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# DIO

## The International Journal of Scientific History

# Galileo's Observations of

## Jupiter's Moons

# The Original Manuscripts

## With English Translations

## Translations & Reproductions of Galileo's Notebooks

With the encouragement of Myles Standish of CalTech and *DIO*, Prof. Charles J. Donovan here brings us English translations of the complete original mss of Galileo's observation books for the nights when he discovered and tracked the Jovian satellite system 4 centuries ago, 1610/1/7-1613/2/29.

These observations created the historical watershed of convincing scholars that celestial bodies could move non-geocentrically — a realization which jumpstarted general acceptance[1] of heliocentrism.

Of special interest to *DIO* readers will be the latter pages, which contain the first observations ever made of Neptune (1613/1/27-28), which only became known to us due to the original genius of Steve Albers and the late immortal discoverer Charlie Kowal (long of *DIO*'s Board, until his recent death), both of whom won *DIO* prizes (see www.dioi.org/pri.htm) for their rôles in the shockingly unexpected 1980 discovery of Galileo's Neptune sightings — which occurred nearly a century before the 1st (by J.Flamsteed 1690, Greenwich) of 23 accidental prediscovery observations of the much nearer and brighter also-then-unsuspected planet Uranus (discovered by Wm. Herschel, 1781/3/13).

Galileo's sighting was the 1st of no less than 8 prediscovery observations of Neptune (1613-1846), all of which are listed at *DIO 2.3* ‡7 §B.

Galileo's observations occurred over 2 centuries before Leverrier's ever-glorious 1846 ***predictive*** discovery of Neptune (quickly captured at the Berlin Observatory on his directions), the history of which has been analyzed[2] more extensively and originally in *DIO* than anywhere else.

[1] See, however, the hitherto unperceived parallel with the motion of Mercury & Venus revealed at the AAS Planetary Division 1991 meeting at Charlottesville: "Figleaf Salad", *DIO 1.1* ‡7. Galileo's discovery of the phases of Venus further restricted options for persisting in geocentrism, but heliocentrism did not disappear from the Church's Index of Prohibited Books until the 1830s.

[2] See *DIO 2.3*, *DIO 4.2*, *DIO 7.1*, & *DIO 9.1*.

# DIO

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### *E. Myles Standish's comments on Charles J. Donovan's translations*:

Galileo's notes on his observations of Jupiter's moons, found in the notebook known as "la vacchetta" (literally *the small cow, the calf*), because of the leather of its binding, were deciphered, edited and translated by Charles Donovan, Professor Emeritus of El Camino College. His UCLA doctorate is in Romance Literature and Linguistics with a specialization in Medieval Latin, Old French and Italian.

### *Notes by Charles J. Donovan*:

The stilted language of my translations of *Le Opere Vol III part 2* should not be attributed to a deliberate and perverse attempt to do violence to the venerable, though too often over-venerated, Saxon tongue. Take it rather as an attempt to remain as close as possible to Galileo's originals in structure and choice of vocabulary. Granted, this very often results in abnormal word order, and always in the preference for the Latin based word over the Germanic, as in choosing to diminish over to lessen in translating diminuire. I have done this, however, in the hope that it might serve as an aid to anyone up to tackling, on his or her own, the grand old Tuscan's Latinity, his penmanship, and his liberal use of abbreviations.



# OSSERVAZIONI

(7 Gennaio 1610 — 29 Maggio 1613).

p.427 Observations Mss. Gal., P.III, T.III, car.30r
(text in Italian)
1610

7 Jan With the aid of the telescope Jupiter was visible along with three fixed stars thus, of which (diagram) none was visible without the telescope.

8 Jan It appeared thus. It was therefore direct and not retrograde as the calculators posit. (diagram)

9 Jan Cloudy

10 Jan It appeared so, that is to say in conjunction with the westernmost star so that Jupiter hid it, (diagram) as one may believe.

11 Jan It was in this guise and the star nearest to Jupiter was half as large as the other, and most (diagram) close to the other, whereas on the other evenings the said three stars all appeared to be of the same size and equidistant one from another: from which it appears that there are around Jupiter three wandering stars up to this time invisible to one and all.

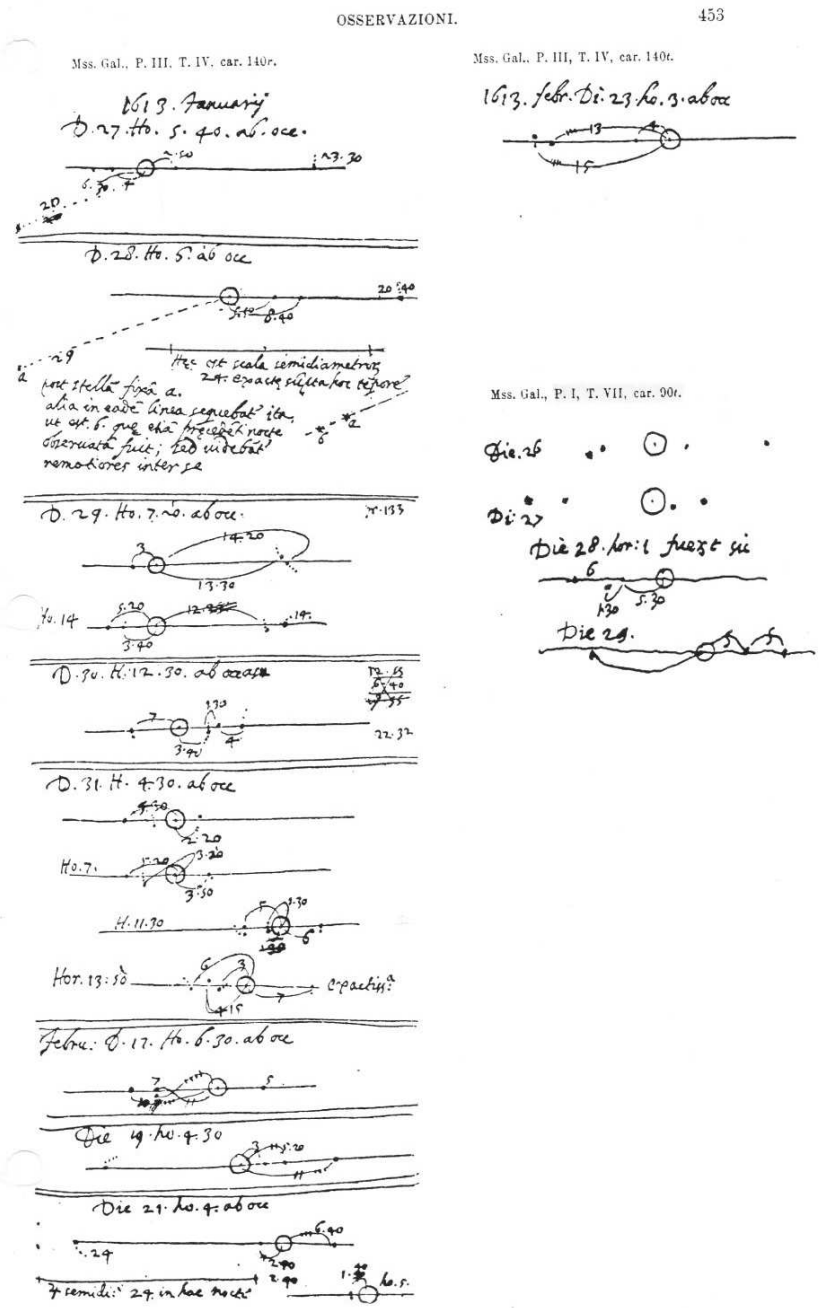
12 Jan It was seen in such constitution. The westerly star was somewhat smaller than the easterly, (diagram) and Jupiter was in the middle at a distance from each equal to its diameter approximately; perhaps there was a third, quite small and quite close to Jupiter towards the east; in fact there was, I having observed with greater diligence, and the night having become darker.

13 Jan The instrument having been quite firmly fastened, four stars were seen close to Jupiter in this (diagram) constitution, or better thus, and they all appeared to be of the same size; the space of (diagram) the three to the west was not greater than the diameter of Jupiter, and they were noticeably closer to one another than on the other evenings; they were in a straight line precisely as before, but the middle star of those to the west was a bit elevated, or rather the westernmost somewhat depressed; all of these stars are most bright although very small, and other fixed stars which appear to be of the same size are not so brilliant.

14 Jan Cloudy

15 Jan It was thus. The closest to Jupiter was the smallest and the others were progressively larger; (diagram) the interstices between Jupiter and the following three were equal to the diameter of Jupiter, but the fourth was about twice as far from the third; they did not make an entirely straight line, but, as the diagram shows, they were as usual most bright although small, but they did not sparkle as they had previously.





453 Observations Mss. Gal., P.III, T.IV, car.140r
1613 January

27 Jan Hr 5 from sunset (diagram)
28 Jan Hr 6 from sunset (diagram) (continuation of above diagram) (scaled line) This is the scale of 24 semidiameters taken exactly at this time. After fixed star a another was following on the same line. It is b which also was observed on the preceding night, but they seemed more remote from each other.
29 Jan Hr 7.20. from sunset (diagram) Hr 14 (diagram)
30 Jan Hr 12.30 from sunset (diagram)
31 Jan Hr 4.30 from sunset (diagram) Hr 7 (diagram) Hr 11.30 (diagram) Hr 13.50 (diagram) most exact
17 Feb Hr 6.30 from sunset (diagram)
19 Feb Hr 4.30 (diagram)
21 Feb Hr 4. from sunset (diagram) (scaled line) Jupiter semidiameters: 24 on this night (diagram) Hr 5

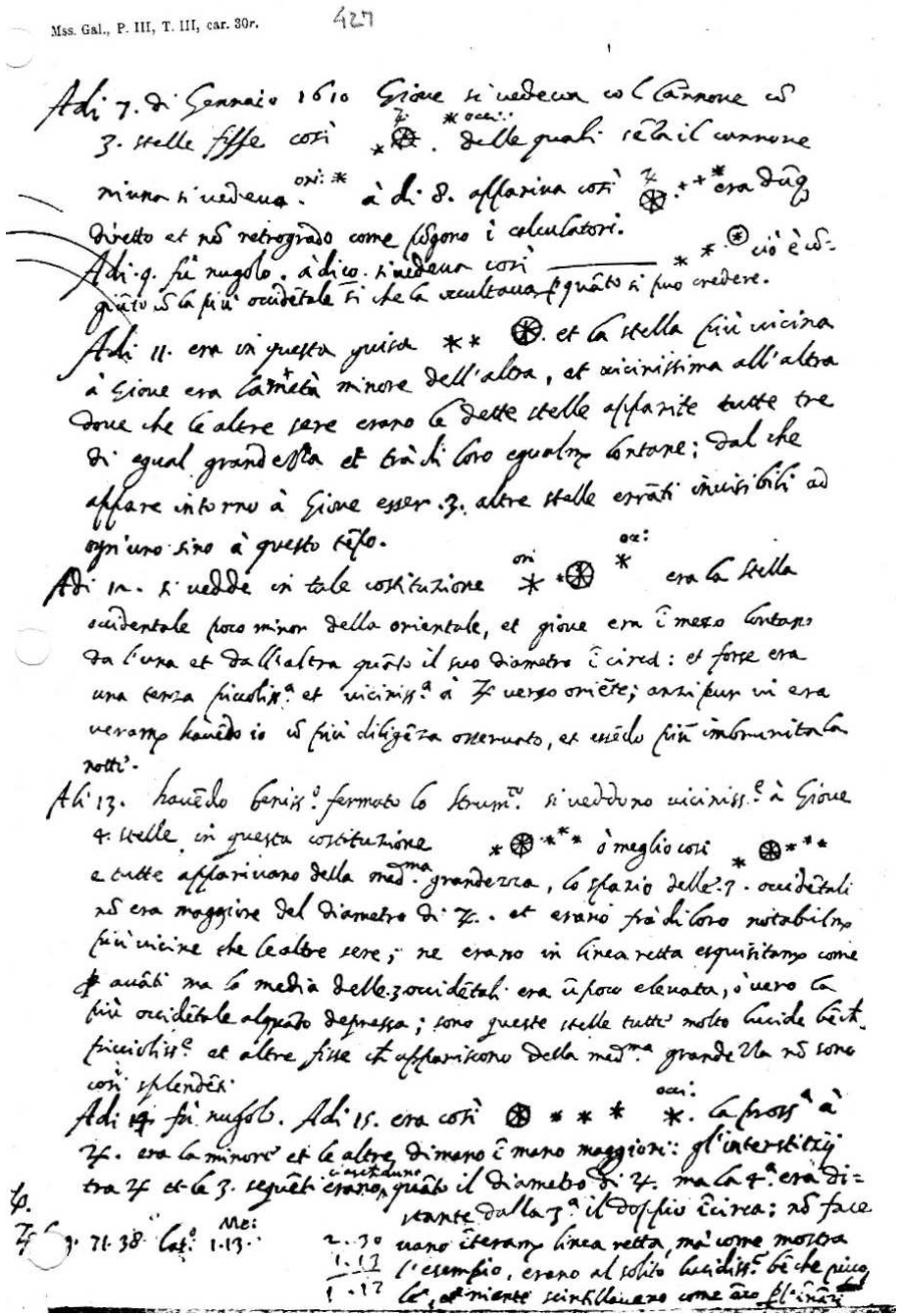
453 Observations Mss. Gal., P. III, T.IV, car.140t
1613

23 Feb Hr 3 from sunset (diagram)

453 Mss. Gal., P. I, T. VII, car.90t.

26 (month & year unknown) (diagram) 27 (month & year unknown) (diagram)
28 (month & year unknown) Hr They were thus: (diagram)
29 (month & year unknown) (diagram)




Mss. Gal., P. III, T. III, car. 30r. 427

Adì 7. di Gennaio 1610 Giove si vedeva con la Cannone con 3. stelle fisse così * ⊛ *. delle quali sola il cannone minore si vedeva. à li 8. apparivano così ⊛ * * era dunq diretto et non retrogrado come pigono i calculatori.
Adì 9. fu nuvolo. à dì 10. si vedeva così ——— * * ⊛ ciò è con giunto con la più occidentale si che la reultava, quanto si può credere.
Adì 11. era in questa guisa * * ⊛. et la stella più vicina à Giove era la metà minore dell'altra, et vicinissima all'altra dove che le altre sere erano le dette stelle apparite tutte tre di egual grandezza et tra di loro egualmente lontane; dal che appare intorno à Giove esser 3. altre stelle erranti invisibili ad ogn'uno sino à questo tempo.
Adì 12. si vedde in tale costituzione * * ⊛ * era la stella occidentale poco minor della orientale, et giove era in mezzo lontano da l'una et dall'altra quanto il suo diametro in circa: et forse era una terza piccolissima et vicinissima à ♃ verso oriente; anzi pur vi era veramente havendo io con più diligenza osservato, et essendo più informato la notte.
Adì 13. havendo benissimo fermato lo strumento si vedevano vicinissime à Giove 4. stelle in questa costituzione * ⊛ * * * ò meglio così * ⊛ * * * e tutte apparivano della medesima grandezza, lo spazio delle 3. occidentali non era maggiore del diametro di ♃. et erano fra di loro notabilmente più vicine che le altre sere; ne erano in linea retta esquisitamente come l'avanti ma la media delle 3 occidentali era un poco elevata, ò vero la più occidentale alquanto depressa; sono queste stelle tutte molto lucide benche piccolissime et altre fisse che apparivano della medesima grandezza non sono così splendide.
Adì 14. fu nuvolo. Adì 15. era così ⊛ * * * *. la prossima à ♃. era la minore et le altre di meno in meno maggiori: gl'intervallij tra ♃ et la 3. seguente erano, quanto il diametro di ♃. ma la 4ª era distante dalla 3ª il doppio in circa: non pare
♃ 3. 71. 38. Lat. 1. 13. Me: 2. 30 1. 13 1. 17 mano in erano linea retta, ma come mostra l'esempio, erano al solito lucidissime benche piccole et nientre scintillavano come fanno gl'inferiori

Mss. Gal., P. III, T. III, car. 30r.

428 Observations Mss. Gal., P.III, T.III, car.30t
(1610)
[from here on, texts in Latin; digressions into Italian so noted]

(short note in Italian) These are to be engraved in wood in one piece, with the stars white and the rest black, and then they are to be sawed into pieces.

The preceding constitution was at Hr 3 of the night, but at Hr 7 there were only three stars with (diagram) Jupiter in such appearance: the smallest was closest to Jupiter, the remaining two twice greater than the small one and equal to each other. The distance from Jupiter to the nearest was increased; the closest was the second, namely by half of the diameter of Jupiter. The third was a bit more distant from the second than the second from Jupiter. Indeed, another hour later the two middle stars were closer still to the extent that the space between them occupied by the smallest star was less, namely about 40 second minutes

16 Jan 1st hour of the night. Such was the constitution. 3 stars only were visible, two close to Jupiter, (diagram) that is each distant from it by a fourth part of its (Jupiter's) diameter, always 1′; however a third star to the west was distant from it (Jupiter) by four times its (Jupiter's) diameter; those closer to Jupiter did not seem larger than the one farther off but brighter.

17 Jan 1/2 (?) hour from sunset. The configuration was of this sort. The easterly star was distant from (diagram) Jupiter by 3′. The westerly by 11′. The easterly seemed twice greater than the other. No more than these two stars were visible. But after four hours had gone by, namely on the 5th hour, a third star began to appear which, as I conjecture, was joined with the easterly one and such was their appearance: the middle one was now as close as (diagram) possible to the more easterly, namely distant from it by 20 second minutes and deflecting a bit towards the south from a straight line drawn through the outermost stars and Jupiter.

18 Jan Hr 0.20 from sunset. Such was the appearance. The more easterly star was greater than the (diagram) other; the interval between the one to the East and the center of Jupiter was less than that between Jupiter and the one to the west, 11′. According to my estimation the diameter of Jupiter occupies 3′ or something less.

19 Jan Hr 2 Thus was the configuration; namely according to a most straight line through Jupiter (diagram) with three the stars. Between the star to the east and the center of Jupiter the interval was 6′; between Jupiter and the next 5′; between this one and the one to the west 4′. The easterly one was a bit larger than the others. I was undecided whether a star was between the easterly one and Jupiter but close to Jupiter so as almost to touch it; but at (diagram) the 5th hour I manifestly saw it now occupying the middle place between Jupiter and the easterly star, so that the constitution was thus. However on the last viewing this star was very small; however at the 6th hour it approximately equalled the others in size.

452 Observations Mss. Gal., P.III, T.IV, car.139r
1612

27 Dec Hr 15.46 from noon, while Venus was rising (diagram) Before sunrise 0.30 two westerly ones were closely conjoined; they were distant now 0.20 according to longitude, but the more westerly had such great longitude that it appeared that in this connection it almost and just almost touched the other; and at the same hour a fourth star was present from the west and the easterly one was made more remote; and such was the configuration; and the tables corresponded to a hair. (diagram)

29 Dec Hr 19.0 from noon doubtful because of clouds

1613

2 Jan Hr 12 from noon (diagram) (diagram) Hr 16.30 or Hr 2.30 before sunrise of the following day

3 Jan Hr 11 from noon after the rising of Jupiter Hr 0.30 it was deflecting fairly to the south. (diagram) before sunrise Hr 0 (diagram) by estimation

5 Jan Hr (6.34 lined out) 7.12 from sunset, from noon truly Hr 11. 38 (diagram) most exact observation after Hr 6.18 (diagram)

452 Observations Mss. Gal., P.III, T.IV, car.139t
1613

20 Jan Hr 10.30 from noon (diagram)

21 Jan Hr 6 from sunset (diagram) Hr 7.30 (diagram)

22 Jan Hr 3.30 from sunset (diagram) Hr 6.50 (diagram) (#4) and (#1) conjoined = .4 and they were thus according to longitude, but according to latitude there was a most great turning away; they were now distant nearly 0.45; and this was a most exact observation. Hr 8 (diagram)

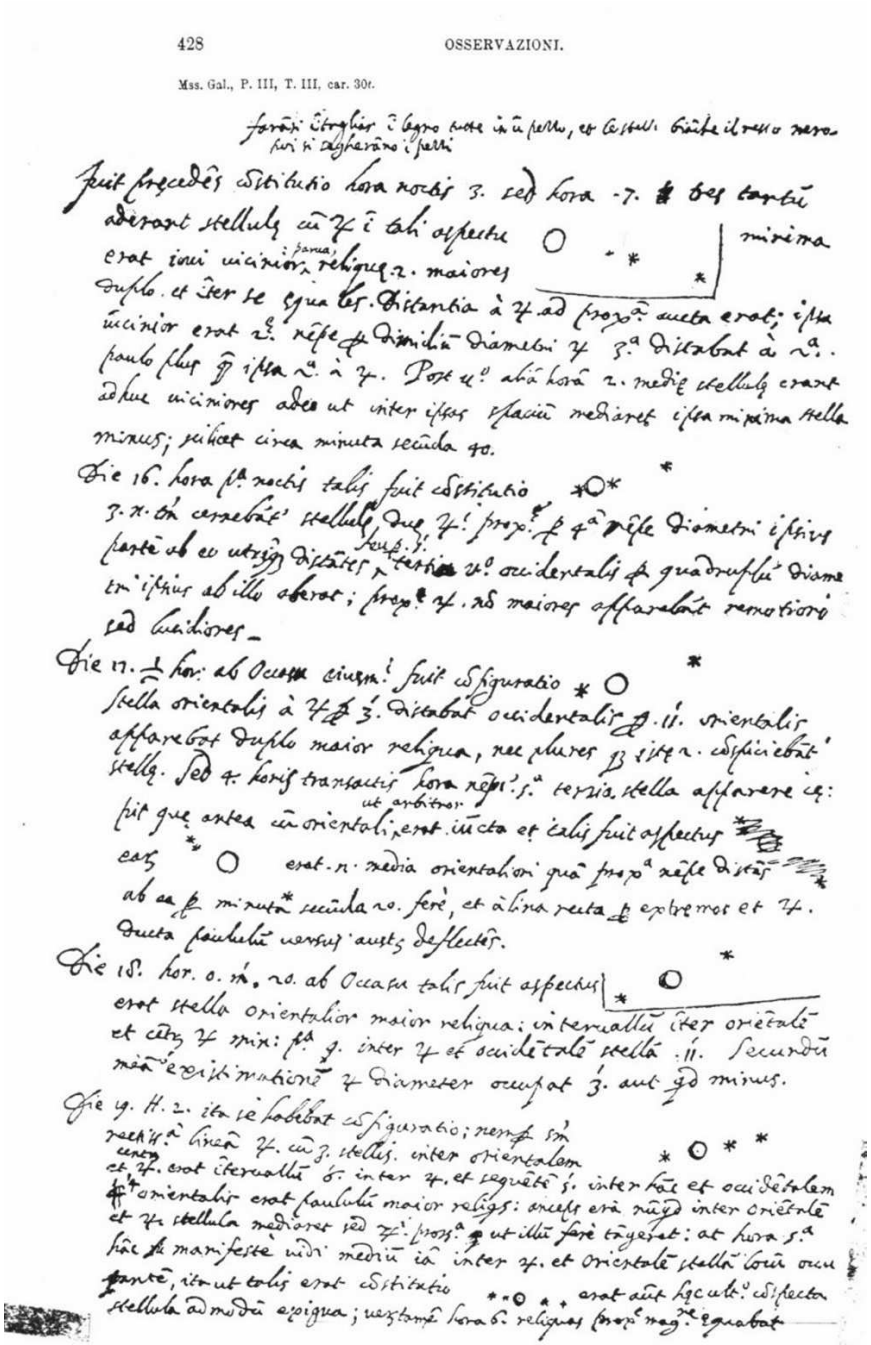
23 Jan Hr 6 from sunset (diagram) Hr 12.50 (diagram) in latitude

24 Jan Hr 6 from sunset (diagram)

25 Jan Hr 6 from sunset (diagram) A fixed star was present distant 10 from Jupiter and corresponding perpendicularly through the center of Jupiter to a direct line through the planets.

26 Jan Hr 5 from sunset (diagram)




428 OSSERVAZIONI.

Mss. Gal., P. III, T. III, car. 30r.

429 Observations Mss. Gal., P.III, T.III, car.31r
(1610)

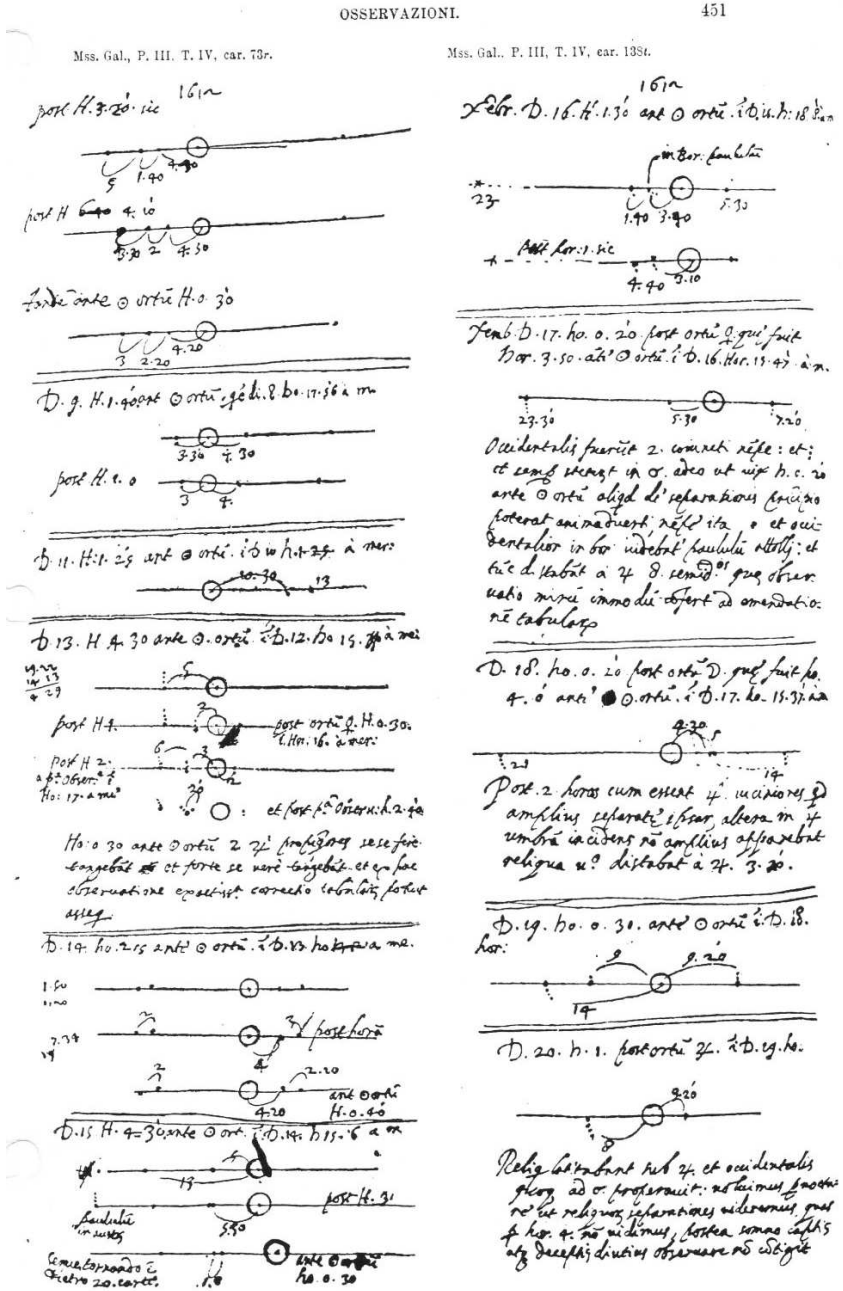
20 Jan Hr 1.15 Thus was the configuration. There were three stars so small that they could scarcely (diagram) be seen. If indeed on these last nights they appeared four times larger, they were for the most part distant from Jupiter and from each other by one minute. I was uncertain whether there were 2 or 3 stars from the west. About the 6th hour it was thus. The (diagram) easterly star was 2′ from Jupiter; the middle one 40″ from Jupiter, from the westerly one indeed 20″ according to my estimation. At Hr 7 indeed it was thus. There were three easterly stars. The nearest to Jupiter was 20″ away from it. Between this one (diagram) and the westernmost the distance was 40″; from these deflected a bit to the south another star which was distant from the westernmost by no more than 10″ according to my estimation.

21 Jan Hr 0.30 The stars on the easterly side were equally distant from one another and from Jupiter (diagram) according to my estimation. Also there was present a star on the west distant 5′ from the center of Jupiter. The easterly star closest to Jupiter was the smallest of all. The remaining three, indeed, were somewhat larger and equal to one another.

22 Jan Hr 2 Thus was the constitution. From the easterly star to the center of Jupiter it was 6′; from (diagram) the center of Jupiter to the more westerly, 7′. The two intermediate stars were 40″ distant from each other; between Jupiter and the one nearest to it 1′. The middle stars were smaller than the outermost. They were all on the same straight line according to the longitude of the Zodiac, excepting the intermediate one which was farther from Jupiter; it declined slightly to the south. Hr 6 They appeared thus. The easterly one, very small, was distant from Jupiter as before. The three (diagram) to the west were equally distant from Jupiter and from each other and the individual interstices were approximately 1Š 1/3. And the star nearest to Jupiter was smaller than the other two following. They were all on a perfectly straight line.

23 Jan Hr 0.40 from sunset Thus was the constitution. There were three stars on a straight line (diagram) according to the longitude of the Zodiac. The most easterly was 7′ distant from the following; the next 6′ from the westerly one. Jupiter occupied the middle place among them and was a bit closer to the middle one. They were about equal in size.





451 Observations Mss. Gal., P.III, T.IV, car.73r
1612

after Hr 3.20 thus: (diagram) after Hr 4.30 (diagram) finally before sunrise Hr 0.30 (diagram)

9 Dec Hr 1.40 before sunrise, which is 8 Dec Hr 17.56 from noon (diagram) after Hr 1.0 (diagram).

11 Dec Hr 1.25 before sunrise; on 10 Dec Hr. 1.25 [lined out?] from noon (diagram)

13 Dec Hr 4.30 before sunrise; on 12 Dec Hr 15 from noon (diagram) after Hr 1 (diagram) after the rising of Venus Hr 0.30 at Hr 16 from noon after Hr 2 (diagram) from first observation at Hr 17 from noon (diagram) and after first observation Hr 2.40 Hr 0.30 before sunrise the 2 closer to Jupiter were almost touching each other and perhaps were truly touching each other and therefore by means of this most exact observation a correction of the tables can be arrived at.

14 Dec Hr 2.15 before sunrise; on 13 Dec Hr [entry inked out] from noon (diagram) (diagram) after an hour (diagram) before sunrise Hr 0.40

15 Dec Hr 4.30 before sunrise; on 14 Dec Hr 15.6 from noon (diagram) after Hr 3 slightly to the south (diagram)

451 Observations Mss. Gal., P.III, T.IV, car.138t
1612

16 Dec Hr 1 .30 before sunrise; on 15 Dec Hr 18.8 from noon (diagram) to the north slightly after Hr 1 thus (diagram)

17 Dec Hr 0.20 after the rising of Venus, which was Hr 3. before sunrise; on 16 Dec Hr 15.47 from noon. (diagram) The westerly ones were 2, conjoined, namely (#2) and (#3) and stayed ever in conjunction, so that scarcely at Hr 0.20 before sunrise something of the beginning of a separation was able to be discerned, truly thus, and the more westerly seemed to be raised slightly to the north; and was then distant from Jupiter 8 semidiameters, which observation marvelously leads to an emendation of the tables.

18 Dec Hr 0.20 after the rising of the moon, which was Hr 4.0 before sunrise; on 17 Dec Hr 15.37 from noon. (diagram) After 2 Hrs when the ones closer to Jupiter were indeed more fully separated, one of them, falling into the shadow of Jupiter, no longer appeared; the other truly was distant from Jupiter 3.20.

19 Dec Hr 0.30 before sunrise; on 18 Dec Hr [blank] (diagram)

20 Dec Hr 1 after rising of Jupiter; on 19 Dec Hr [blank] (diagram) The others were hidden behind Jupiter and the westerly one hastened to conjunction. We wanted to stay up all night so that we might see the separation of the others, which after 4 hours we did not see; thence, seized and overcome by sleep, it did not befall us any longer to observe.



OSSERVAZIONI. 429

Mss. Gal., P. III. T. III, car. 31r.

430 Observations Mss. Gal., P.III, T.III, car.31t
(1610)

Hr truly 5 Two small stars which were near to Jupiter are no longer discerned of which the (diagram) constitution was such (large grid) (in Italian) one of the three of Orion's Belt (diagram) Canis Around Canis besides others there are 7 stars in exactly similar configuration of which the distant of the largest from Canis does not surpass 20 minutes. (diagram) Canis Minor, I believe Star A is not seen without the lens. However, seen with the lens it appears to be of so great a size that the others are seen to be of 2nd, 3rd and 4th magnitude less than it.

450 Observations Mss. Gal., P.III, T.IV, car.72r
1612

7 Nov Hr 1 before sunrise; this is (?) 6 Nov Hr ... after noon (diagram)

20 Nov Hr 2 before sunrise or 19 Nov Hr ... after noon (diagram) I was doubtful about the first [prima, feminine: stella] easterly one. (diagram) After an hour such was the constitution. At the same time I saw Mercury, and its disc appeared most like Jupiter or slightly larger; its diameter, then, scarcely equalled a fifth part of the diameter of Venus.

22 Nov Hr 0.30 before sunrise; that is on 21 Nov Hr ... from noon (diagram)

25 Nov Hr 2 before sunrise; on 24 Nov Hr 17.25 from noon. (diagram) (diagram) after an hour thus; in which hour Mercury was elevated 0.30 degree; it was Hr 1.15 before sunrise and Hr 18.10 after noon. And after Hr (diagram) 0.30 thus 24 Nov

27 Nov Hr 2 before sunrise; on 26 Nov Hr ... from noon (diagram) a certain small star A in a similar site appeared. (diagram) before sunrise Hr 0.30 and Jupiter perceptibly approached fixed A.

28 Nov Hr 4 before sunrise; on 27 Nov Hr 15.28. from noon Venus was then rising. (diagram) (diagram) after Hr 1.30 (diagram) Hr 0.30 before sunrise

29 Nov Hr 2.30 before sunrise; on 28 Nov Hr [blank] from noon (diagram) (diagram) after an hour

450 Observations Mss. Gal., P.III, T.IV, car.72t
1612

3 Dec Hr 1 before sunrise; on 2 Dec Hr 2 from noon (diagram) doubtful

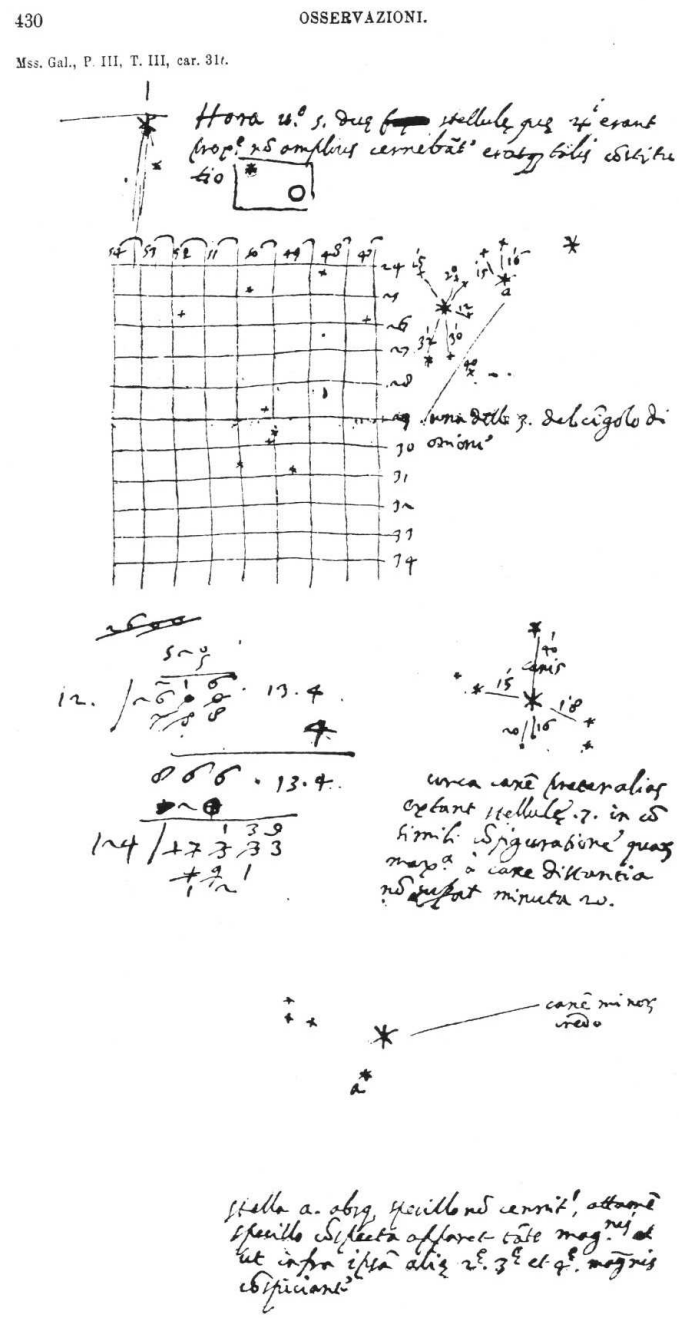
5 Dec Hr 1.15′ before sunrise on 4 Dec Hr 18.17 from noon (diagram) was receding from Jupiter was nearing (diagram) Hour 0.30 before sunrise

6 Dec Hr 4.0′ before sunrise on 5 Dec Hr 15.54 from noon Venus was rising. (diagram) after Hr 0.30 (diagram) after Hr 1.45 (diagram) first observation and after Hr 3.20 (diagram) from first observation finally Hr 0.30 before sunrise thus was an exact observation (diagram) it was indeed raised a bit towards north

7 Dec Hr 1.40 before sunrise on 6 Dec Hr 17.54 from noon (diagram) slightly deflecting to the South After Hr 1 (diagram) thus, and the 2 closest to Jupiter were almost touching; however, on contact they did not turn aside, although through Hr 0.20 they were observed in the same condition; and the distance from Jupiter of the smaller one seemed slightly diminished, from which it is concluded that it was in its its mid remotion. The diameter of Mars was determined through collation to the moon since it was in opposition with the sun. Degree 0[°] 0′12″

8 Dec Hr 2.30 after the rising of Jupiter, which was Hr 4.30 before sunrise on 7 Dec Hr 15.5 from noon (diagram) The 2 closer to Jupiter were barely touching each other and at approximately Hr 1.30 are hardly perceptibly separated; however, after Hr 2.10 after the first observation they were 0.40' distant from each other; however, the hour 2.50 from the first observation thus: (diagram) slightly to the south





431 Observations Mss. Gal., P.III, T.III, car.32r
(1610)

24 Jan Hr 0.50 Such was the configuration. Three stars were visible on the same straight line with (diagram) Jupiter except that the middle one deflected a bit to the south; they were all to the east of Jupiter, The nearest was 2′ from Jupiter; the next 30″ from this; the most easterly was 9′ from this. The sky was most clear. Hr 6.15 It was so. Now only two stars appeared on an exactly straight line with Jupiter, each to the (diagram) east; the one nearer to Jupiter was 3′ from it; the other in truth was about 8′ from it.

25 Jan Hr 1.40 It was thus. There were now only 2 easterly stars of which the more easterly was 5 (diagram) 5′ distant from the other, the latter indeed according to estimation 6′ from Jupiter. Both appeared equal and rather large.

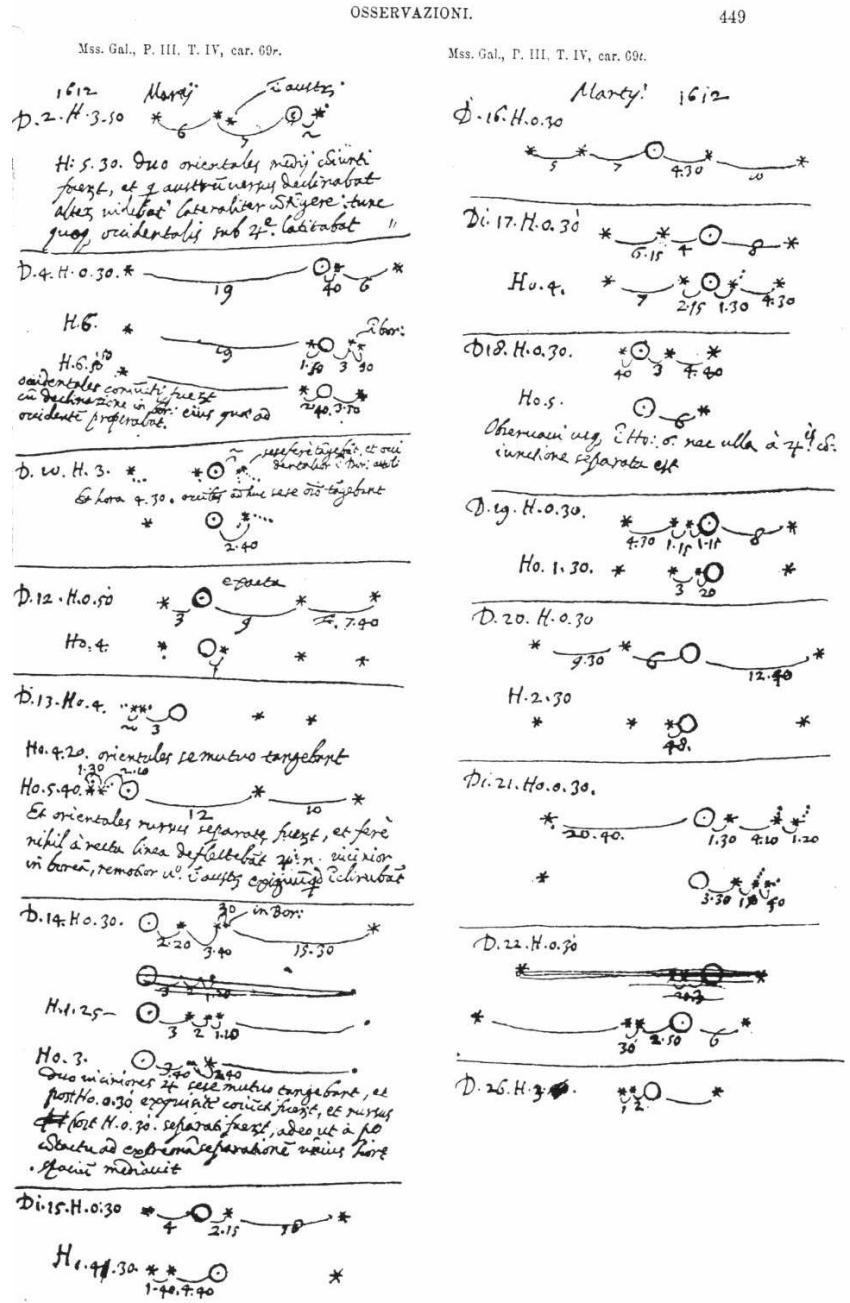
26 Jan Hr 0.40 The position of the stars was of this sort. Now three stars were observed of which 2 (diagram) easterly ones and a third west from Jupiter; the westerly one was 5′ from Jupiter; the middle one was, it seemed, 5′20″ from the same. The more easterly one indeed was 6′ from this one; they were all on the same straight line with Jupiter, of almost equal magnitude and rather large. Hr 5.20 In truth, the constitution was as above, except that there was emerging near Jupiter from the (diagram) east a fourth small star, smaller than the others, 40″removed from Jupiter and slightly deflecting from the straight (line) of the other stars towards the north, as the present figure points out.

27 Jan Hr 1 from sunset. Only one small star was visible and it was easterly as in this constitution; it (diagram) was quite small, and was 7Š from Jupiter according to estimation. 28 and 29 Jan. The sky was cloudy.

30 Jan Hr 1 Thus were the stars constituted. There was one easterly star distant 2′30″ from Jupiter, (diagram) two in truth westerly of which the one nearer to Jupiter was 3′ from it; the other was 1′ from this and was smaller than the others, and declined slightly southward from the straight line on which the others along with Jupiter are found.

31 Jan Hr 2 There were two easterly ones. The one close to Jupiter was 2′20″ distant from it; the (diagram) more easterly 30″ from this one. The westerly one was 12′ (?) away from Jupiter. They were on a straight line, except that the one closer to Jupiter was elevated slightly to the north. Hr 4 Truly the two easterly ones were closer to each other, to the extent that they were only 20″ distant. In said observations the westerly star was exceedingly small.





449 Observations Mss. Gal., P.III, T.IV, car.69r
1612 March

2 Mar Hr 3.30 (diagram) to the south Hr 5.30 The two middle easterly ones were conjoined, and because the one turned southward was declining, it seemed to be touching the other laterally; then also the westerly one was hidden behind Jupiter.

4 Mar Hr 0.30 (diagram) to the north Hr 6 (diagram) Hr 6.50 (diagram) The westerly ones were conjoined with a turning away to the north of the one which was advancing to the west.

10 Mar Hr 3 (diagram) They were almost touching each other and (#2) more westerly raised to the north. And Hr 4.30 The westerly were still entirely touching each other. (diagram)

12 Mar Hr 0.50 (diagram) Hr 4 (diagram)

13 Mar Hr 4 (diagram) Hr 4.20 The easterly ones were touching each other. Hr 5.40 (diagram) And the easterly ones were separated again, and were hardly deflected from a straight line; the one nearer to Jupiter now inclined to the north, the more remote truly indeed slightly to the south.

14 Mar Hr 0.30 (diagram) to the north Hr 1.25 (diagram) Hr 3 (diagram) The two closer to Jupiter were touching each other, and after Hr 0.30 were perfectly conjoined; and were again after Hr 0.30 separated, so that from this contact till the utmost separation there elapsed the space of one hour.

15 Mar Hr 0.30 (diagram) Hr 4.30 (diagram)

449 Observations Mss. Gal., P.III, T.IV, car.69t
Mar 1612

16 Mar Hr 0.30 (diagram)

17 Mar Hr 0.30 (diagram) Hr 4 (diagram)

18 Mar Hr 0.30 (diagram) Hr 5 (diagram) I observed until Hr 6; nor was any separated from the conjunction of Jupiter.

19 Mar Hr 0.30 (diagram) Hr 1.30 (diagram)

20 Mar Hr 0.30 (diagram) Hr 2.30 (diagram)

21 Mar Hr 0.30 (diagram) (diagram)

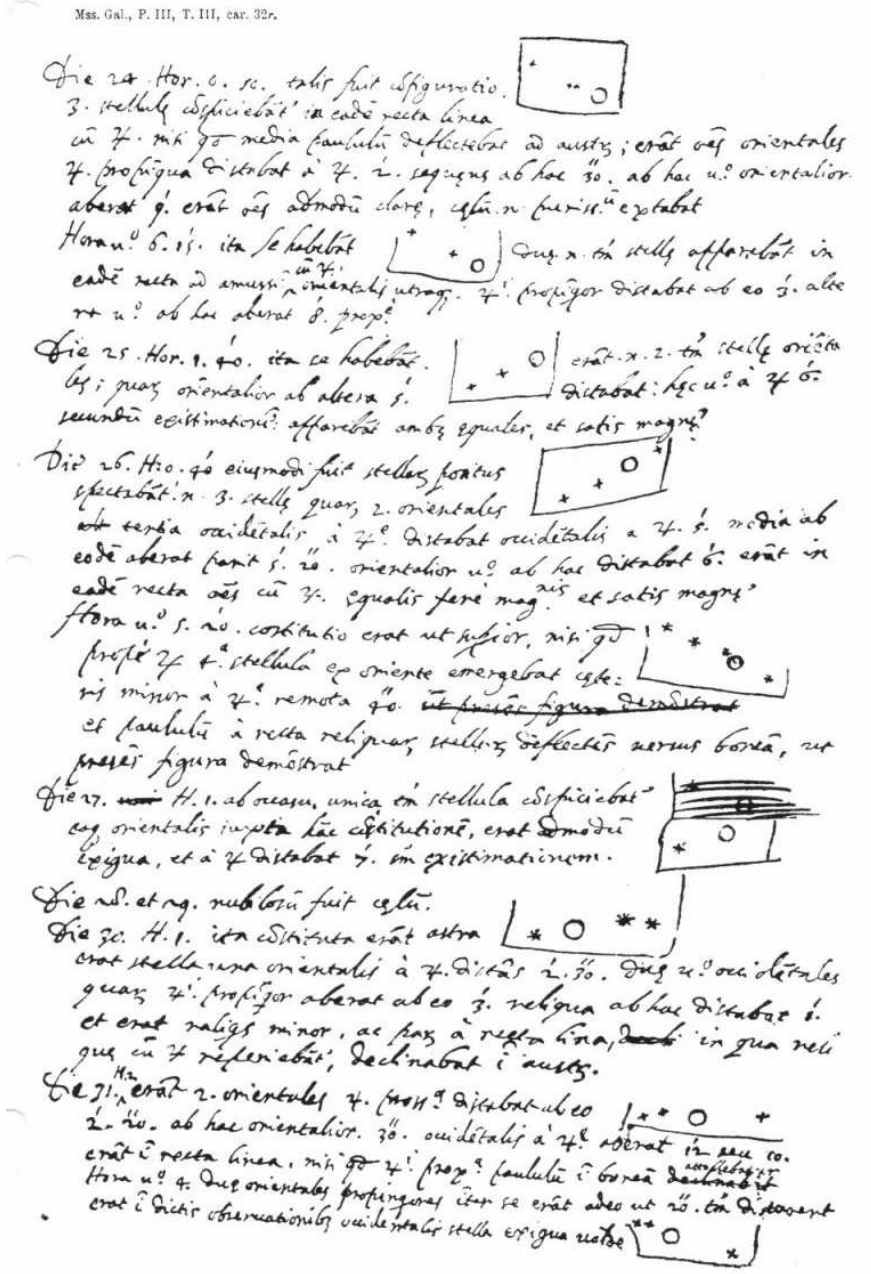
22 Mar Hr 0 .30 (diagram)

26 Mar Hr 3 (diagram)



OSSERVAZIONI. 431

Mss. Gal., P. III, T. III, car. 32r.



432 Observations Mss. Gal., P.III, T.III, car.32t
(1610)

the Suculae (Hyades) becoming visible (diagram) (diagram) on a straight (line) through Jupiter and its stars at right angles to the south a certain star is distant by about 30′ (large boxed diagram) requisite description

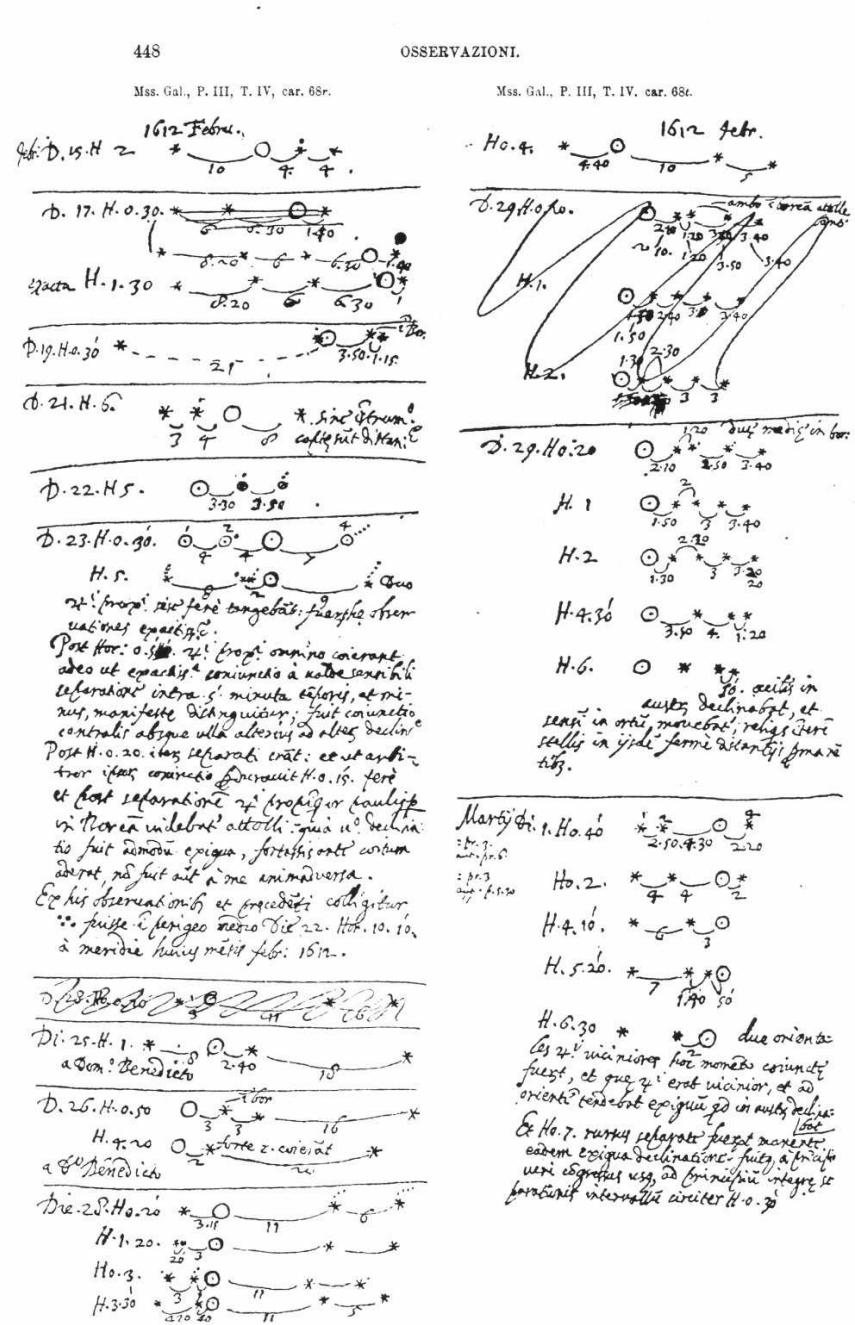
1 Feb Hr 2 Such was the constitution. The more easterly star was 6′ from Jupiter, the westerly one, (diagram) indeed, 8' to Jupiter. From the east a very small star was near, about 20″ from it.

2 Feb Hr 0.40 An easterly one was 6′ distant from Jupiter; from the westerly one closer to it 4′; this (diagram) from the more westerly 8′. They were all approximately of the same size. However, at the seventh hour it was thus. Now there were four stars present, 2 easterly, (diagram) 2 westerly. The more easterly one was 4′ from the next; this 1′40″ from Jupiter; Jupiter 6′ from the next one, and this one from the more westerly 8′. They were all on a most straight line.

3 Feb Hr 7 Thus it was. The easterly one was 1′30″ distant from Jupiter. The nearer westerly one (diagram) was 2′ away; from it the other westerly one was 10′ distant. They were all exactly on the same straight line, and of about the same size.

4 Feb Hr 2 There were 2 easterly stars and 2 westerly as in the opposite figure. The more easterly (diagram) one was 3′ from the next, this was 0′40″ away from Jupiter; Jupiter from the nearer westerly one 4′; this indeed from the next westerly one 6′. They were all in the same straight line, and of approximately the same size; the one certainly closest to Jupiter appeared to be slightly smaller. Hour 7 They were thus. From the more easterly one to the next 0′30″; from this one to Jupiter 2′; (diagram) from Jupiter to the nearer westerly one 4′; from this to the more westerly one 3′; all equal and on a straight line, always according to the ecliptic.





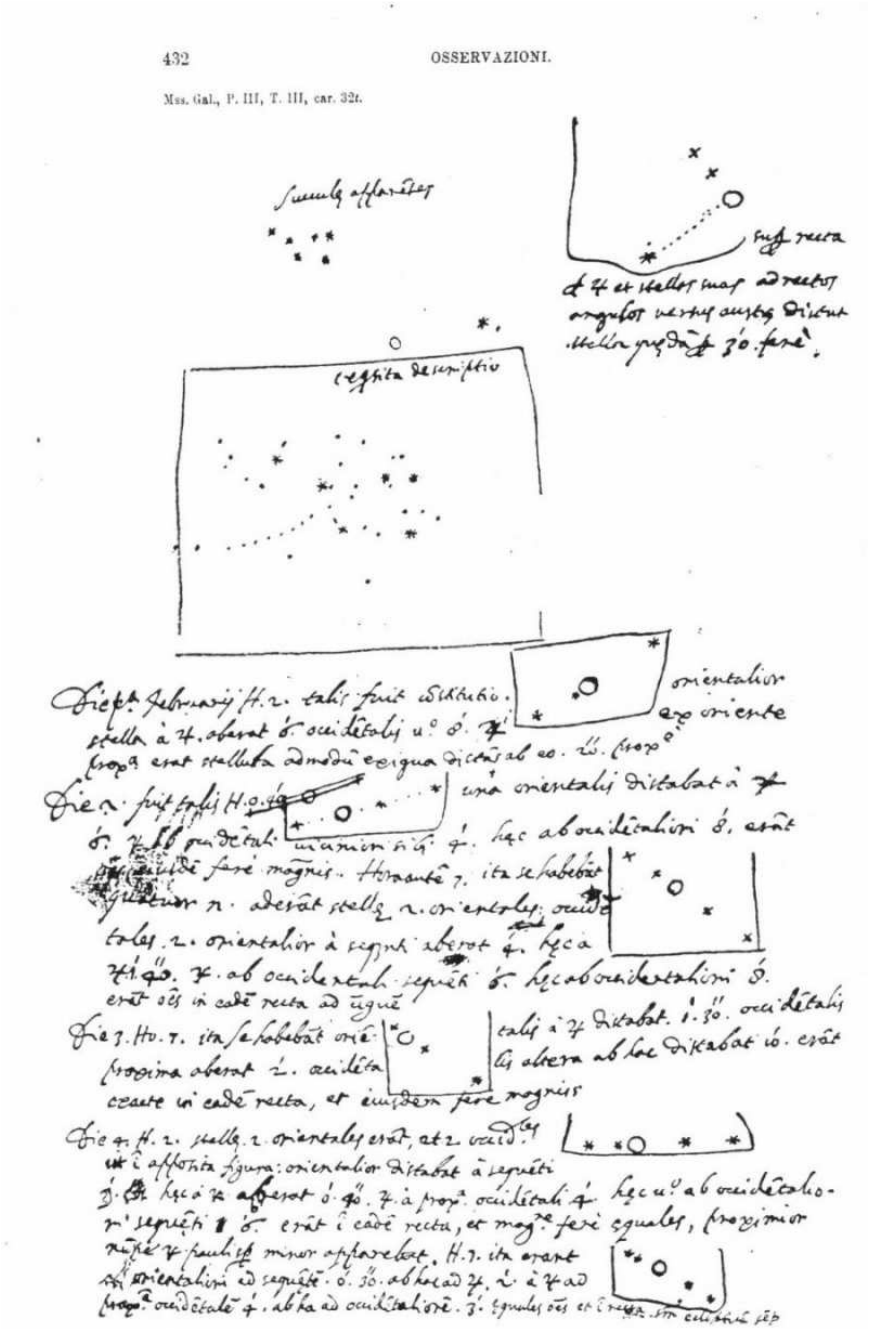
448 Observations Mss. Gal., P.III, T.IV, car.68t
1612 Feb

15 Feb Hr 2 (diagram)
17 Feb Hr 0.30 (diagram) exact Hr 1.30 (diagram)
19 Feb Hr 0.30 (diagram)
21 Feb Hr 6 (diagram) The distances were taken without the instrument.
22 Feb Hr 5 (diagram)
23 Feb Hr 0.30 (diagram) Hr 5 (diagram) The two closest to Jupiter were almost touching each other; these observations were most exact. After Hr 0.5 the ones closest to Jupiter had come wholly together to the extent that within 5 minutes of time, or less, a most exact conjunction is manifestly distinguished from a most perceptible separation; it was a central conjunction without any turning away of one from the other. After Hr 0.20 they were again separate, and, as I judge, their conjunction will have lasted nearly 0.15 hour; and after the separation, the one nearer to Jupiter seemed to be raised a bit to the north, because truly its turning away was quite slight; perhaps it was present before the coming together; however, it was not noticed by me. From these observations and from the preceding one it is gathered that (#2) was in middle perigee from day 22 of this month of Feb at Hr 10.10 from noon.
25 Feb Hr 1 (diagram) to the north from Don Benedetto
26 Feb Hr 0.50 (diagram) Hr 4.20 (diagram) perhaps 2 had come together from Don Benedetto
28 Feb Hr 0.20 (diagram) Hr 1.20 (diagram) Hr 3 (diagram)

448 Observations Mss. Gal., P.III, T.IV, car.68t
1612 Feb

Hr 4. (diagram)
29 Feb Hr 0.20. (diagram) both were raised to the north Hr 1. (diagram) Hr 2. (diagram) Hr 4.30Š (diagram) Hr 6. (diagram) the westerly one was declining to the south and was moving perceptibly to the east, the other stars remaining at nearly the same distances.
1 Mar Hr .40Š (diagram) Hr 2. (diagram) Hr 4.10Š (diagram) Hr 5.20Š (diagram) Hr 6.30 (diagram) The two easterly ones closer to Jupiter at this moment were conjoined, and the one which was closest to Jupiter was tending slightly to the east because it was declining to the south. And Hr 7. They were again separate, the same slight turning away remaining; and there was from the beginning of the true coming together until the beginning of the complete separation an interval of about Hr 0.30





433 Observations Mss. Gal., P.III, T.III, car.33r
(1610)

5 Feb The sky was cloudy.

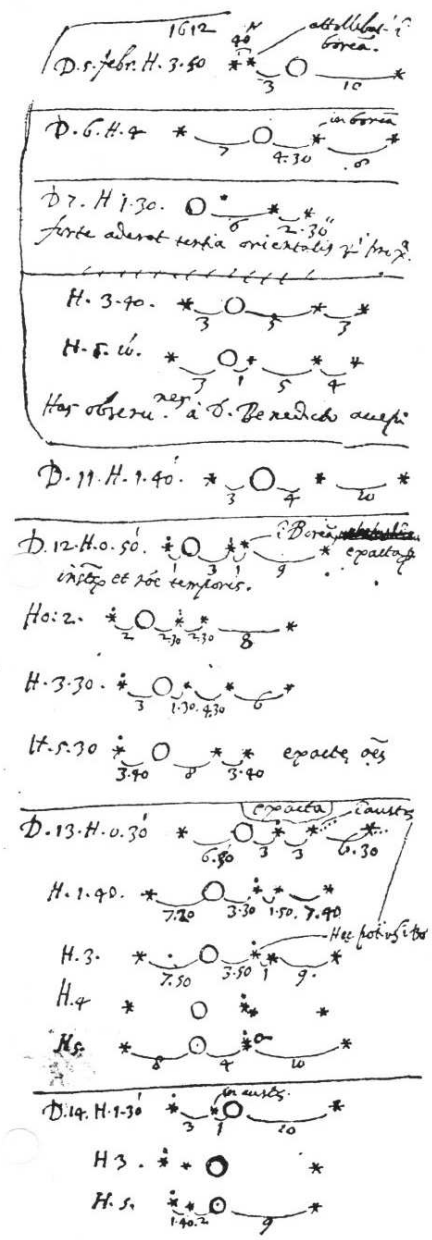
6 Feb Such was the constitution. Hr 2 Only two stars were present, one to the east, 2′ distant from (diagram) Jupiter; another to the west, 3′ removed from Jupiter. They were on the same straight line with Jupiter.

7 Feb Two stars were present, both easterly, thus constituted. The interstices between the same and (diagram) Jupiter were 1′ for both, and they were on the same straight line. (large boxed diagram) 8 Feb Hr 1 There were three stars, all easterly as in the opposite diagram, the one next to Jupiter (diagram) was small, distant 1′20″ from it; the middle one was 4′ from this one and was rather large; the most easterly one, very small, was 20″ from this one. They were viewed at Hr 0.40 from sunset. I was undecided as to whether there were only one or 2 stars near to Jupiter; now, in the meantime, towards sunrise, there seemed to be another one near to this, extremely small, distant 20 from the former. They were all on the same straight line constituted according to the extension of the ecliptic. Truly at Hr 3 the star near to Jupiter almost touched it; it was now only 10 distant. The others, indeed, were only slightly farther from Jupiter; the middle one was now 6Š distant from Jupiter; finally at Hr 4 it was entirely in juncture with Jupiter to the extent that it was no longer discerned. 9 Feb Hr 0.30Š There were present 2 easterly stars and one westerly thus: the small easterly one was (diagram) 4Š distant from the next; the middle one was larger and 7Š removed from Jupiter. Jupiter was 4Š from the westerly one which was small. 10 Feb Hr 1.40 Two quite small stars were visible, both to the east. The more removed was 10Š from (diagram) Jupiter, the closer, in truth, 0Š20 and they were on the same straight line. However, at Hr 4, the closer one was no longer apparent. Indeed, as I conjecture, it was hidden behind Jupiter. The other was yet diminished so that it could hardly be discerned, although the air was quite clear, and it was greatly removed from Jupiter. Now it seemed to be 12Š distant.

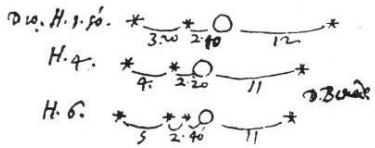


OSSERVAZIONI. 447

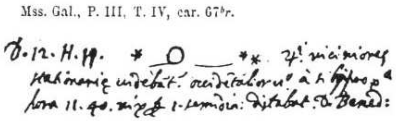
Mss. Gal., P. III, T. IV, car. 67r.



Mss. Gal., P. III, T. IV, car. 67a v.



Mss. Gal., P. III, T. IV, car. 67b r.



447 Observations Mss. Gal., P.III, T.IV, car.67t
1612

5 Feb Hr 3.50 (diagram) was raised to the north.

6 Feb Hr 4 (diagram) to the north

7 Feb Hr 1.30 (diagram) As it happened, there was a third easterly one next to Jupiter. Hr 3.40 (diagram) Hr 5.10 (diagram) I received these observations from Don Benedetto.

11 Feb Hr 1.40 (diagram)

12 Feb Hr 0.50 (diagram) raised to the north through the instrument and by reason of the season(?) time(?) weather(?) (temporis). Hr 2 (diagram) Hr 3.30 (diagram) Hr 5.30 (diagram) all exact

13 Feb Hr 0.30 (diagram) exact to the south Hr 1.40 (diagram) Hr 3 (diagram) this one rather to the north Hr 4 (diagram) Hr 5 (diagram)

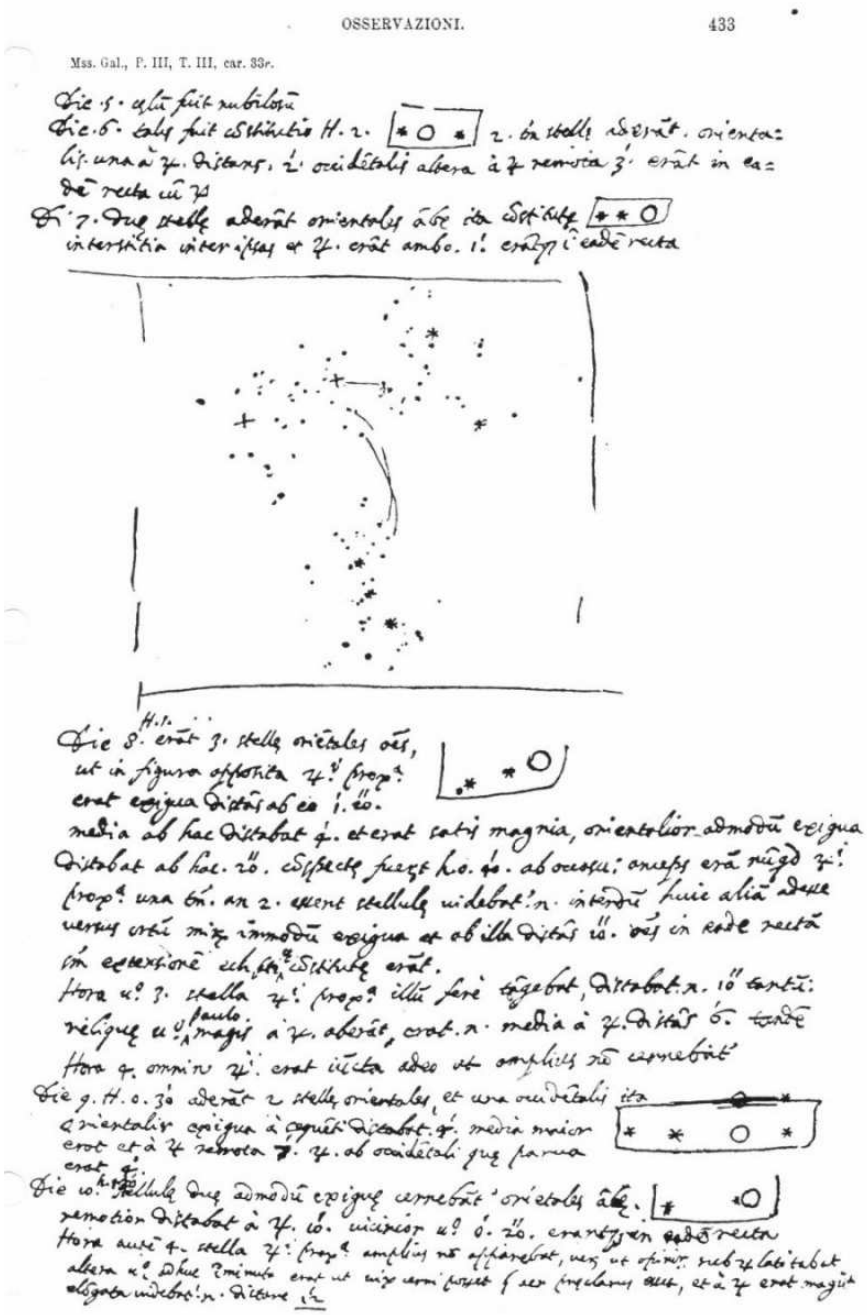
14 Feb Hr 1.30 (diagram) to the south Hr 3 (diagram) Hr 5 (diagram)

447 Observations Mss. Gal., P.III, T.IV, car.67r
1612

10 Feb Hr 1.50 (diagram) Hr 4 (diagram) Don Benedetto Hr 6 (diagram)

12 Feb Hr 11 (diagram) The ones closest to Jupiter seemed stationary; the more westerly one truly was distant from the one closest to itself by hardly 1 semidiameter. Don Benedetto





OSSERVAZIONI. 433

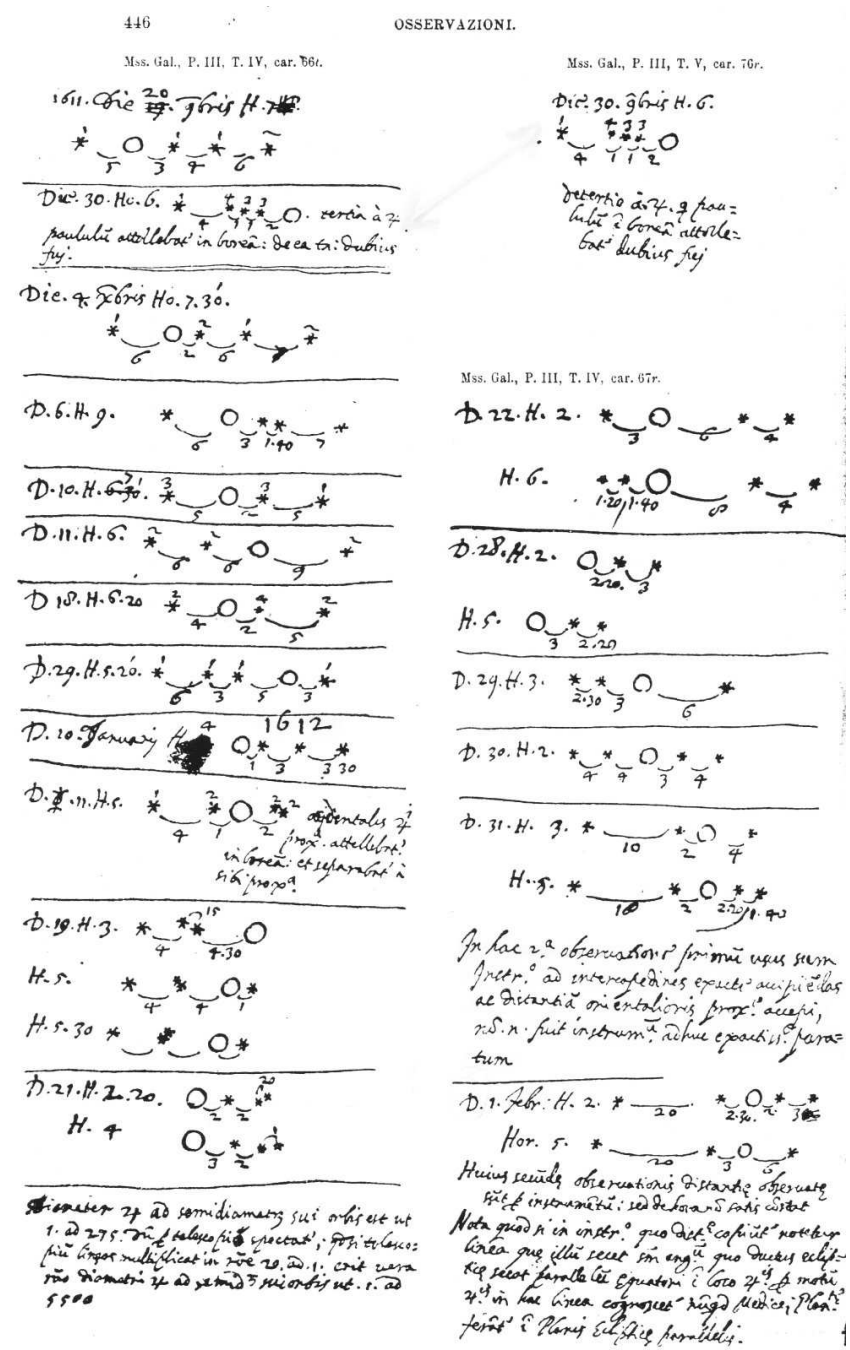
Mss. Gal., P. III, T. III, car. 33r.

434 Observations Mss. Gal., P.III, T.III, car.33t
(1610)

11 Feb Hr 1 There were two stars present from the east and from the west. The westerly one was (diagram) distant 4Š from Jupiter. The nearer easterly one was equally 4Š; the more easterly was 8Š distant from this. They were all quite clear and on a straight line to a hair. But at Hr 3 a fourth star was seen near to Jupiter as the other diagram makes clear; it was smaller (diagram) than the others and 0.30 from Jupiter and from a straight line of the aforementioned it deflected slightly to the north. They were all most bright and astonishingly conspicuous. At Hr 5.30 truly the easterly star near to Jupiter already occupied to a hair the middle place between (diagram) Jupiter and the following star and they were all of the same magnitude and on the same straight line exactly in this way: 12 Feb Hr 0.40 from sunset. Four stars were present, 2 from the east and 2 from the west. The more (diagram) remote easterly one was 10Š from Jupiter; the more remote westerly one truly 8Š and these were conspicuous enough. The remaining two were very close to Jupiter and were very small especially the easterly one which was from Jupiter distant 0Š40 the westerly one truly was 1Š away. Hr 4. The small star near to Jupiter from the east no longer appeared. 13 Feb Hr 0.30 Four stars were present, one from the east, conspicuous enough, distant from Jupiter (diagram) 2Š the other truly more easterly less apparent one distant from the previous one 4Š; from the west 2, of which the more westerly was distant from Jupiter 4Š and was conspicuous enough; a little small star came between this one and Jupiter and near to the more westerly star; it was indeed no more than 0.30 from the former; they were all on the same straight line to a tee according to the longitude of the ecliptic. 15 Feb Hr 1 (since on the 14th the sky was obstructed by clouds) such was the position. There were (diagram) 3 easterly stars, none westerly. The one close to Jupiter was 0.50″ away, the following was was 0′20″ away from this; from this one truly the easternmost was 2′ distant and was larger than the remaining ones; indeed those closer to Jupiter were rather small. But at approximately Hr 5, of the stars near to Jupiter only one was discerned and the distance of this one was 0.30′; the distance truly of the easternmost was indeed 4′. Hr 6 however, besides the two constituted from the east, as was just mentioned, a little star, astonishingly small, was discerned distant from Jupiter 2′.

16 Feb Hr 6. They stood in such constitution: an easterly one was 7′ from Jupiter; Jupiter from the (diagram) following westerly one 5′; this one from the more westerly one 3′; they were all of almost the same magnitude and conspicuous enough, and on the same straight line exactly according to the line of the zodiac.





446 Observations Mss. Gal., P.III, T.IV, car.66t
1611

20 Nov Hr 7 (diagram)
30 Nov Hr 6 (diagram) Concerning the third, which was raised slightly to the north, I was doubtful.
4 Dec Hr 7.30 (diagram)
6 Dec Hr 9 (diagram)
10 Dec Hr 7 (diagram)
11 Dec Hr 6 (diagram)
18 Dec Hr 20 (diagram)
29 Dec Hr 20 (diagram)
1612
10 Jan Hr 4 (diagram) Hr 5 (diagram) The westerly one closest to Jupiter was raised to the north and was separated from the one closest to itself.
19 Jan Hr 3 (diagram) Hr 5 (diagram) Hr 5.30 (diagram)
21 Jan Hr 2.20 (diagram) Hr 4 (diagram) The diameter of Jupiter to the semidiameter of its orbit is as 1 to 275 when it is viewed through the telescope; but if the telescope multiplies the lines in the ratio of 20 to 1 it will be the true ratio of the diameter of Jupiter to the semidiameter of its orbit as 1 to 5500.

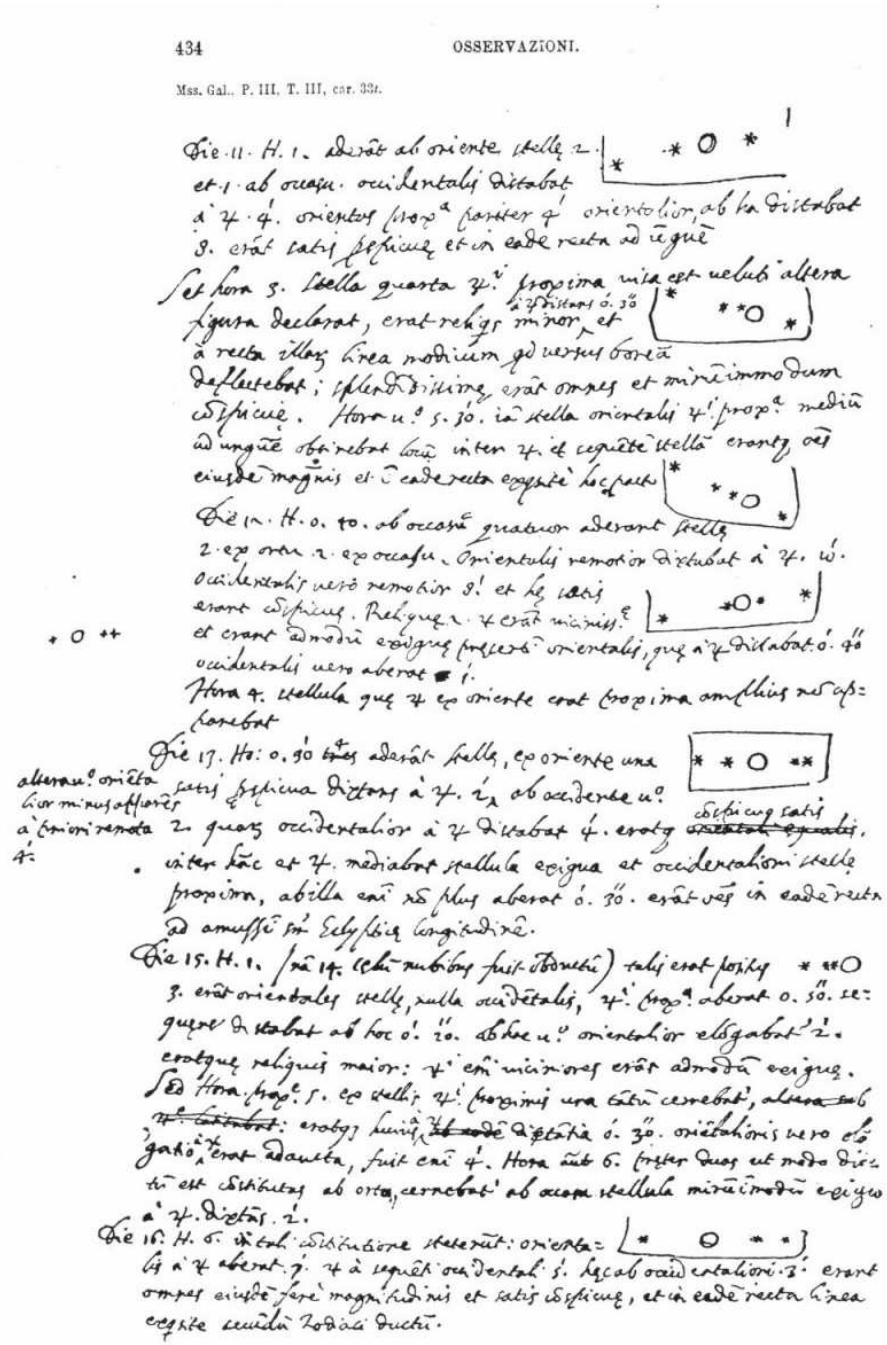
443 Observations Mss. Gal., P.III, T.IV, car.76r
1611

[repeat of 30 Nov observation]

446 Observations Mss. Gal., P.III, T.IV, car.67r
1612

22 Jan Hr 2 (diagram) Hr 6 (diagram)
28 Jan Hr 2 (diagram) Hr 5 (diagram)
29 Jan Hr 3 (diagram)
30 Jan Hr 2 (diagram)
31 Jan Hr 3 (diagram) Hr 5 (diagram) In this second observation I first used the instrument for taking intervals exactly, and I took the distance of the more easterly one accurately; the instrument was not as yet most exactly prepared.
1 Feb Hr 2 (diagram) Hr 5 (diagram) The distances of this second observation were observed through the instrument, but as to the hour it is not sure. Note that if in the instrument with which the distances are obtained there be noted a line which divides it according to the angle by which a line of the ecliptic divides a parallel of the equator in the place/locus of Jupiter, through the movement of Jupiter on this line it may be known if the Medicean planets travel on parallel planes of the ecliptic.




434 OSSERVAZIONI.

Mss. Gal., P. III, T. III, car. 33t.

435 Observations Mss. Gal., P.III, T.III, car.34r
(1610)

9 Mar Hr 5 Such was the constitution: an easterly one was 7′ from Jupiter; the nearest of the westerly (diagram) ones was 0.40′ from it the following was 0.20′; the westerlymost one was 8′ distant from Jupiter. They were all in the same straight line, only the westerly one closest to Jupiter was slightly and almost imperceptibly raised to the north or the following one declined towards the south. As for their magnitude, they were as has been noted.

10 Mar Hr 5 Only three stars were discerned. One was to the east 4′ distant from Jupiter; two were (diagram) to the west, of which the closer to Jupiter was 1′ away, the other truly more westerly was 4′. They were all in the same straight line according to the line of the ecliptic.

12 Mar Hr 0.30 Only two stars were visible: one rather small one to the east distant 1′ from Jupiter; one, (diagram) conspicuous, to the west 4′ distant.

18 Mar Hr 1 Two stars were present both to the east. The closer to Jupiter was 2′ distant from It. The (diagram) other, more easterly, was 8′ away from the same Jupiter. They were equal and not very conspicuous.

20 Mar Hr 2 Two stars were visible both to the west and rather conspicuous. The air was now most (diagram) clear; the one following from Jupiter was 3′ distant from it. From this one indeed the more westerly one was likewise 3′ away. The one closer to Jupiter was smaller than the other. I believe that the planets were in middle longitudes because no perceptible change occurred.

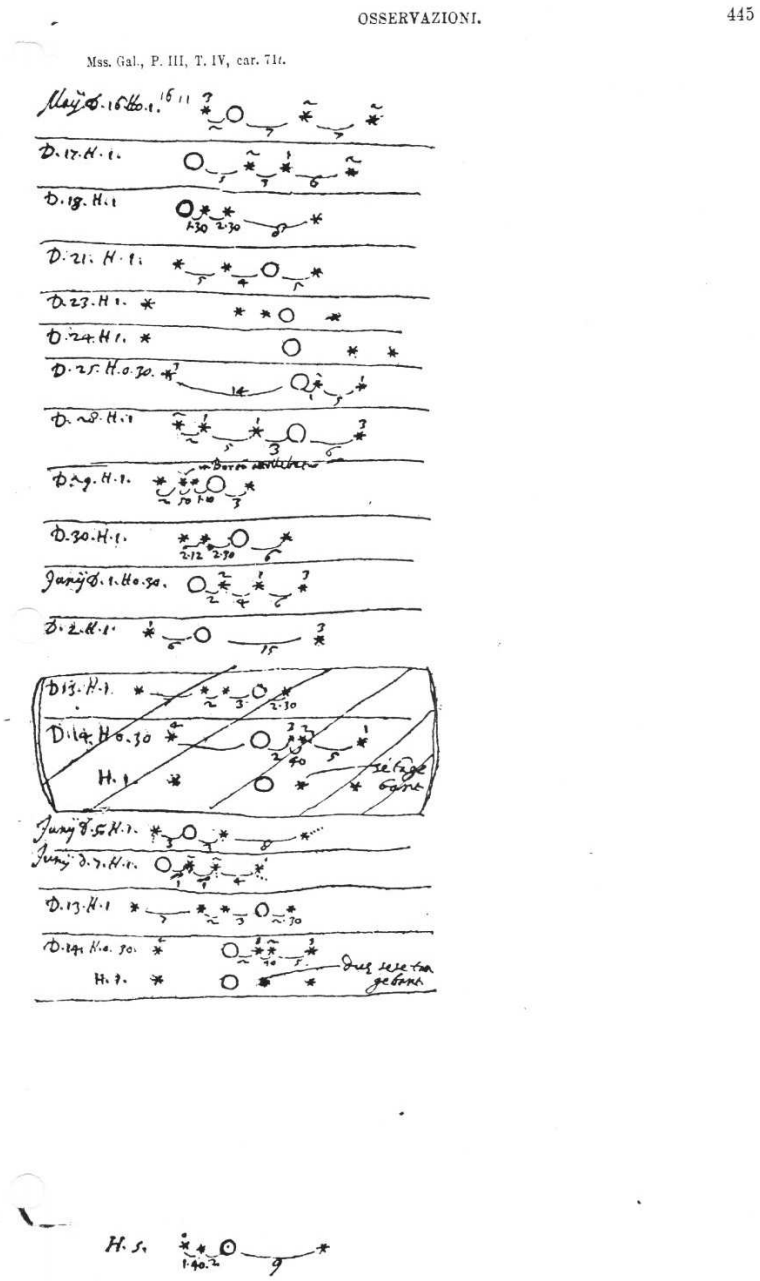
25 Mar Hr 0.30 4 planets have been seen; two to the east, of which the nearer to Jupiter was 0.30″, the (diagram) more easterly likewise 0.30″ from this (last mentioned planet). The westerly one closer to Jupiter was 1.40 from it; the more westerly one was 10′ distant from Jupiter and was larger than the others. Now the ones nearer to Jupiter were quite small. The more westerly one then was somewhat larger than the other two and was born slightly off towards the north above a straight line drawn from the others.

27 Mar Hr 2.30 Three planets were present, all to the west in this position: the closest to Jupiter was 2 (diagram) away from it, the following one likewise 2′ away from this (aforementioned planet). The westerlymost one indeed almost touched this (following mentioned planet). The middle one was born slightly towards the north and was exceedingly small. The closest to Jupiter was somewhat larger, but the westerlymost was as yet more apparent.

28 Mar Hr 1 Only one westerly star was present, 3′ distant from Jupiter, and was rather conspicuous. (diagram)

29 Mar Two stars were visible both to the east. The closer to Jupiter was quite small and was 1′ distant (diagram) from it. The more easterly one was rather conspicuous and was 3Š away from Jupiter. They were in the same straight line according to the line of the Zodiac as they have always appeared.





445 Observations Mss. Gal., P.III, T.IV, car.71t
1611

16 May Hr 1 (diagram)
17 May Hr 1 (diagram)
18 May Hr 1 (diagram)
21 May Hr 1 (diagram)
23 May Hr 1 (diagram)
24 May Hr 1 (diagram)
25 May Hr 0.30 (diagram)
28 May Hr 1 (diagram)
29 May Hr 1 (diagram) was elevated to the north
30 May Hr 1 (diagram)
1 Jun Hr 0.30 (diagram)
2 Jun Hr 1 (diagram)
5 Jun Hr 1 (diagram)
7 Jun Hr 1 (diagram)
13 Jun Hr 1 (diagram)
14 Jun Hr 0.30 (diagram) Hr 1 (diagram) two were touching each other. Hr 5 (diagram)





Mss. Gal., P. III, T. III, car. 34r.

Die 9. Mar: H: 5. tres fuit constitutio. orientalis aberat à ♃. 7'. proxima ac detrahit dicebat 0. 40. ab hac sequens aberat 1. 0'. omnium ceteris dicebat à ♃. 8'. erant ces in eadem recta sublimis ♃: proxima occidentalis fuerunt, et ferè circiter hiter elongabat omnes. vabat' è boreâ quod magnitudo erat ut admoveri est.

Die 10. Ho. 5. tres tantum erant bonus stellæ. Orientalis una à ♃ distans 4'. Occidentales duæ, quarum ♃. propinquior aberat 1'. reliqua vero occidentalior distabat ab hac m. 4'. erant ces in eadem recta secundum ecliptic ductum.

Die 12. H0. 30. duæ cum stellæ conspiciebat'; orientalis una satis exigua distans à ♃. 1'. occidentalis conspicua distans 4'.

Die 18. H. 1. duæ aderat stellæ orientales ambæ. ♃' proxima distabat ab eo 2'. reliqua orientalior, et aberat ab eadem ♃. 8'. erat equales, et ab admodum conspicuæ

Die. 20. H. 2. duæ spectabat' stellæ occidentales ambæ, ac satis conspicuæ, erat 2. clarissimus ster, sequens à ♃. distabat abe eo 3'. ab hac autem occidentalior aberat pariter 3'. ♃' propinquior erat minor reliqua. credo Planetæ fuisse in medijs longitudinibus nam zonus horis nulla certa in hij mutatio facta fuit

Die 25. H 0. 30. q. Planetæ conspicuit sunt. orientales 2. quorum ♃' proxima distabat ab eo m. 0'. 30". orientalior ab hac pariter 0'. 30". occidentalis ♃' propinquior aberat ab eo. 0'. 40". occidentalior distabat à ♃. 10'. et erat reliqua maior; propinquores 2. ♃. erant admodum exigui, ~~erat~~ orientalior tri: reliqua duarum erat aliquanto maior, et versus boream paulisper sub recta linea à reliqua descripta attollebat'

Die 27. Ho. 2. 30 tres adstabat Planetæ occidentales ces, in hac positione vicinior ♃ aberat ab eo 2'. sequens ab hac pariter 2'. occidentalior 2.° hic ferè tangebat: medius paululum è boream attollebat'; erat admodum exiguus, vicinior ♃. erat aliquanto maior, sed occidentalior adhuc apparetior erat

Die 28. H. 1. una tantum aderat stella Occidentalis, distans à ♃ 3'. erat satis conspicua

Die 29. duæ videbat' stellæ orientales ambæ. vicinior ♃' erat admodum exigua, et ab illo distabat 1'. orientalior erat satis conspicua, aberat à ♃. 3'. erat è eadem recta tam Indici ductu velut cet apparuerit.

436 Observations Mss. Gal., P.III, T.III, car.34t
(1610)

(note in Italian) But these people make the world in their fashion and I in its own. I have not put in the hills and the valleys, and other stars in the heavens if first I have not seen them, but you indeed have made Jupiter incorruptible without seeing it such.

2 Apr Such was the constitution; three easterly ones and one westerly. The westerly one was 3′ away (diagram) from Jupiter. The easterly one closest to Jupiter was 1′ away from it; the following one was 2′ away from this; the more easterly one was 8′ away from this. They were all in a straight line to a hair and were all conspicuous.

In Firenzuola 3 Apr Hr 0.40 Three planets were visible, one to the east, two indeed to the west. The easterly one was (diagram) 9′ distant from Jupiter. The closer westerly one was 1′ from Jupiter; the remaining more westerly one was 3′ from the other. It was brighter than the others.

Florence 5 Apr Hr 1 Only one easterly planet was present 2′30″ distant from Jupiter and was rather conspicuous. (diagram)

In San Romano 6 Apr Hr 2 Only one easterly one was present 5′ distant from Jupiter and it was rather conspicuous. It (diagram) was not, as I conjecture, the same as the preceding, but another conjoined with Jupiter on a previous night; Venus then indeed appeared. Now it was under Jupiter.

9 Apr Hr 1 Four planets have been seen in this configuration: namely 2 easterly ones of which the closer (diagram) to Jupiter was 2′ away from it, the other likewise 2′ away from this (aforementioned planet). At the same time there were two westerly ones of which the closer was 1′30″ distant from Jupiter; the other was 8′ distant from Jupiter. They were in the same straight line to a hair, and rather conspicuous.

10 Apr Hr 0.30 Thus was the constitution: namely three easterly planets of which the closest to Jupiter (diagram) was 1′ 30″ distant from it; the following was 5′ away from Jupiter; the remaining one was indeed 5′ from this.

11 Apr Hr 1 3 stars were present all to the west. The closest to Jupiter was 2′ distant; the following one (diagram) was 3′ away from this and the most westerly indeed was 4′ distant from this.

13 Apr Hr 0.30 Only a pair of stars was sighted, one to the east distant 4′ from Jupiter, one to the west (diagram) indeed 6′.

14 Apr Hr 1.30 Four planets were sighted; 2 to the east, likewise 2 to the west. The easterly one closer (diagram) to Jupiter was 1′ away, the other easterly one was 6′ distant from Jupiter. The closer westerly one was 0′40″ away, the other one 4′.

15 Apr Only 2 appeared, one easterly, the other westerly. (diagram)

16 Apr Three were seen, all easterly. The closest to Jupiter was 2′ away; the following one 2′; the (diagram) easternmost 4′ from this.

17 Apr 3 stars were present, one to the east 9′ distant from Jupiter; 2 to the west of which the closer to (diagram) Jupiter was 2′ distant, the more westerly was 4′ distant from this.

18 Apr Hr 0.20 Four planets were seen. The easterly one more removed from Jupiter was 12′ from it, (diagram) the closer 1′. The closer westerly one was 3′ away; the more westerly one was indeed likewise 3′ from this. And they were in the same straight line to a hair.

At the Villa del Cappone (2 diagrams) 24 Apr (diagram)

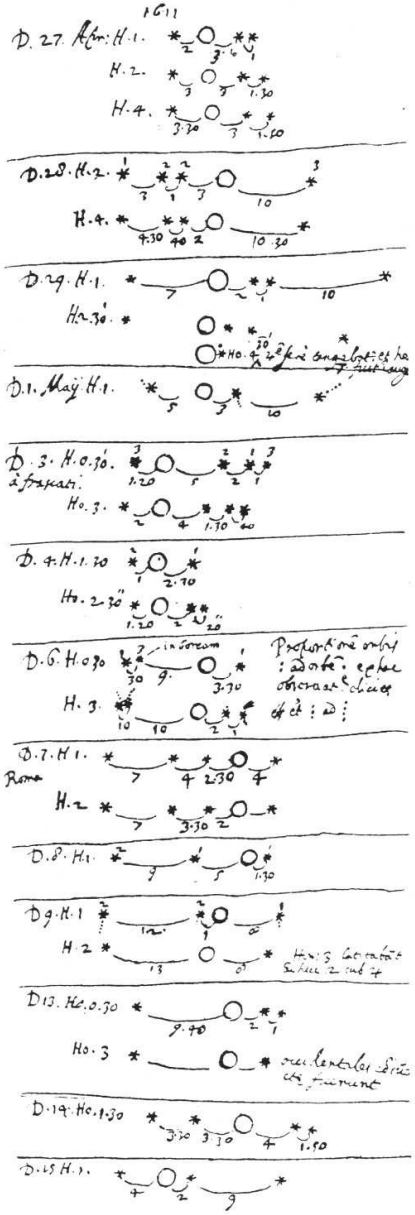
25 Apr (diagram)

26 Apr (diagram)



444 OSSERVAZIONI.

Mss. Gal., P. III, T. IV, car. 71r.



Mss. Gal., P. III, T. III, car. 36r.

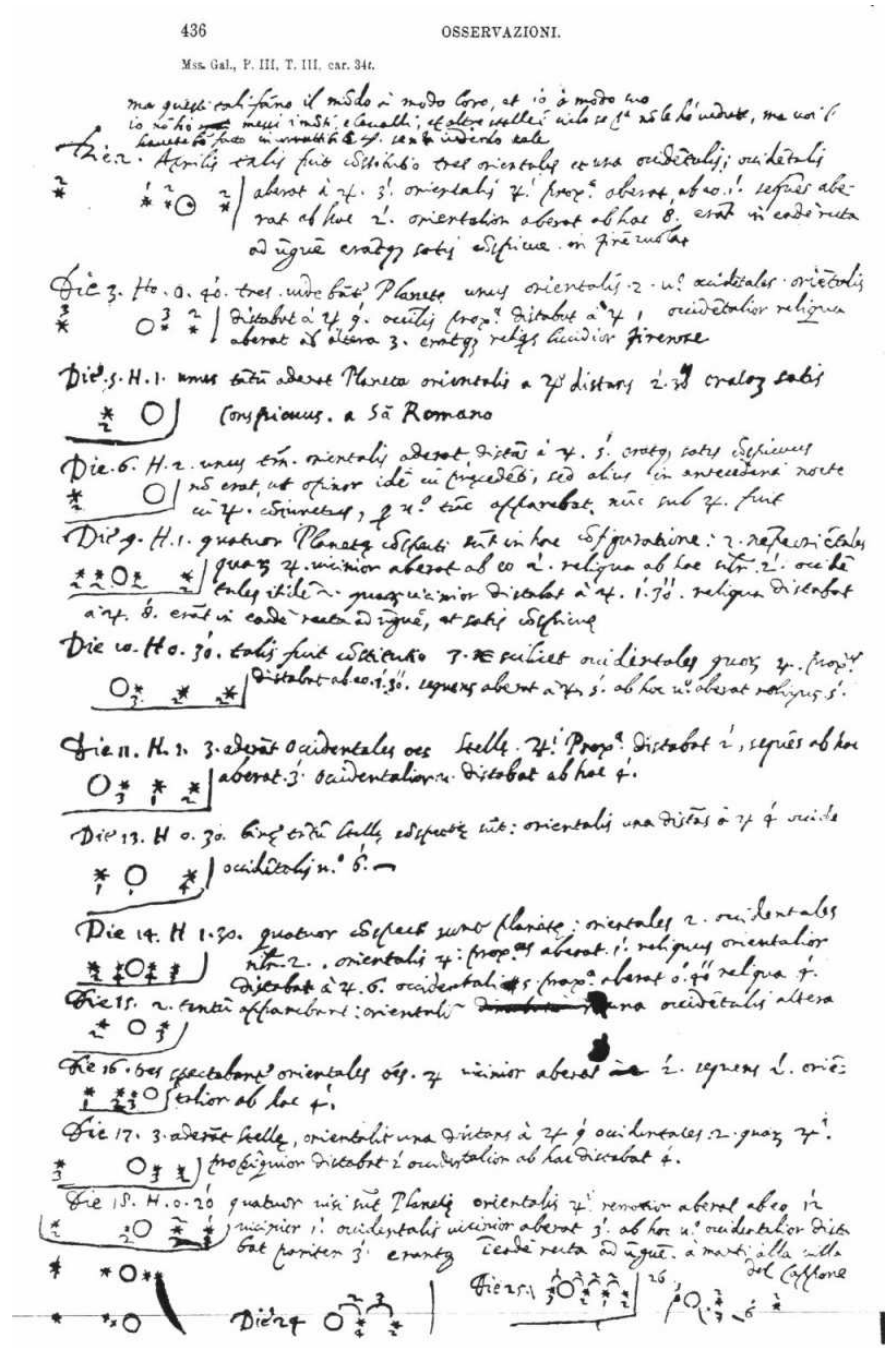
444 Observations Mss. Gal., P.III, T.IV, car.71r
1611

27 Apr Hr 1 (diagram) Hr 2 (diagram) Hr 4 (diagram)
28 Apr Hr 2 (diagram) Hr 4 (diagram)
29 Apr Hr 1 (diagram) Hr 2.30 (diagram) (diagram) Hr 4.30 It was almost touching Jupiter. Hr 7 it was in augmentation.
1 May Hr 1 (diagram)
3 May Hr 0.30 (diagram) at Frascati Hr 3 (diagram)
4 May Hr 1.30 (diagram) Hr 2.30 (diagram)
6 May Hr 0.30 (diagram) to the north the proportion of the orbit of (#2) to the orbit of (#1) is ascertained from this observation; also (#3) to (#4) Hr 3 (diagram)
7 May Hr 1 (diagram) Rome Hr 2 (diagram)
8 May Hr 1 (diagram)
9 May Hr 1 (diagram) Hr 2 (diagram) Hr 3 Evidently 2 were hidden behind Jupiter.
13 May Hr 0.30 (diagram) Hr 3 (diagram) The westerly ones were conjoined.
14 May Hr 1.30 (diagram)
15 May Hr 1 (diagram)

444 Observations Mss. Gal., P.III, T.IV, car.36r
1611

3 May Hr 0.30 (diagram) at Frascati Hr 3 (diagram)
4 May Hr 1.30 (diagram) The sky was foggy. Hr 2.30 (diagram)

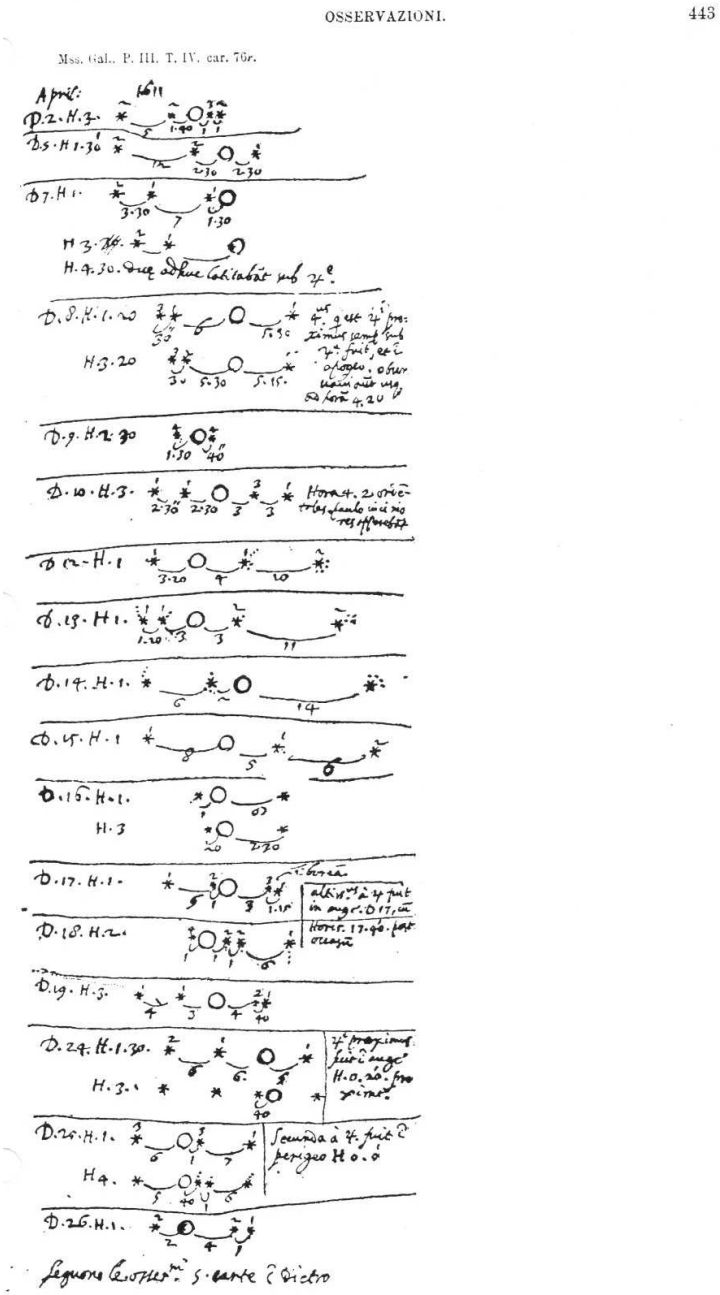



436 OSSERVAZIONI.
Mss. Gal., P. III, T. III, car. 34t.

437 Observations Mss. Gal., P.IV, T.VI, car.19r
(1610)

15 May Hour 1. (diagram)
16 May Hour 1. (diagram)
17 May Hour 1. (diagram) I was doubtful as to the closer to Jupiter
20 May Hour 1. (diagram)
21 May (diagram) The nearest to Jupiter was raised slightly towards the north.





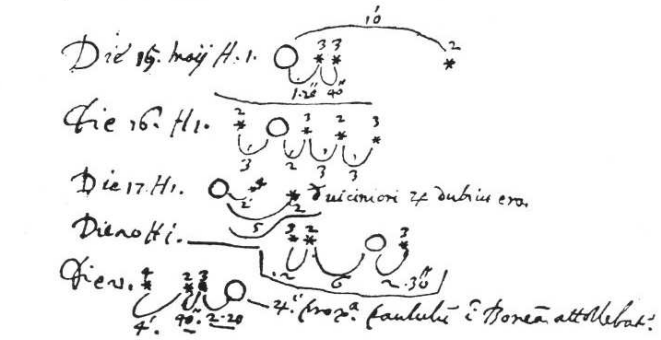
443 Observations Mss. Gal., P.III, T.IV, car.76r
1611

2 Apr Hr 3 (diagram)
5 Apr Hr 1.30 (diagram)
7 Apr Hr 1 (diagram) Hr 3 (diagram) Hr 4.30 two were still hidden behind Jupiter.
8 Apr Hr 1.20 (diagram) The fourth, which is nearest to Jupiter, was at all times behind Jupiter and in apogee. I observed them all until Hr 4.20. Hr 3.20 (diagram)
9 Apr Hr 2.30 (diagram)
10 Apr Hr 3 (diagram) At Hr 4 the two easterly ones appeared slightly closer.
12 Apr Hr 1 (diagram)
13 Apr Hr 1 (diagram)
14 Apr Hr 1 (diagram)
15 Apr Hr 1 (diagram)
16 Apr Hr 1 (diagram) Hr 3 (diagram)
17 Apr Hr 1 (diagram) to the north The highest was in augmentation 0.7
18 Apr Hr 2 (diagram)
19 Apr Hr 3 (diagram)
24 Apr Hr 1.30 (diagram) The one closest to Jupiter was in augmentation at Hr 0. 20 approximately. Hr 3 (diagram)
25 Apr Hr 1 (diagram) The second one was in apogee at Hr 0.0 Hr 4 (diagram)
26 Apr Hr 1 (diagram) (in Italian) The observations follow 5 diagrams back.



OSSERVAZIONI. 437

Mss. Gal., P. IV. T. VI, car. 19br.

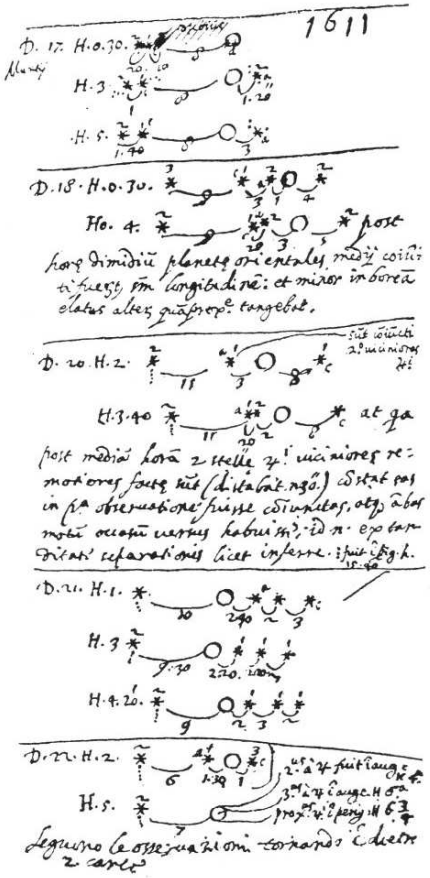


[there is no Page 438]

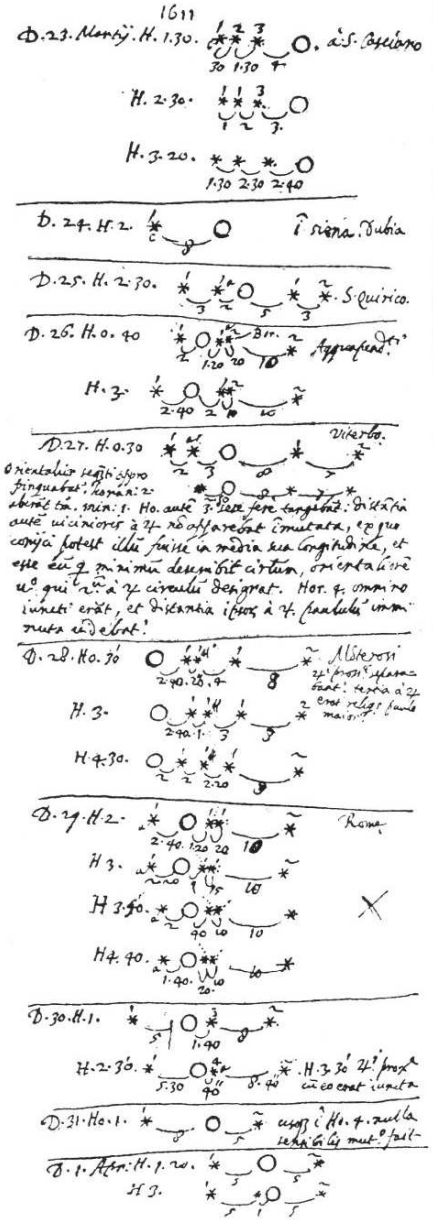




Mss. Gal., P. III. T. IV, car. 78r.



Mss. Gal., P. III. T. IV, car. 75t.



442 Observations Mss. Gal., P.III, T.IV, car.78r
1611

17 Mar Hr 0.30 (diagram) Hr 3 (diagram) Hr 5 (diagram)

18 Mar Hr 0.30 (diagram) Hr 4 (diagram) after half an hour the middle easterly planets were conjoined according to longitude and the smaller one elevated to the north touched the other as closely as possible.

20 Mar Hr 2 (diagram) the two closer to Jupiter are conjoined. Hr 3.40 (diagram) but since after a half an hour the two stars closer to Jupiter became more removed (they were distant now 30), it is evident that in the first observation they were conjoined and that both had had their movement towards the west; one may infer this from the slowness of their separation. (#3) was in perigee at Hr 15.40.

21 Mar Hr 1 (diagram) Hr 3 (diagram) Hr 4.20 (diagram)

22 Mar Hr 2 (diagram) 2nd from Jupiter was in augmentation hour fourth Hr 5 (diagram) 3rd from Jupiter in augmentation Hr 5 closest to Jupiter in perigee Hr 6 3/4 (in Italian) They follow the observations going back two diagrams.

442 Observations Mss. Gal., P.III, T.IV, car.75t
1611

23 Mar Hr 1.30 (diagram) at San Cassiano (due east of Massa, in province of Lucca) Hr 2.30 (diagram) Hr 3.20 (diagram)

24 Mar Hr 2 (diagram) in Siena. doubtful

25 Mar Hr 0.40 (diagram) San Quirico

26 Mar Hr 0.40 (diagram) Aquapendente Hr 3 (diagram)

27 Mar Hr 0.30 (diagram) Viterbo The more easterly was approaching the following one; now at Hr 2 it was only 1 minute away; however at Hr 3 they were almost touching each other; the distance of the closer one did not appear changed, from which it may be conjectured that it was in its middle longitude and that it is the one which describes the smallest circle, truly the more easterly one which traces the second circle from Jupiter; Hr 4 they were all entirely joined, and the distance of these from Jupiter seemed slightly changed.

28 Mar Hr 0.30 (diagram) Monterosi Hr 3 (diagram) Hr 4.30 (diagram) Those close to Jupiter were separated; the third from Jupiter was slightly larger than the others.

29 Mar Hr 2 (diagram) Rome Hr 3 (diagram) Hr 3.40 (diagram) Hr 4.40 (diagram)

30 Mar Hr 1 (diagram) Hr 2.30 (diagram) Hr 3.30. The closest to Jupiter was joined with it.

31 Mar Hr 1 (diagram) Until Hr 4 there was no perceptible change. 1 Apr Hr 1.20 (diagram) Hr 3 (diagram)

439 Observations Mss. Gal., P.IV, T.VI, car.73t
1610

25 Jul At earliest morning namely on Sunday the feast of Saint James, at Padua, I first observed an easterly matutinal Jupiter near which three Medicean planets, all easterly, stood from it into this order: (diagram)

29 Jul thus: (diagram)

5 Aug (diagram) The middle easterly one was raised slightly to the north.

8 Aug (diagram)

15 Aug (diagram) The nearest to Jupiter was elevated towards the north.

17 Aug (diagram)

24 Aug (diagram) The middle one was elevated sharply to the north.

25 Aug (diagram)

20 Aug (diagram)

21 Aug (diagram)

22 Aug (diagram)

31 Aug (diagram)

7 Sep (diagram)

25 Oct (diagram)

4 Nov (diagram)

5 Nov (diagram)

14 Nov Hr of night 7 (diagram)

15 Nov Hr 5 (diagram) The air around Jupiter was foggy, out of which an easterly star was scarcely conspicuous.

18 Nov Hr 5 (diagram)

19 Nov (diagram)

20 Nov Hr 5 (diagram) A westerly one was elevated to the north, and at Hr 7 the westerly ones were almost touching.

21 Nov (diagram)

439 Observations Mss. Gal., P.III, T.IV, car.74r
(1610)

30 Nov (diagram) The easterly one nearest to Jupiter was elevated slightly to the north and after 1/3 hour was conjoined with the one closest to itself.

2 Dec Hr 3 (diagram) Hr 5 The one closest to Jupiter was conjoined with it. The air was most clear.

3 Dec Hr 5 (diagram)

4 Dec Hr 5 (diagram)

6 Dec Hr 5 (diagram)

7 Dec Hr 5 (diagram) Hr 7 (diagram) The extreme easterly one was raised slightly to the north.

9 Dec Hr 5 (diagram)

10 Dec Hr 4 (diagram)

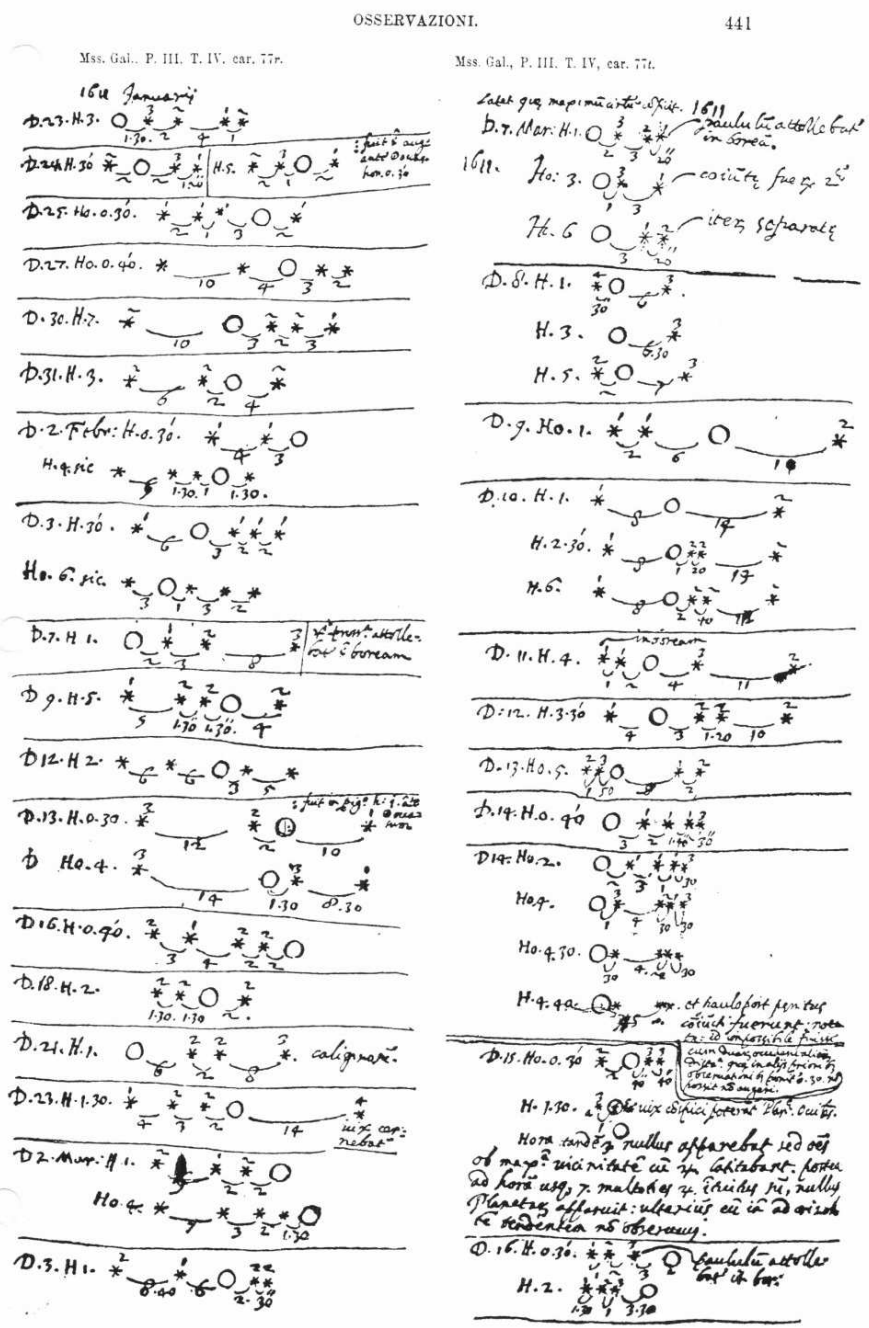
12 Dec Hr 3 (diagram)

13 Dec Hr 3.30 (diagram) The second one from Jupiter was elevated to the north. Hr 4 the ones closer to Jupiter were conjoined. Hr 5 (diagram) The middle one was seen to decline to the south.

14 Dec Hr 3.30 (diagram)

19 Dec Hr 3 30 (diagram) (in Italian) It continues three diagrams later.





441 Observations Mss. Gal., P.III, T.IV, car.77r
1611 January

23 Jan Hr 3 (diagram)
24 Jan Hr 30Š (diagram) | Hr 5 (diagram) was in augmentation before sunrise Hr 0.30.
25 Jan Hr 0.30Š (diagram)
27 Jan Hr 0.40Š (diagram)
30 Jan Hr 7 (diagram)
31 Jan Hr 3 (diagram)
2 Feb Hr 0.30 (diagram)
3 Feb Hr 30 (diagram) Hr 6 thus: (diagram)
7 Feb Hr 1 (diagram) The closest to Jupiter was raised to the north.
9 Feb Hr 5 (diagram)
12 Feb Hr 2 (diagram)
13 Feb Hr 0.30 (diagram) : was in perigee Hr 1 before sunrise. Hr 4 (diagram)
16 Feb Hr 0.40 (diagram)
18 Feb Hr 2 (diagram)
21 Feb Hr 1 (diagram) foggy
23 Feb Hr 1.30 (diagram) was scarcely discerned
2 Mar Hr 1 (diagram) Hr 4 (diagram)
3 Mar Hr 1 (diagram)

441 Observations Mss. Gal., P.III, T.IV, car.77t
1611

The one which makes the greatest circle is hidden

7 Mar Hr 1 (diagram) was raised slightly to the north. 1611 Hr 3 (diagram) two were conjoined Hr 6 (diagram) separate again

8 Mar Hr 1 (diagram) Hr 3. (diagram) Hr 5 (diagram)

9 Mar Hr 1 (diagram) Hr 1.30. (diagram)

10 Mar Hr 1 (diagram) Hr 2.30Š (diagram) Hr 6 (diagram)

11 Mar (diagram) to the north Hr 4. (diagram)

12 Mar Hr 3.30Š (diagram)

13 Mar Hr 5. (diagram)

14 Mar Hr 0.40Š (diagram)

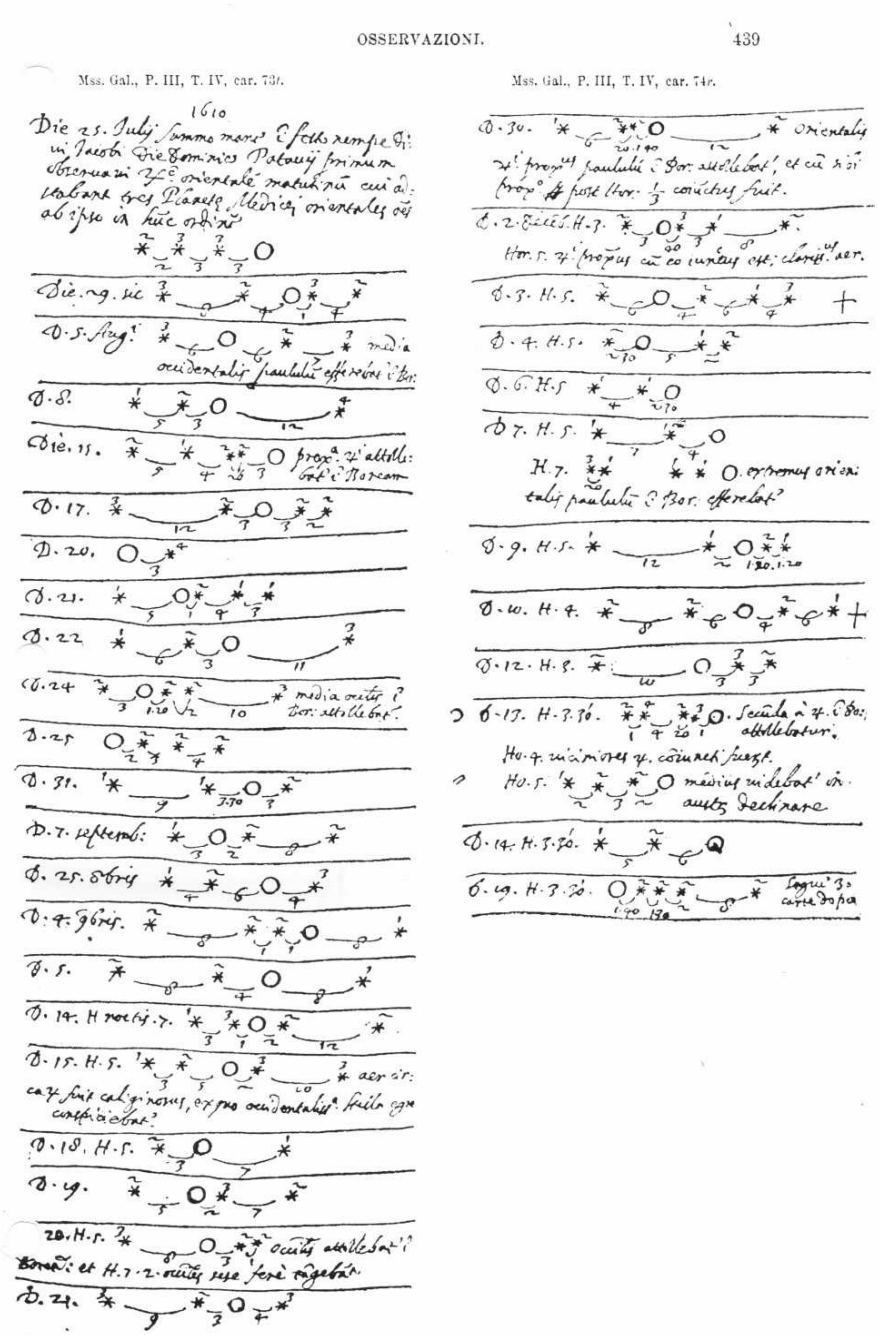
14 Mar Hr 2 (diagram) Hr 4. (diagram) Hr 4.30. (diagram) Hr 4.40. (diagram) and shortly afterwards they were deeply conjoined; noted: this was impossible since the distance of the two westerly most which is posited at 0.30 in prior observations cannot not be increased

15 Mar Hr 0.30Š (diagram)

15 Mar Hr 1.30Š (diagram) The westerly planets could hardly be discerned. Hr finally 3. None (nullus , masculine, therefore planeta) appeared but all because of the the greatest proximity with Jupiter were hidden; afterwards until Hr 7 I observed attentively many times; no planet appeared; previously already I did not observe it tending to the horizon.

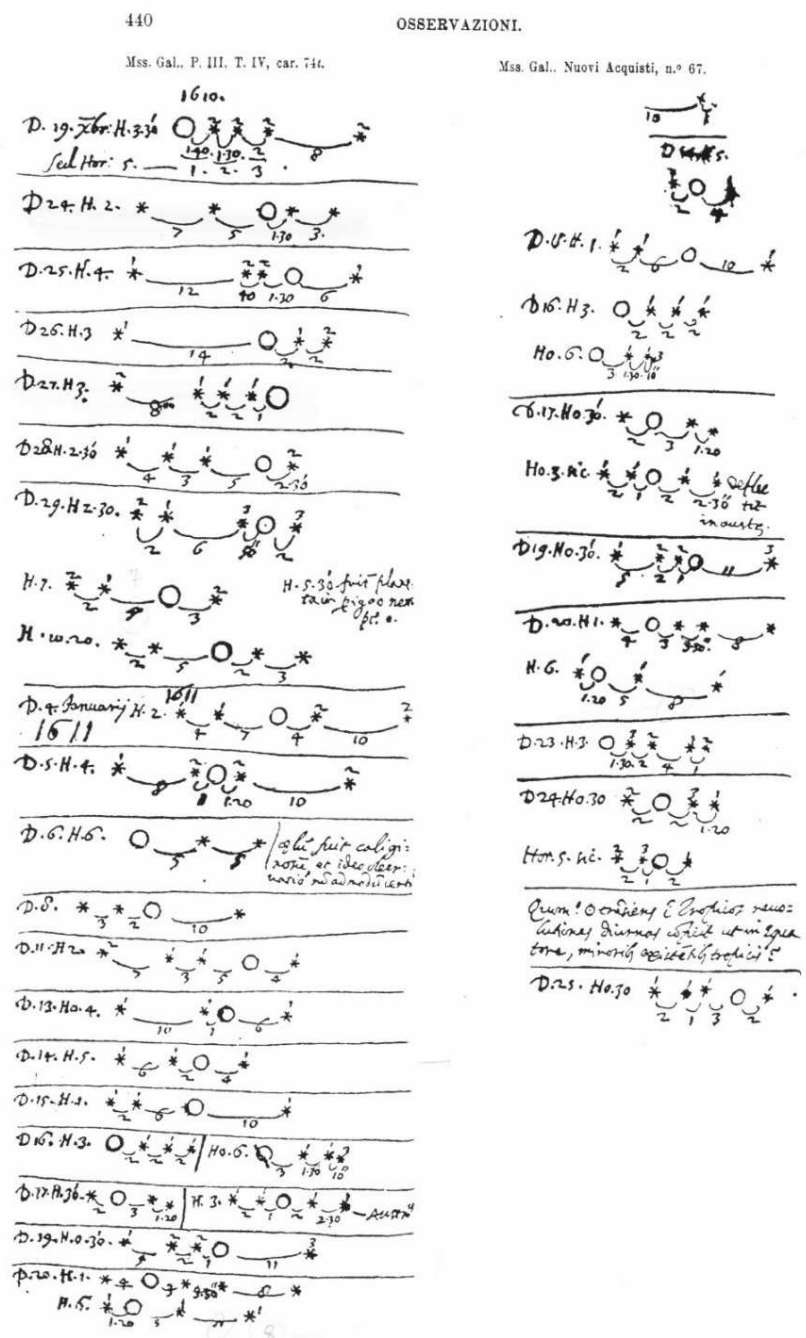
16 Mar Hr 0.30Š (diagram) it was raised a bit to the north. Hr 2 (diagram).





440 Observations Mss. Gal., P.III, T.IV, car.74t
1610

19 Dec Hr 3 .30 (diagram) But Hr 5 (diagram)
24 Dec Hr 2 (diagram)
25 Dec Hr 4 (diagram)
26 Dec Hr 3 (diagram)
27 Dec Hr 3 (diagram)
28 Dec Hr 2.30 (diagram)
29 Dec Hr 2.30 (diagram) Hr 5.30 The planet was in perigee, namely 0. Hr 7 (diagram) Hr 10.20 (diagram)
1611
1611 4 Jan Hr 2 (diagram) 5 Jan Hr 4 (diagram)
6 Jan Hr 6 (diagram) The sky was foggy, therefore the observation not very certain.
8 Jan (diagram)
11 Jan Hr 2 (diagram)
13 Jan Hr 4 (diagram)
14 Jan Hr 5 (diagram)
15 Jan Hr 2 (diagram)
16 Jan Hr 3 (diagram) Hr 6 (diagram)
17 Jan Hr .30 (diagram) Hr 3 (diagram) south
19 Jan Hr 0.30 (diagram)
20 Jan Hr 1 (diagram) Hr 5 (diagram)

440 Observations Mss. Gal., NuoviAquisti, nr. 67
1611

(diagram) [repeats of observations in left-hand column, 15-20 Jan]
23 Jan Hr 3 (diagram)
24 Jan Hr 0.30 (diagram) Hr 5 thus: (diagram) How does the sun, crossing into the tropics, accomplish daily revolutions as on the equator, the coexistent tropics being lesser?
25 Jan Hr 0.30 (diagram)