Early Modern Copernicanism and Giordano Bruno
From last lecture..

- What is history?
- The study of men and women in Time
- History does not deal with the ‘beginning’ of a phenomenon, but..
- History investigates the ‘causes’ of a phenomenon
- The importance of studying religion historically
- Is the earth a unique place?
- The ‘causes’ of this issue with a historical focus: why are men and women so invested in the question IN HISTORICAL TERMS?
- Also, assumptions about science and religion: do we really know what they are IN HISTORICAL TERMS?
Old cosmology: a mix of Bible and Aristotle

- Geocentrism
- The earth does not move
- The ‘heavens’ above the earth are incorruptible
- What is behind this formulation? Nature and theology in the later Middle Ages
Christianity, Aristotle and Plato

Raphael, ‘School of Athens’ (1509-10), Stanza della Segnatura
Thomas Aquinas (1225-1274): the Christianization of Aristotle

Aquinas by Carlo Crivelli, mid-fifteenth century
Aquinas and the link between faith, reason and nature

‘..although God exceeds all sensibles and senses, his effects, from which the demonstration is taken for proving God exists, are sensible. And thus the origin of our knowledge in sense holds even when what is known exceeds sense’ (introduction to the proof of God’s existence from the ‘Summa contra Gentiles’)
1492: the earth is not that small

World map, Brescia, 1483 ca.  World map, Amsterdam 1570
1517: earth (and heaven) turned upside-down

Text of the Bull ‘Exurge Domine’, with which Luther was excommunicated by the Pope, 1520, Vatican Library
Nicholaus Copernicus: the earth is not the center

Nicholaus Copernicus’ s *De Revolutionibus*, I ed. 1543
The problems with Copernicus’s theory:

- ‘Wrong’ theology
- ‘Wrong’ timing
- ‘Wrong’ calculations
- For some decades, NOBODY CARED!
Wrong theology: ‘Then spake Joshua to the LORD in the day when the LORD delivered up the Amorites before the children of Israel, and he said in the sight of Israel, Sun, stand thou still upon Gibeon; and thou, Moon, in the valley of Ajalon. And the sun stood still, and the moon stayed’ (Joshua, 10:12-13)
Wrong timing: the Protestant Reformation spreading fast..

Religious map of Europe, ca. 1560s
Wrong timing: the Reformation and the Council of Trent (1545-1563)
Wrong calculations: the orbits
Wrong calculations: the size
Wrong calculations: the problem of the parallax and the phenomenological issue

\[ d(\text{parsecs}) = \frac{1}{p(\text{arcseconds})} \]

Diagram showing the parallax effect with stars viewed from January and July, illustrating the distance calculation.
Parallax first measured by Friedrich Wilhelm Bessel (1838)
Giordano Bruno (1546-1600) and Copernicanism
Bruno as a ‘magician’
Bruno and ‘memory’
Bruno as a spy
Bruno as a heretic
But Bruno was also an interpreter of Copernicus!

- Bruno’s ‘The Ash Wednesday Supper’ (1584) as a defense of Copernicanism, but…

- Bruno thought that Copernicus was too much of a mathematician and not enough of a physicist, and he criticized Copernicus’s epicycles

- Bruno and the ‘Copernican mistake’: are the moon and the earth on the same epicycle? Was Copernicus wrong or was Bruno not a good scientist? And what’s really the point here?
Bruno goes beyond Copernicus

- The ‘solid orbs’ of Copernicus
- The ‘closed’ universe of both Copernicus and Aristotle
- Bruno’s ‘pure’, uniform substance instead of the solid orbs
- Bruno’s notion of ‘impetus’ as opposed to Copernicus’ s ‘sympathy’: theology, natural philosophy, physics and ‘magic’
- The universe is not closed (‘De immenso’, 1591)!
Bruno’s universe

Bruno visualized a planetary system similar to the one of Copernicus with a new concept that the stars extended outwards infinitely.
Summarizing...

- Copernicus: a system to discuss and refine
- ‘Magic’, religion and natural philosophy: all parts of the same body of knowledge
- Bruno’s science: ‘mistakes’ (lunar orbit) and intuition (impetus)
- Bruno’s science: the relationship between ‘physics’ and ‘mathematics’ in the context of early modern natural philosophy
Important points:

• Natural Philosophy in the early modern world was NOT like science in our own times

• Many points of contacts between natural philosophy and religion: indeed they were part of the same discipline

• The historian focuses on the PROCESS by which natural philosophy becomes ‘science’ and as such other than religion and philosophy