



PHY1033C/HIS3931/IDH 3931 : Discovering Physics:  
The Universe and Humanity's Place in It  
Fall 2016

Prof. Peter Hirschfeld, Physics



## Announcements

- HW3 due today! HW 4 due Oct. 4
- Reading: Gregory, Chapter 5

Watch a portion of “Harmony of the Worlds,”  
(from 24:28 to 54:28) on youtube:

<https://www.youtube.com/watch?v=p9GAMHCsQTs>  
[Equivalence of the Tychonic and Copernican systems](#)  
[Kepler's 3 Laws](#)

- Reminder: Ariel Berrean’s homework review  
Mondays 5:30-7:30

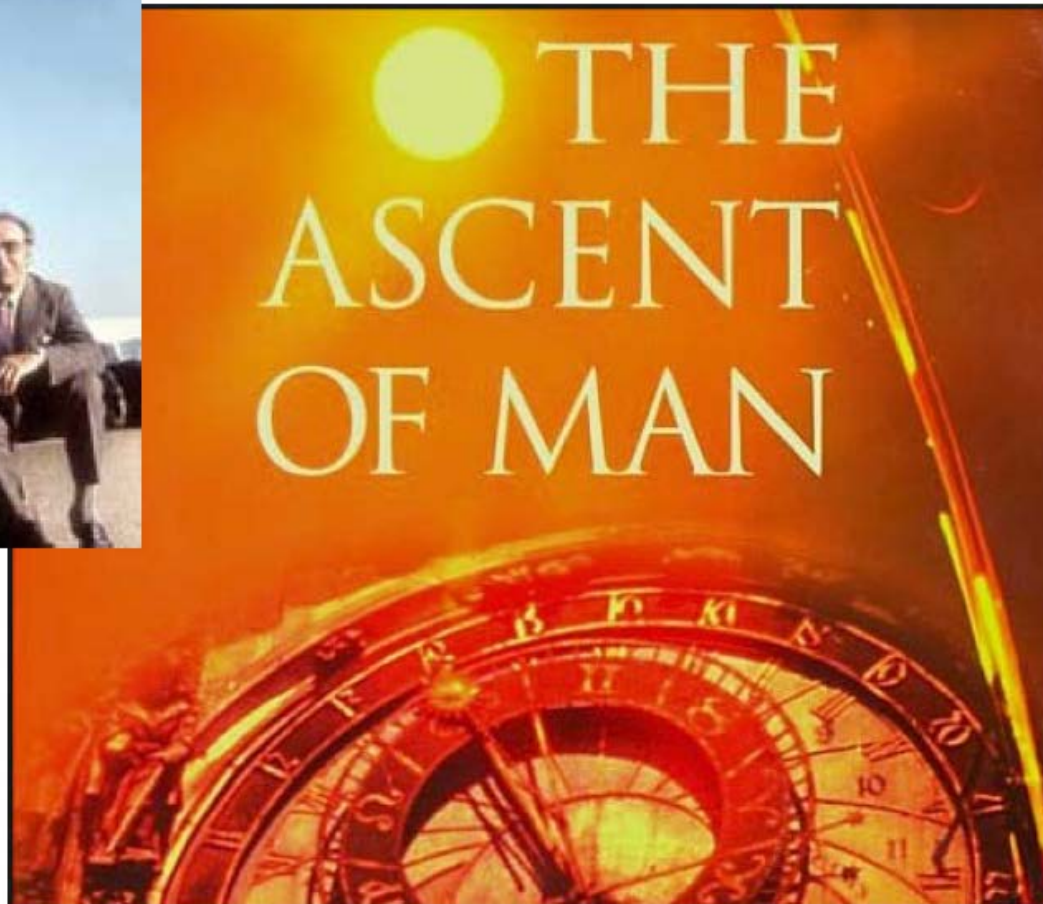
## Last time (or two)

- Copernicus' de Revolutionibus 1543
- 4 Earthly motions identified by Copernicus
- Radians, angular speed, angular acceleration
- Why Earth's axis points always in the same direction ("conservation of angular momentum")
- Precession of equinoxes
- Film: Jacob Bronowski: The Starry Messenger  
from "Ascent of Man" series

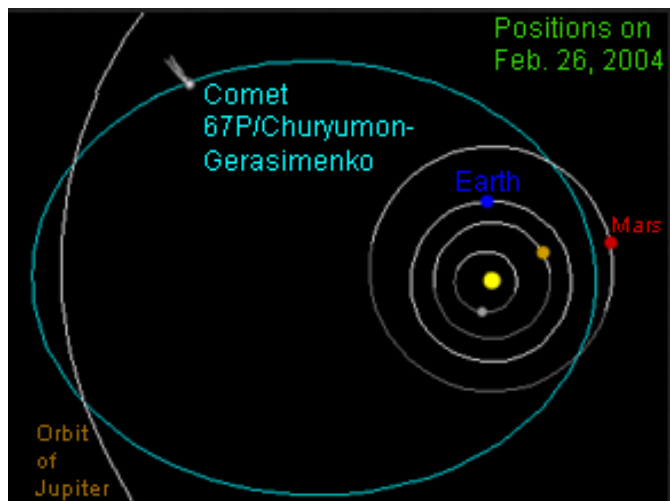
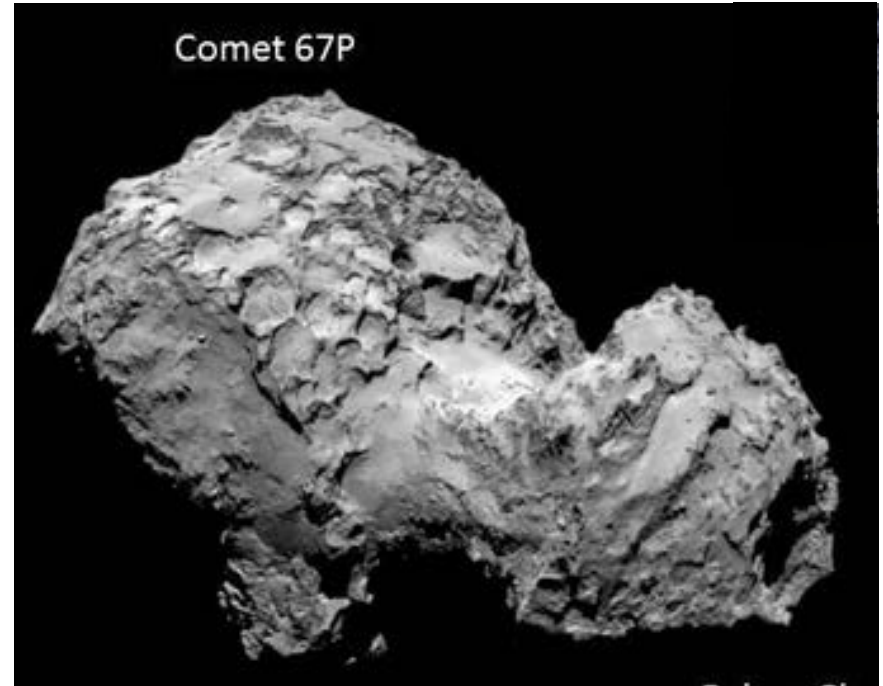
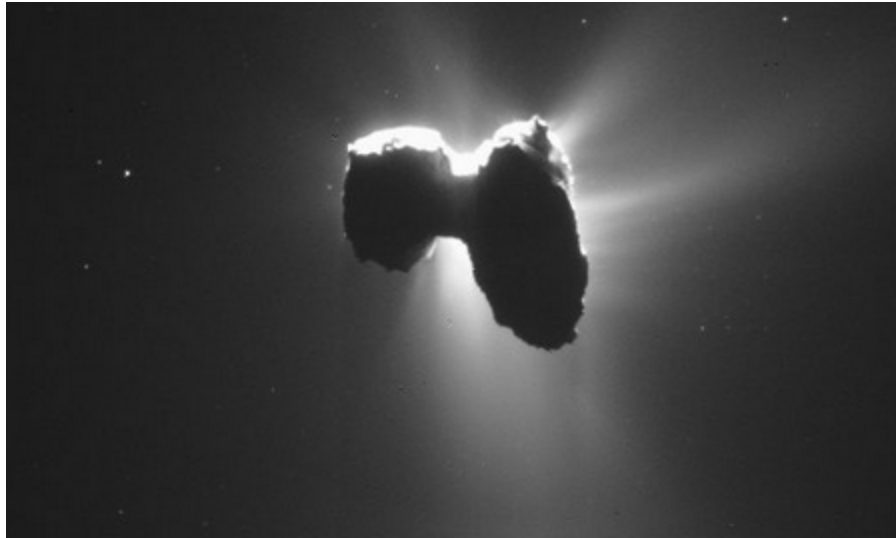
# Film discussion

## Jacob Bronowski, "The Ascent of Man"

The Starry Messenger -- Galileo



# Science news



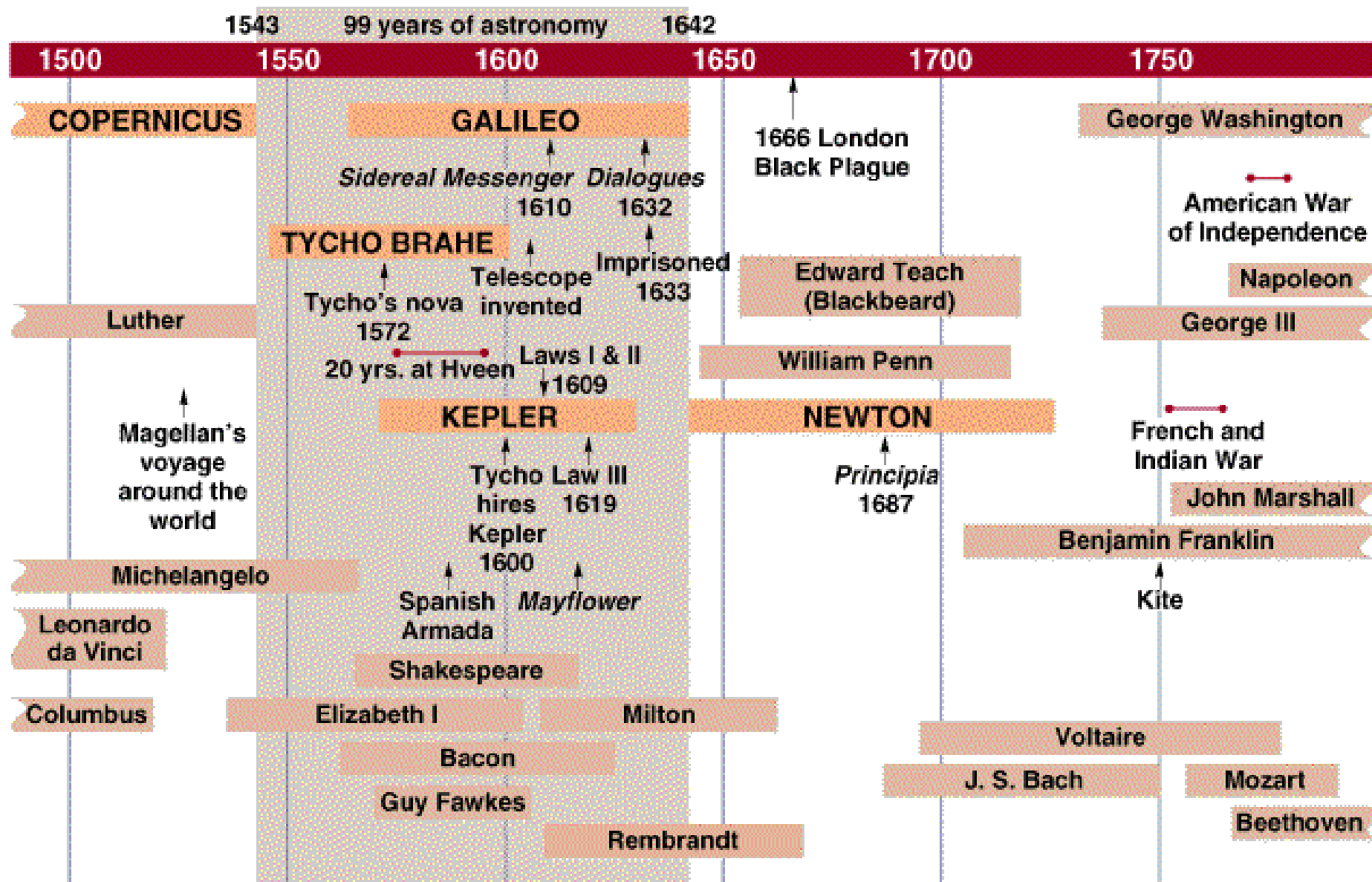
Images of Comet 67C, taken by Rosetta spacecraft,  
**due to crash land on Friday** (European Space Agency)

## Clicker question:

Galileo's discoveries did not include

- a. mountains on the moon
- b. phases of Venus
- c. four of Jupiter's moons
- d. invention of the telescope
- e. many new stars

# Peek at timeline



# Tycho Brahe 1546-1601

- Unusual youth: noble, wanted to study – dispensation from king
- The New Star of 1572 (was actually a supernova): change in the heavens!
- The Comet of 1577: he showed it passed *through* the celestial spheres of several planets
- Rejected Copernicus: created Tychonic System: moon and Sun orbiting earth and all other planets orbiting the Sun. System is *observationally equivalent* to Copernican.
- Famous for the high quality of his planetary data

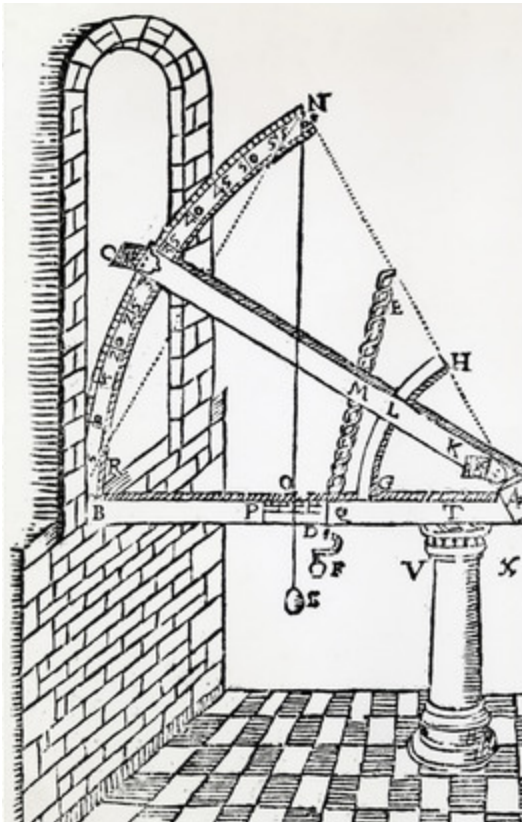
# Tycho as celebrity

Wikipedia: “His body has been exhumed twice, in 1901 and 2010, to examine the circumstances of his death and to verify what material his artificial nose was made of. The conclusion was that his death was likely caused by a burst bladder as first suggested and that the artificial nose was more likely made of brass than silver or gold as believed in his time.”

# Brahe instruments at Uraniborg



Armillary – for measuring right ascension/declination



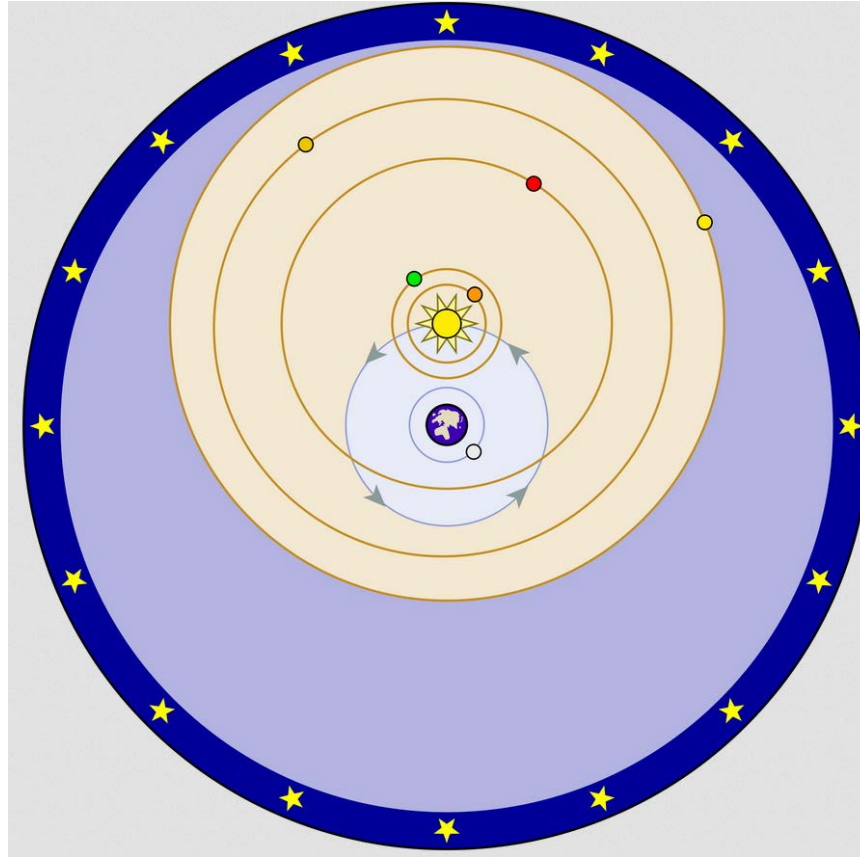
Sextant – for measuring angular differences



Quadrant – same?

# Tychonian system

- 1) Sun & Moon orbit Earth
- 2) All planets orbit Sun



Completely equivalent to the Copernican system in terms of planetary positions!

<https://people.sc.fsu.edu/~dduke/ntycho.html>