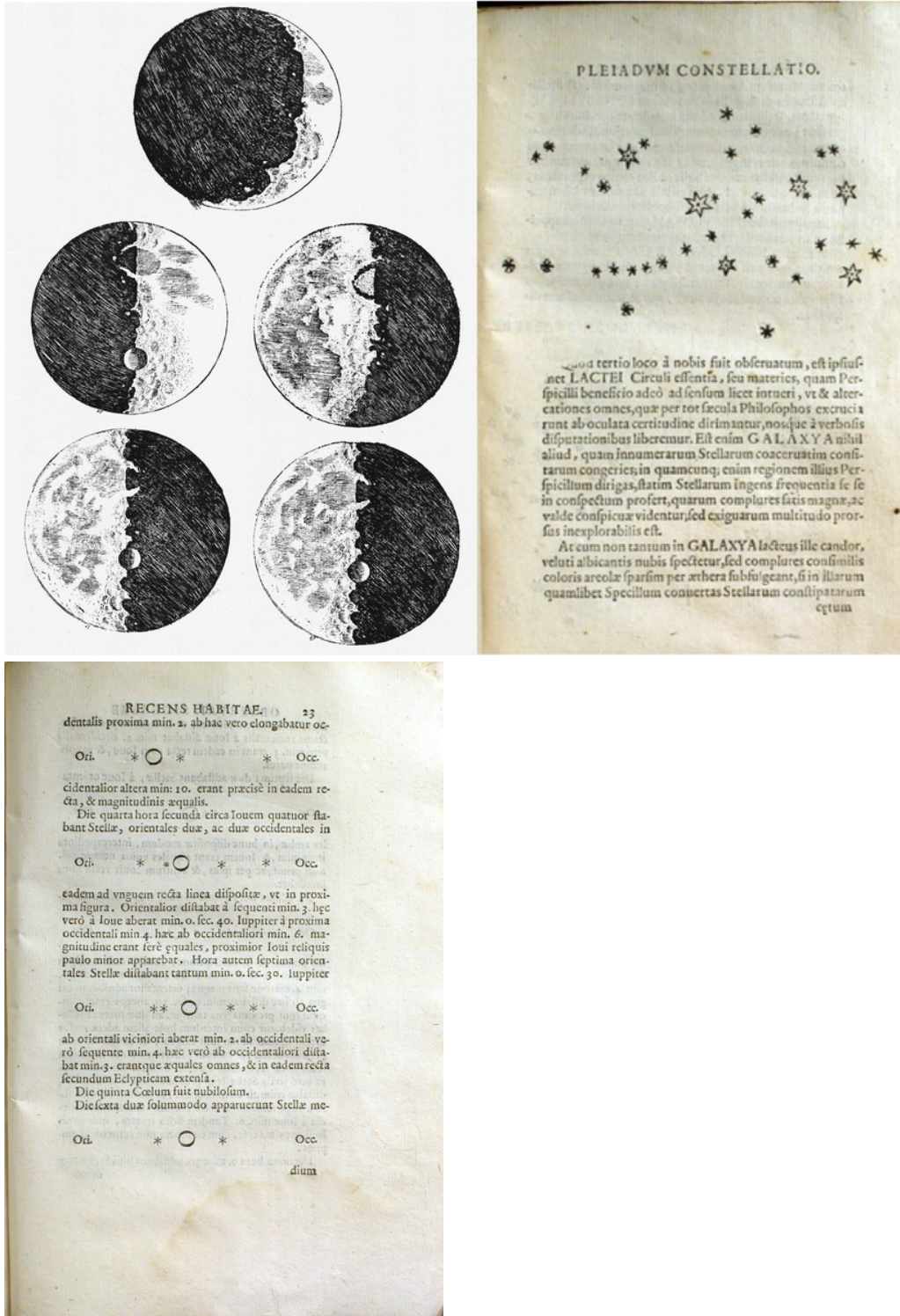


Sidereus Nuncius [Wikipedia permalink/921426383](https://en.wikipedia.org/wiki/Sidereus_Nuncius)



Shown above are Galileo's sketches of the Moon, Pleiades, and moons of Jupiter.

Sidereus Nuncius (usually *Sidereal Messenger*, also *Starry Messenger* or *Sidereal Message*) is a short **astronomical** treatise (or *pamphlet*) published in **New Latin** by **Galileo Galilei** on March 13, 1610.^[1] It was the first published scientific work based on observations made through a **telescope**, and it contains the results of Galileo's early observations of the imperfect and mountainous **Moon**, the hundreds of **stars** that were unable to be seen in either the **Milky Way** or certain **constellations**

with the naked eye, and the **Medicean Stars (later Galilean moons)** that appeared to be circling **Jupiter**.^{[2] [3]}

The **Latin** word *nuncius* was typically used during this time period to denote *messenger*; however, it was also (though less frequently) rendered as *message*. Though the title *Sidereus Nuncius* is usually translated into English as *Sidereal Messenger*, many of Galileo's early drafts of the book and later related writings indicate that the intended purpose of the book was "simply to report the news about recent developments in astronomy, not to pass himself off solemnly as an ambassador from heaven."^[4] Therefore, the correct English translation of the title is *Sidereal Message* (or often, *Starry Message*).

Telescope: The first telescopes appeared in the **Netherlands** in 1608 when **Middelburg** spectacle-maker **Hans Lippershey** tried to obtain a patent on one.^[6] By 1609 Galileo had heard about it and built his own improved version. He probably was not the first person to aim the new invention at the night sky^[7] but his was the first systematic (and published) study of **celestial bodies** using one.^[8] One of Galileo's first telescopes had 8x to 10x linear magnification and was made out of lenses that he had ground himself.^[9] This was increased to 20x linear magnification in the improved telescope he used to make the observations in *Sidereus Nuncius*.^{[10] [3]}

Sidereus Nuncius contains more than seventy drawings and diagrams of the Moon, certain constellations such as **Orion**, the **Pleiades**, and **Taurus**, and the **Medicean Stars** of **Jupiter**. Galileo's text also includes descriptions, explanations, and **theories** of his observations.

Moon: In observing the Moon, Galileo saw that the line separating lunar day from night (the **terminator**) was smooth where it crossed the darker regions of the Moon but quite irregular where it crossed the brighter areas. From this he deduced that the darker regions are flat, low-lying areas, and the brighter regions rough and mountainous.^[3] Basing his estimate on the distance of sunlit mountaintops from the terminator, he judged, quite accurately, that the lunar mountains were at least four miles high. Galileo's **engravings** of the lunar surface provided a new form of visual representation, besides shaping the field of **selenography**, the study of physical features on the Moon.^[2]

Stars: Galileo reported that he saw at least ten times more stars through the telescope than are visible to the naked eye, and he published star charts of the belt of **Orion** and the star cluster **Pleiades** showing some of the newly observed stars. With the naked eye observers could see only six stars in the **Taurus** constellation; through his telescope, however, Galileo was capable of seeing thirty-five – almost six times as many. When he turned his telescope on Orion, he was capable of seeing eighty stars, rather than the previously observed nine – almost nine times more. In *Sidereus Nuncius*, Galileo revised and reproduced these two star groups by distinguishing between the stars seen without the telescope and those seen with it.^[11] Also, when he observed some of the "nebulous" stars in the **Ptolemaic** star catalogue, he saw that rather than being cloudy, they were made of many small stars. From this he deduced that the nebulae and the **Milky Way** were "congeries of innumerable stars grouped together in clusters" too small and distant to be resolved into individual stars by the naked eye.^[10]

Medicean Stars (Moons of Jupiter) In the last part of *Sidereus Nuncius*, Galileo reported his discovery of four objects that appeared to form a straight line of stars near Jupiter. On the first night he detected a line of three little stars close to Jupiter parallel to the ecliptic; the following nights brought different arrangements and another star into his view, totalling four stars around Jupiter.^{[12] [3]} Throughout the text, Galileo gave illustrations of the relative positions of Jupiter and its apparent companion stars as they appeared nightly from late January through early March 1610. That they changed their positions relative to Jupiter from night to night and yet always appeared in the same straight line near it, persuaded Galileo that they were orbiting Jupiter. On January 11 after four nights of observation he wrote:

"I therefore concluded and decided unhesitatingly, that there are three stars in the heavens moving about Jupiter, as Venus and Mercury round the Sun; which at length was established as clear as daylight by numerous subsequent observations. These observations also established that there are not only three, but four, erratic sidereal bodies performing their revolutions round Jupiter...the revolutions are so swift that an observer may generally get differences of position every hour."^[13]

In his drawings, Galileo used an open circle to represent Jupiter and asterisks to represent the four stars. He made this distinction to show that there was in fact a difference between these two types of celestial bodies. It is important to note that Galileo used the terms *planet* and *star* interchangeably, and "both words were correct usage within the prevailing Aristotelian terminology."^[14]

At the time of *Sidereus Nuncius*' publication, Galileo was a mathematician at the [University of Padua](#) and had recently received a lifetime contract for his work in building more powerful telescopes. He desired to return to [Florence](#), and in hopes of gaining [patronage](#) there, he dedicated *Sidereus Nuncius* to his former pupil, now the [Grand Duke of Tuscany](#), [Cosimo II de' Medici](#). In addition, he named his discovered four moons of Jupiter the "Medicean Stars," in honor of the four royal [Medici](#) brothers.^[3] This helped him receive the position of Chief Mathematician and Philosopher to the Medici at the [University of Pisa](#).^[10] Ultimately, his effort at naming the moons failed, for they are now referred to as the "[Galilean moons](#)".

Reception: The reactions to *Sidereus Nuncius*, ranging from appraisal and hostility to disbelief, soon spread throughout Italy and England. Many poems and texts were published expressing love for the new form of [astronomical](#) science. Three works of art were even created in response to Galileo's book: [Adam Elsheimer](#)'s *The Flight into Egypt* (1610), [Lodovico Cigoli](#)'s *Assumption of the Virgin* (1612), and [Andrea Sacchi](#)'s *Divine Wisdom* (1631).^[10] In addition, the discovery of the Medicean Stars fascinated other astronomers, and they wanted to view the moons for themselves. Their efforts "set the stage for the modern scientific requirement of experimental reproducibility by independent researchers. Verification versus falsifiability...saw their origins in the announcement of *Sidereus Nuncius*."^[14]

But many individuals and communities were skeptical. A common response to the Medicean Stars was simply to say that the telescope had a lens defect and was producing illusory points of light and images; those saying this completely denied the existence of the moons.^[14] That only a few could initially see and verify what Galileo had observed supported the supposition that the optical theory during this period "could not clearly demonstrate that the instrument was not deceiving the senses."^[15] By naming the four moons after the Medici brothers and convincing the Grand Duke Cosimo II of his discoveries, the defense of Galileo's reports became a matter of State. Moran notes, "the court itself became actively involved in pursuing the confirmation of Galileo's observations by paying Galileo out of its treasury to manufacture spyglasses that could be sent through ambassadorial channels to the major courts of Europe."

The first astronomer to publicly support Galileo's findings was [Johannes Kepler](#), who published an open letter in April 1610, enthusiastically endorsing Galileo's credibility. It was not until August 1610 that Kepler was able to publish his independent confirmation of Galileo's findings, due to the scarcity of sufficiently powerful telescopes.^[16]

Several astronomers, such as [Thomas Harriot](#), [Joseph Gaultier de la Vatable](#), [Nicolas-Claude Fabri de Peirese](#), and [Simon Marius](#), published their confirmation of the Medicean Stars after Jupiter became visible again in the autumn of 1610. Marius, a German astronomer who had studied with [Tycho Brahe](#), was the first to publish a book of his observations. Marius attacked Galileo in *Mundus Jovialis* (published in 1614) by insisting that he had found Jupiter's four moons before Galileo and had been observing them

since 1609. Marius believed that he therefore had the right to name them, which he did: he named them after Jupiter's love conquests: **Io** , **Europa** , **Ganymede** , and **Callisto** . But Galileo was not confounded — he pointed out that being outside the Church, Marius had not yet accepted the **Gregorian calendar** and was still using the **Julian calendar** . Therefore, the night Galileo first observed Jupiter's moons was January 7, 1610 on the Gregorian calendar — December 28, 1609 on the Julian calendar (Marius claimed to have first observed Jupiter's moons on December 29, 1609).^[14] Although Galileo did indeed discover Jupiter's four moons before Marius, **Io** , **Europa** , **Ganymede** , and **Callisto** are now the names of Galileo's four moons.

Identify all true statements:

- Sidereus Nuncius was published in Classical Latin.
- The Medicean Stars were discovered by the Mediceans, but Galileo suggested they were actually moons of Jupiter.
- Contemporary and subsequent writings suggest that the title of Galileo's work, *Sidereus Nuncius*, was not an attempt to anoint himself as a messenger of the truth
- Most historians agree that Galileo invented and constructed Europe's first telescope.
- Galileo's *Sidereus Nuncius* included both observations, as well as interpretations of what he saw.
- The Moon's terminator is not visible on a full moon.
- Galileo's estimate that the lunar mountains were at least four miles high was based on his comparison of the mountains' shadows with the known size of the Moon.
- Galileo reported that he saw at about 10% more stars through his telescope than are visible to the naked eye.
- Galileo identified what Ptolemy thought were clusters of very faint stars as "nebulus" clouds of gas.
- Jupiter's moons appear approximately as a straight line perpendicular to the ecliptic.
- The ecliptic is the path the sun takes against the background stars in one year.
- It is possible to detect the motion of a Galilean moon by observing it for one hour.
- In his drawings, Galileo used an open circle to represent Jupiter and asterisks to represent the four moons.
- While serving as a mathematician at the University of Padua and had Galileo received a lifetime contract for his work in building more powerful telescopes.
- Galileo referred to the four moons of Jupiter as the "Medicean Stars" because an Italian duke had four children.
- It took less than three years for Galileo's *Sidereus Nuncius* became known among his contemporaries throughout Europe.
- For many years Johannes Kepler remained skeptical of Galileo's claims in *Sidereus Nuncius*.
- Io, Europa, Ganymede and Callisto were the children of an Italian duke who was a patron of Galileo.
- In response to a claim that someone else claimed to be the actual discoverer of Jupiter's moons, Galileo pointed out that only one moon was visible on the specified date of discovery.