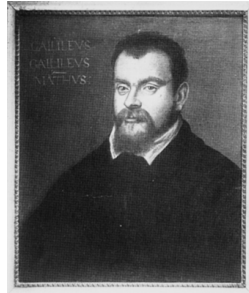


## Galileo & the Telescope—Sept 16

- Galileo makes a telescope
- Discovers
  - Moons of Jupiter
  - Mountains on the moon
  - New stars
  - Milky Way has many stars
  - Phases of Venus
    - Disproves Ptolemy's earth-centered model
- A model of discovery
  - What cannot be seen cannot be discovered
  - Many discoveries were made soon after a new technology or instrument was built

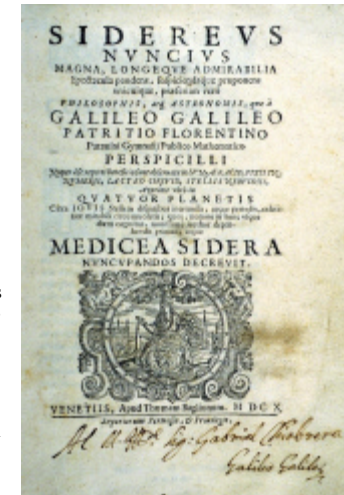


Galileo by Tintoretto  
[http://galileo.rice.edu/images/people/galileo/g\\_tintoretto.gif](http://galileo.rice.edu/images/people/galileo/g_tintoretto.gif)

## Sidereus Nuncius

Unfolding great and many wonderful sights and displaying to the gaze of everyone, especially philosophers and astronomers, the things that were observed by Galileo Galilei, Florentine patrician and public mathematician of the University of Padua, with the help of a spyglass lately devised by him, about the face of the moon, countless fixed stars, the Milky Way, nebulous stars, but especially about the four planets flying around the star of Jupiter at unequal intervals and periods with wonderful swiftness; which unknown by anyone until this day, the first author detected recently and decided to name **Medicean Stars**. Venice 1610

trans. A van Helden, *Sidarius*



## Galileo's telescope



Wood, paper; length: 1360mm, lens diameter 26mm  
<http://galileo.imss.firenze.it>

## Mountains on the Moon

- Imperfections on a heavenly object



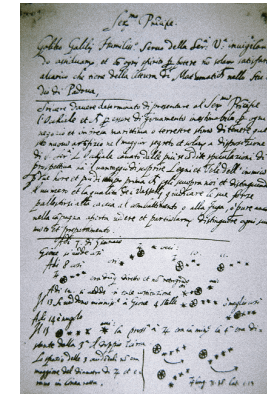
<http://hsci.cas.ou.edu/exhibits/>

## Countless stars (Pleiades)



## Galilean moons of Jupiter

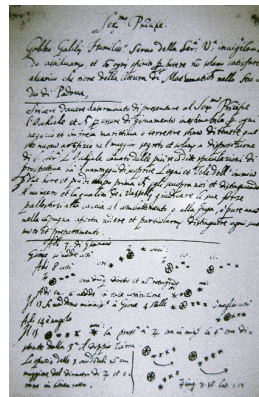
- When did Galileo first know that these were not stars, but objects that followed Jupiter?
- On 7 Jan 1610, what hint did Galileo uncover about these “stars”? Read p64.



Galileo's journal  
[http://galileo.rice.edu/images/things/journal\\_iup1.gif](http://galileo.rice.edu/images/things/journal_iup1.gif)

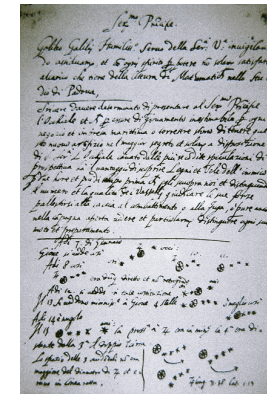
## Galilean moons of Jupiter

- On 8 Jan 1610, what did Galileo mean “contrary to the astronomical computation, his motion was direct”? Read 1<sup>st</sup> paragraph p65.



Galileo's journal  
[http://galileo.rice.edu/images/things/journal\\_iup1.gif](http://galileo.rice.edu/images/things/journal_iup1.gif)

- On 10 Jan 1610, Galileo realized what changed from night to night were these “stars,” not Jupiter. These stars followed Jupiter and their positions changed from night to night.
- Assume the three objects seen near Jupiter on 7 Jan 1610 were real stars. Draw what Galileo would have seen on Jan 8<sup>th</sup>.

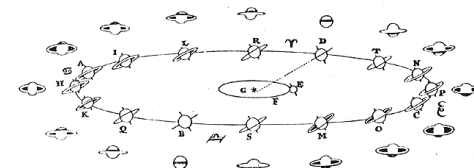


## Phases of Venus

4. What phases are possible for Venus in Ptolemy's model?

## Saturn 1610

- I discovered another very strange wonder, which I should like to make known to their Highnesses . . . , keeping it secret, however, until the time when my work is published . . . . the star of Saturn is not a single star, but is a composite of three, which almost touch each other, never change or move relative to each other, and are arranged in a row along the zodiac, the middle one being three times larger than the lateral ones, and they are situated in this form: oOo. —Letter to Medici
- Circulated an anagram: s m a i s m r m i l m e p o e t a l e u m i b u n e n u g t t a u i r a s.
  - *Altissimum planetam tergeminum observavi*, or "I have observed the highest planet tri-form."
- Tri-form disappeared in 1612.



Huygens' model  
[http://galileo.rice.edu/images/things/huygens\\_phases2.gif](http://galileo.rice.edu/images/things/huygens_phases2.gif)