SIDEREUS NUNCIUS

or

THE SIDEREAL MESSENGER

GALILEO GALILEI

Translated with
introduction, conclusion, and notes by

ALBERT VAN HELDEN

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We have briefly explained our observations thus far about the Moon, the fixed stars, and the Milky Way. It remains for us to reveal and make known what appears to be most important in the present matter: four planets never seen from the beginning of the world right up to our day, the occasion of their discovery and observation, their positions, and the observations made over the past 2 months[73] concerning their behavior and changes. And I call on all astronomers to devote themselves to investigating and determining their periods. Because of the shortness of time, it has not been possible for us to achieve this so far.[74] We advise them again, however, that they will need a very accurate glass like the one we have described at the beginning of this account, lest they undertake such an investigation in vain.[75]

Accordingly, on the seventh day of January of the present year 1610,[76] at the first hour of the night, when I inspected the celestial constellations through a spyglass, Jupiter presented himself. And since I had prepared for myself a superlative instrument, I saw (which earlier had not happened because of the weakness of the other instruments)[77] that three little stars were positioned near him—small but yet very bright. Although I believed them to be among the number of fixed stars, they nevertheless intrigued me because they appeared to be arranged exactly along a straight line and parallel to the ecliptic, and to be brighter than others of equal size. And their disposition among themselves and with respect to Jupiter was as follows:[78]

73. 7 January to 2 March 1610.

74. In 1612 Galileo published periods for all four satellites. They were virtually the same as the modern values. See *Discourse on Bodies in Water*, tr. Thomas Salusbury, ed. Stillman Drake (Urbana: University of Illinois Press, 1960), 1.

75. Especially in the case of the satellites of Jupiter, it was necessary to pave a telescope that magnified fifteen times or more and was especially adapted for celestial use.

76. All dates used by Galileo are Gregorian.

77. See pp. 13-14, above.

78. Satellites I and II were very close together, just to the east of Jupiter. Galileo saw them as one. See Jean Meeus, "Galileo's First Records of Jupiter's Satellites," *Sky and Telescope* 24 (1962): 137-39.

East * * O * West

That is, two stars were near him on the east and one on the west; the more eastern one and the western one appeared a bit larger than the remaining one. I was not in the least concerned with their distances from Jupiter, for, as we said above, at first I believed them to be fixed stars. But when, on the eighth, I returned to the same observation, guided by I know not what fate,[79] I found a very different arrangement. For all three little stars were to the west of Jupiter and closer to each other than the previous night, and separated by equal intervals, as shown in the adjoining sketch.[80] Even though at this point I had by no means turned my thought to the mutual motions of these stars, yet I was aroused by the question

East O * * * West

of how Jupiter could be to the east of all the said fixed stars[1] when the day before he had been to the west of two of them. I was afraid, therefore, that perhaps, contrary to the astronomical computations, his motion was direct and that, by his proper motion, he had bypassed those stars.[81] For this reason I waited eagerly for the next night. But I was disappointed in my hope, for the sky was everywhere covered with clouds.

Then, on the tenth, the stars appeared in this position with regard to Jupiter. Only two stars were near him, both to the east. The

East * * O West

79. See pp. 12-13, above.

80. On this night, satellite IV was at its farthest distance from Jupiter to the east, and it escaped Galileo because of the smallness of the field of view of his spyglass. See Meeus, "Galileo's First Records."

81. See pp. 15-16, above.

third, as I thought, was hidden behind Jupiter.[82] As before, they were in the same straight line with Jupiter and exactly aligned along the zodiac. When I saw this, and since I knew that such changes could in no way be assigned to Jupiter, and since I knew, moreover, that the observed stars were always the same ones (for no others, either preceding or following Jupiter, were present along the zodiac for a great distance), now, moving from doubt to astonishment, I found that the observed change was not in Jupiter but in the said stars. And therefore I decided that henceforth they should be observed more accurately and diligently.

And so, on the eleventh, I saw the following arrangement:

East * * O West

There were only two stars on the east,[83] of which the middle one was three times as far from Jupiter than from the more eastern one, and the more eastern one was about twice as large as the other, although the previous night they had appeared about equal. I therefore arrived at the conclusion, entirely beyond doubt, that in the heavens there are three stars wandering around Jupiter like Venus and Mercury around the Sun. This was at length seen clear as day in many subsequent observations, and also that there are not only three, but four wandering stars making their revolutions about Jupiter. The following is an account of the changes in their positions, accurately determined from then on. I also measured the distances between them with the glass, by the procedure explained above.[84] I have added the times of the observations, especially when more than one were made on the same night, for the revolutions of these

82. On this night, Satellite I was so close to jupiter on the west that it was lost in the planet's glare. Satellites II and III were very close to each other and Calileo saw them as one, just to the east of the planet. See Meeus, "Calileo's First Records."

83. Satellites I and II had just ended their transits in front of the planet and were still too close to be discerned by Calileo. See ibid.

84. See pp. 38-39.

planets are so swift that the hourly differences can often be perceived as well.

Thus, on the twelfth, at the first hour of the following night, I saw the stars arranged in this manner. The more eastern star was

East * *O * West

larger than the western one, but both were very conspicuous and bright.[85] Both were two minutes[86] distant from Jupiter. In the third hour a third little star, not at all seen earlier, also began to appear. This almost touched Jupiter on the eastern side and was very small. All were in the same straight line and aligned along the ecliptic.

On the thirteenth, for the first time four little stars were seen by me in this formation with respect to Jupiter.[87] Three were on

East * O* * * West

the west and one on the east. They formed a very nearly straight line, but the middle star of the western ones was displaced a little to the north from the straight line. The more eastern one was 2 minutes distant from Jupiter; the intervals between the remaining ones and Jupiter were only 1 minute. All these stars displayed the

85. Note that CaWeo initially saw only two of the satellites, III on the east and II on the west. Satellites I and IV were both on the east and rather close to jupiter. Apparently Calileo could not see either one until satellite I moved farther away from the planet. See Meeus, "Calileo's First Records."

86. Calileo,tookjupiter's angular diameter to be about 1 arcminute, and he used this measure to estimate the distances of the satellites. In his drawings and in *Sidereus Nuncius,* however, he showed the planet's disk as being about twice as large while keeping the distances of the satellites the same. The drawings are thus out of proportion. See Stillman Drake, *Telescopes, Tides, and Tactics* (Chicago: University of Chicago Press, 1983), 214-19.

87. It was thus on this day that Calileo recognized that there were four moons. During the previous observations he had been prevented by various circumstances from seeing all four moons at once.