides AH and HB known together with angle AHB, its side AB too will be obtained as known, that is, the distance between the two stars. Angle BAH also will not remain unknown. Next, since the two arcs AC and BC have been determined

by observation, while arc AB has become known by reasoning, triangle AEC [recte: ABC] will have all three sides known, and so its angle BAC will not remain hidden. If you subtract this from angle BAH, known already, angle HAC will be left measured. So triangle HAC, having the two sides HA and AC known together with angle HAC, will make known its angle AHC along with arc HC. Now arc DG determines the size of angle HAC [recte: AHC], and so is itself known. But point D was known, and so point G cannot remain hidden either. In this way we have made known the comet's apparent position in longitude along the ecliptic. Arc CG, that is, of the apparent latitude, will be shown to be known by means of its complement HC, known from above. At last, therefore, we have brought to light both the comet's apparent position and its apparent latitude, which is what we chose to accomplish. The figure for a problem of this kind may turn out in various forms, yet the reasoning will not vary much. And our little book on spherical triangles, whatever figure may present itself, will carry you across to the goal you desire.

Problem Ten [Problema Decimvm.]

To measure the comet's distance from the centre of the world and from the centre of vision. [Diſtantiam Cometæ à centro mundi, centroque viſus dimetiri.]

Let the circle of altitude ABCD, set up on centre E, represent a great orb, relative to which the Earth is said to take the place of a point. Let circle HL serve for the Earth, and let diameter AD run through point A, placed above the crown of the head, and through H, the centre of vision, which lies as it were on the convex surface of the Earth. Let G be the centre of the comet, and let two lines be drawn through the comet's centre, EB from the centre of the world and HC from the centre of vision, until they meet the great orb mentioned above at points B and C. Now it is clear that B is the comet's true position and C its apparent position, and from this arc BC too, the comet's parallax in the circle of altitude, will be defined. Finally, if EK issues from the centre of the world parallel to HC itself, point K will differ imperceptibly from point C, as we explained in the first problem. We are therefore seeking two lines, EG and HG, of which the one, EG, signifies the comet's distance from the centre of the world, while the other, HG, denotes its remove from the centre of vision. We are seeking them, I say, according to some measure, whether celebrated or known [ſive famoſam ſive notam], for example relative to the Earth's semidiameter, which line EH represents. We shall neatly achieve this once we have prolonged line GH until the straight line EN, coming from the centre of the world, can stand perpendicular on it. For by observation angle AHG, and therefore the angle opposite it [cōtrapoſitus], EHN, will be known, since point H is regarded as the centre of the instrument. Therefore, in right-angled triangle EHN, the ratio of line HE to each of the straight lines EN and NH will be made known. Moreover, by the manifold reasoning set out above, we shall measure arc BK, which will also make known angle BEK and therefore its alternate angle [coalternum] EGN. In triangle GEN [?], therefore, the ratio

of GE to each of the straight lines EN and NG will emerge as known. Since, therefore, the ratio of each of the two lines GE and EH to the perpendicular EN is known, their ratio to each other will not remain hidden either. In this way the comet's distance from the centre of the world has been disclosed. Now the ratio of GE to GN was known, and from this NG too will become known relative to HE, relative to which we also previously made known line NH. The two lines GN and NH will therefore be referred to line EH by known ratios. If we subtract the smaller of them, namely NH, from the other, the whole NG, line HG will remain. The comet's distance from the centre of vision, relative to line EH, is known, which is what we wished to learn.

Diagram. A large circle with a smaller circle concentric with it about E. A vertical diameter runs from A at the top through H and E to D at the foot; it is broken by a short gap above H. From E a line passes through L on the small circle and through G to B on the large circle. From E a second line runs up to the right to K on the large circle. A long line runs from an unlabelled point at the left of the large circle up past N, near the top of the small circle, on through H and G, to C on the large circle. A short line runs from E to the long line; the label N stands beside the point where they meet. The large circle's stroke has a short gap at the lower right.

- A (top of the large circle, on the vertical): the point above the head
- B (upper right on the large circle): end of the line from E through G; the comet's true position
- C (right on the large circle, below B): end of the line through H and G; the comet's apparent position
- K (right on the large circle, below C): end of the second line from E
- H (on the vertical, at the top of the small circle): centre of vision
- G (where the two lines to B and C cross): centre of the comet
- L (on the small circle, on the line from E to G)
- N (on the small circle's upper left, at the end of the short line from E)
- E (centre, below the crossing of the lines): centre of the world
- D (foot of the vertical, below the large circle)

Problem Eleven [Problema Vndecimum.]

To show easily how many miles lie between the centre of the comet and the centre of the world, or the centre of vision. [Quot miliaria centro Cometæ, centroque mundi, vel centro viſus, interjaceant, faciliter edocere.]

Whatever is said about miles may also be stated for any other measure, whether customary or assumed at will. The Earth's semidiameter, however, must first be known in that same measure. How this is done, I believe, escapes no one. For who will not know how to measure the Earth's semidiameter from its circumference, known in any measure whatever? Therefore, once the Earth's semidiameter is known in miles, for example, since we have learned from the foregoing [ex præmiſſa] the ratio of that semidiameter to each of the two distances mentioned, each of them will be known in miles. For the

number of miles that line EH contains is to the number of miles found in line EG as the number of any measure whatever in line EH, when reckoned, is to the number of that same measure that line EG takes up. Three such known numbers will therefore make known the fourth proportional that was being sought.

Problem Twelve [Problema Dvodecimvm.]

To determine the comet's visual diameter by the contrivance of an instrument. [Diametrum Cometæ viſualem inſtrumenti artificio deprehendere.]

You will prepare a slender ruler, five or six or more cubits long, which you will divide into equal parts as many as you please; the more there are, the more praiseworthy the work will be. We wish to represent this ruler by line AB, to which you will fit another ruler, CD, at right angles, so that its two arms are equal on either side. This ruler is to be movable on ruler AB, and in its motion it is always to make right angles with ruler AB itself; and its divisions are to be such as we marked beforehand [præſignavim[9]] on ruler AB. Finally, at the three points A, C and D, three

Diagram. The figure fills the left of the page, and the text stands in a narrow column to its right. A vertical scale, a line with short cross-ticks, rises from a point at the foot to a point below the middle of a shallow arc at the head. Two dashed lines diverge upward from the foot point to the ends of the arc; the left one runs on past the arc's end toward the top of the page. A solid horizontal bar crosses the scale and reaches the two dashed lines, just below the label 800. Numerals stand to the right of the scale at every second tick.

- A (foot, at the meeting of the two dashed lines and the scale)
- B (head of the scale, below the middle of the arc)
- C (left end of the horizontal bar; the sort is clogged)
- D (right end of the horizontal bar)
- Mark at the left end of the arc: a bar over a short oblique stroke, tilted [?]
- Mark at the right end of the arc: an upright cross with a short oblique stroke beside it [?]
- Scale numerals, top to bottom: 1500[102], 1200, 1100, 1000, 900, 800, 700, 600, 500, 400, 300, [?]00, 100 small nails, slender ones, or needles are to be fixed. You will then have the finished instrument, which you will use in this way. Place point A near your right eye, with the left one closed, and aim ruler AB at the centre of the comet. This will be done conveniently if you set some support under it. With this remaining as it is, move the little ruler CD [regulellam] back and forth until it occupies the comet's whole diameter. When this is done, take the number of small divisions [particularum] that lie between point A and ruler CD and enter it in a table fitted to this task; directly opposite that number [numeai] [recte: numeri] you will find the comet's visual diameter. How

[102] the second figure has the form of the 5 in the label 500 on this scale, not the 3 in the label 300; the label stands one labelled step above 1200

to construct this table, however, we shall explain elsewhere. You can use this or another similar instrument not only to measure the diameter of the comet, but also those of the Moon and the Sun, provided its light does not drive the eye away.

Problem Thirteen [Problema Decimumtertivm.]

To compare the diameter of the comet's body with the Earth's semidiameter in a definite ratio. [Diametrum corporis Cometæ ad terræ ſemidiametrum, ſub proportione certa conferre.]

In this inquiry we suppose the comet's body to be, as it were, spherical. Let its great circle [circulus major] be CD, drawn on centre B, and let the centre of vision, A, be joined to the centre of circle CD by line AB. Then let two straight lines, AC and AD, be drawn touching circle CD at the two points [in duobus punctus] [recte: punctis] C and D, and terminating the two semidiameters BC and BD. It is therefore clear that the comet itself is seen under angle CAD, and hence that the arc subtending angle

Diagram. The figure stands across the head of the page, above the text. A circle on the right has its centre at B. Three straight lines run from the point A at the far left: an upper one touching the circle at C, a lower one touching it at D, and a middle one running through the centre B to the far side of the circle. Two radii run from B, one up to C and one down to D.

- A (far left, where the three lines meet)
- C (above the upper point of contact)
- B (just below the centre of the circle)
- D (below the lower point of contact)
- E [?] (far right, at the end of the middle line; the sort is clogged, and the text on this page does not cite this point)

CAD is the visual diameter of the comet itself. Since this is known by the foregoing, angle CAD will also be known, and hence its half, BAC. Therefore, since the angle at C is a right angle, the ratio of AB to BC, the comet's semidiameter, will become known. But from what was said above, AB was known with respect to the Earth's semidiameter, so BC will not be unknown in that same respect. Thus in whatever measure the Earth's semidiameter is established as known, in that same measure the comet's semidiameter too, and therefore its whole diameter, will not be unknown; and that diameter is what we set out to investigate in this problem.

Problem Fourteen [Problema Decimumqvartvm.]

Finally, to measure the bulk of the comet. [Corpulentiam Cometæ tandem dimetiri.]

From the foregoing, the ratio of the diameters of the Earth and the comet was established. The ratio of spherical bodies, moreover, is said to be the triplicate [triplare] of the ratio of their diameters. Hence the comet too will be compared

to the Earth in a definite ratio; and since the Earth's mass as known is what we assume [notam ſubjiciamus], the comet's bulk too will be made plain.

Problem Fifteen [Problema Decimumqvintum.]

To inquire with skill how great a length the comet's tail has. [Cauda Cometæ quantam habeat longitudinem doctè ſciſcitari.]

Before we tackle this, one must understand that the comet's tail does not differ in substance from the comet's body, but that it is thinner and lighter. For it is said to shine more faintly because of its thinness, and to tend upward because of its lightness. As a result, it must be reckoned that a straight line drawn from the centre of the world to the centre of the comet would, if extended further, emerge through the middle of the tail, just as if it were the axis of the smoky cone they call the comet's tail. Moreover, the angle that the tail itself subtends in the visual field must be observed by means of an instrument.

Diagram. The figure stands at the left of the page, with the text running down its right side. A large circle carries a vertical diameter from A at the top to the foot of the circle. A small circle on the centre E lies inside it, crossed by the same diameter. Three straight lines run to the right-hand arc of the large circle: one from E up to B, one from the top of the small circle, at H, to C (this line is also carried a short way to the left beyond H), and one from E to K.

- A (top of the large circle, at the head of the vertical diameter)
- B (on the large circle, upper right, at the end of the line from E)
- C (on the large circle, just below B, at the end of the line from H)
- K (on the large circle, right, at the end of the lower line from E)
- G (just below the crossing of the line to B and the line to C)
- L (where the line to B crosses the small circle; an italic form)
- H (at the top of the small circle, left of the diameter)
- E (centre of both circles, left of the diameter)
- D (below the foot of the vertical diameter)
- o [?] (a small ring standing alone inside the large circle, upper left, joined to no line and not cited in the text on this page or the next)

How this should be done ought not to seem difficult to anyone, since we also used an instrument of this kind above. Now, to complete what was proposed, I draw a great circle ABCD, with respect to which the circle of the Earth, HL, has an imperceptible [inſenſibiem] [recte: inſenſibilem] size. Let the centre of the world be E, and let the two points A and D terminate the diameter AD, of which one, namely A, is to be set at the zenith [vertici capitum], and let the other occupy the opposite place. Let the centre of vision be H. From it and from the centre of the world, P [?], let two straight lines issue through G, the centre of the comet. Of these, let one, EB, end at the comet's true position, point B, and let the other, HC, meet the comet's apparent position, point C. Parallel to this line, let B K [?] be produced.

Arc BK, therefore, which differs imperceptibly from arc BC, namely by the comet's parallax, will become known from the foregoing. Hence angle BEK

too, and therefore its alternate angle EGH, will by no means remain hidden. Finally, let the length of the tail be GN, subtending the visual angle GHN, measured with the help of the instrument. When the straight line HN is added, triangle GHN will have two known angles, at G and at H: the angle at G because its consequent angle [conſequentem], EGH, is known, and the angle at H through the instrument. Moreover, side HG is known from what was recorded above; therefore its side GN, namely the length of the tail, will not be unknown.

But if one should next wish to compare the straight line GN with the Earth's semidiameter, take the line HG as intermediary [mediatrice]. It is with respect to HG that we have just now measured GN, while HG itself was known a little above through its relation to EH. So GN too will be measured in that same respect, which is what had to be worked out.

PROBLEM SIXTEEN [PROBLEMA DECIMUMSEXTVM.]

Next, to investigate the thickness of a tail of this kind. [Groſſiciem hujuſmodi caudæ deinceps indagare.]

A tail of this kind must be round [teretem]. Its figure will therefore be either cylindrical or conical. If cylindrical, we shall multiply the comet's diameter, known from above, by itself [in ſeipſam ducemus], and then the product by the length of the tail. For the four-sided column [Columnæ … quadrilatere] created in this way will stand to the comet's tail in the same ratio as a square circumscribing a circle stands to the circle itself, which is roughly as fourteen to eleven. The thickness [Groſſities] of a cylinder of this kind therefore becomes known once we have made the four-sided column known.

If, however, the tail is conical, having its base in the comet's body and its vertex raised on high [ſublimem], then once the thickness of the cylinder has been found, as mentioned above, we shall reckon a third part of it as the thickness of the tail. For a cylinder [Kylindrus] is shown to be three times a cone having the same base as itself.

THE END [FINIS.]

I simply could not bring myself to pass over in silence Johannes Schöner's very serious slip [gravissimum … lapsum] in the use of the astronomical staff [radij aſtronomici]. For on leaf eleven, where he teaches its use and follows it through with a calculation, he strays far from the truth.

Indeed, since the staff is nothing other than a doubled square [norma geminata], and since the cross-piece [tranſverſarium] stands at right angles to the index [indici] on both sides and so forms two right triangles, it follows that in using the staff these compound figures must be resolved into their simple ones. Thus in the diagram on the cited page, the cross-piece C D, standing on the index A B, makes two right triangles, A E D and A E C. So, for use, in the right triangle A E D one must take A E, the segment of the index, and E D, half of the cross-piece C D. From these, through the tables of tangents [tangentium Canones], with the legs of the right angle given, the acute angle opposite the other leg will be given. For as A E, the segment [ſigmentum]

[recte: ſegmentum] of the index, is to E D, half of the cross-piece, so is the whole sine to the tangent of angle E A D. The double of this angle is the whole angle C A D, the distance of the observed stars.

Here I shall use the same example that he himself gives. In 1475, on October 17 [Anno 1475. de Octobris 17.], in the morning, between the second and third hour, Bernhard Walther of Nuremberg [Nuribergenſis] observed the distance of Mars and Saturn. He found the segment of the index to be 807, while the cross-piece, projecting an equal distance on either side of the index, came to 210 such units [tantarum]. So, as 809 [recte: 807] is to half of the cross-piece, 105, so is the whole sine, 10000000, to 1301115, the tangent of angle E A D, 7° 24′ 47″ [7 grad. 24 minut. ſecund. 47.]. Its double, 14° 49′ 34″ [14. grad. 49. minut. ſecund. 34.], stands for angle C A D, which was the true distance between Mars and Saturn. The distance given by his calculation [ex illius Calculo] is 14° 35′ [14 grad. 35 minut.], as nearly as may be [ut proximè]: 14′ [14 min.] less than it should be [Iuſto minor.].

For he would have set up the proportion only in this way: as 807 is to 210, the whole cross-piece [tranſverſarium totum], so is 10000000, the whole sine, to the tangent 2602230. The arc [peripheria] corresponding to this is 14° 35′ 10″ [14 gra.35 minut. ſecund. 10.]. Although this error turns out smaller still in smaller cases [in minoribus], so conversely in larger ones [in majoribus] it grows much greater.

Regimantanus [Regiomontanus] did not touch this sore spot [hoc ulcus non tetigit], for he thought these matters clear in the teaching of the right-angled figure [in magiſterio rectanguli] [?]. Nor could he have reproved Schöner, since that book was brought to light after his death [poſt ejus fata].

Before us, Petrus nomus [recte: Nonius] [Pedro Nunes], a man of keen discernment [emunctæ naris homo] and Mathematician to the Kings of Portugal, also noted this error, in the sixth chapter of the second book, which he titled *On Rulers and Instruments* [de Regulis & inſtrumentis].