Astronomy 350L

(Fall 2006)

The History and Philosophy of Astronomy

(Lecture 1: Introduction)

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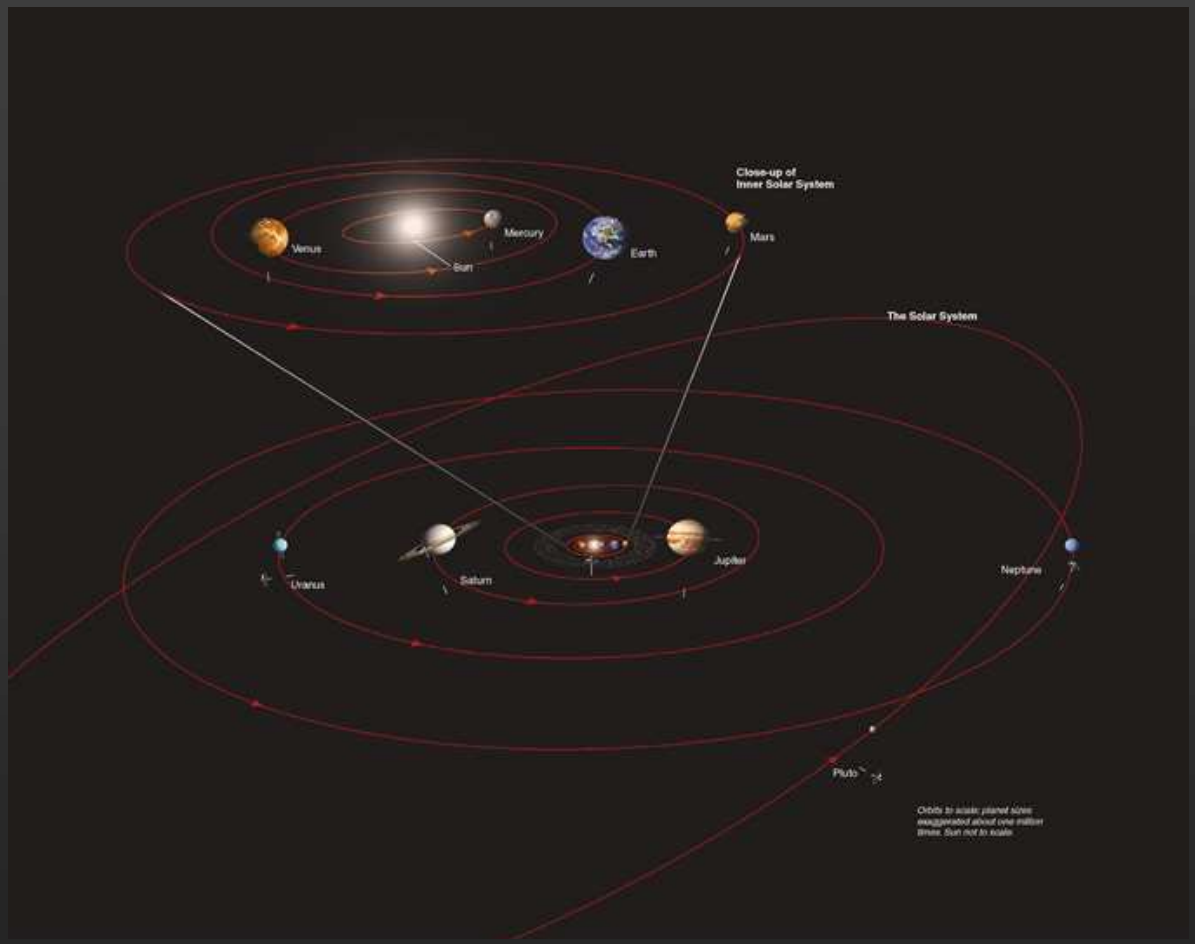
Our Cosmic Environment: A Quick Tour

Earth:

- 10,000 km
- 4.5 billion years
- Humans: 1 million yrs

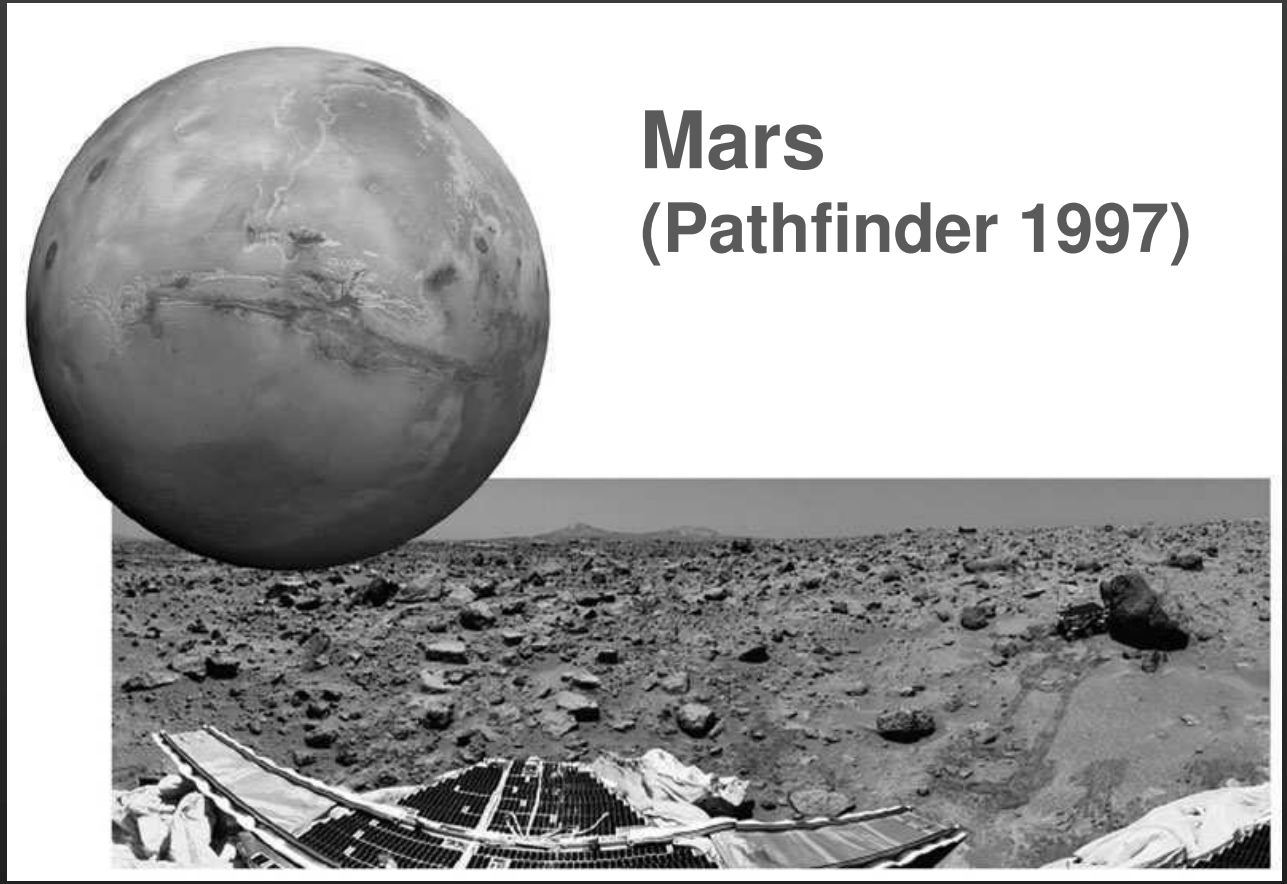
Architecture of the Solar System



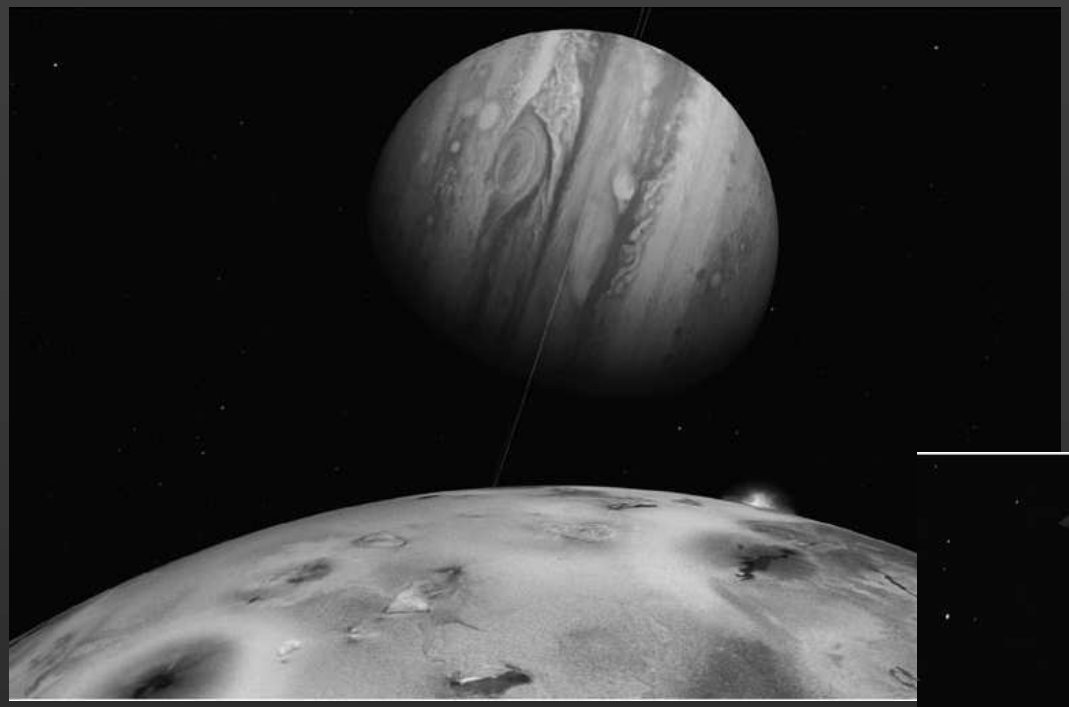
Solar System:

- few 100 million km
- 5 billion years

Exploring the Planets I



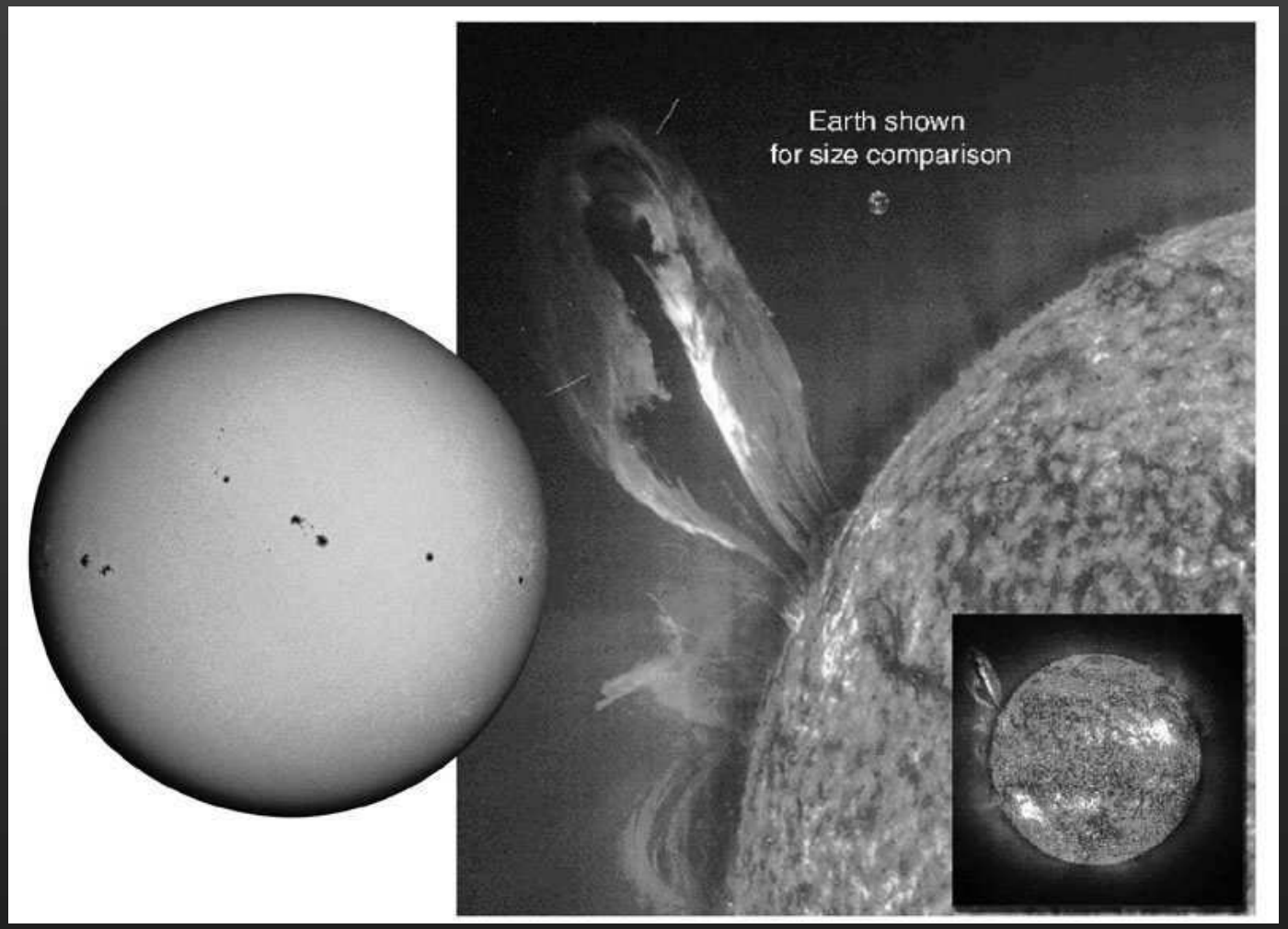
Exploring the Planets II



Jupiter + Io

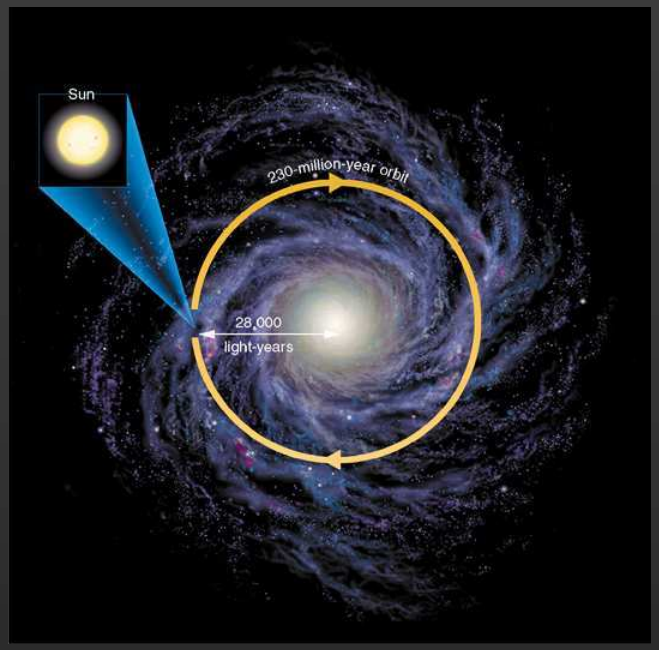
Saturn

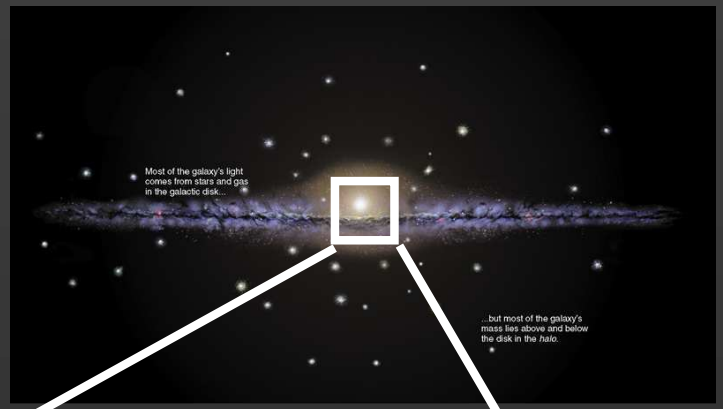
Our Dynamic Sun

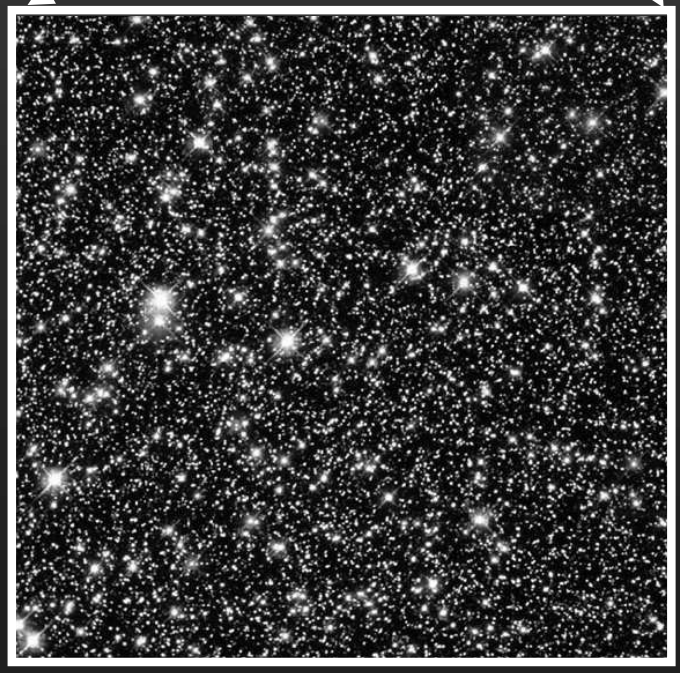


Sun is a ***typical*** Star!

Architecture of the Milky Way: Our Galaxy

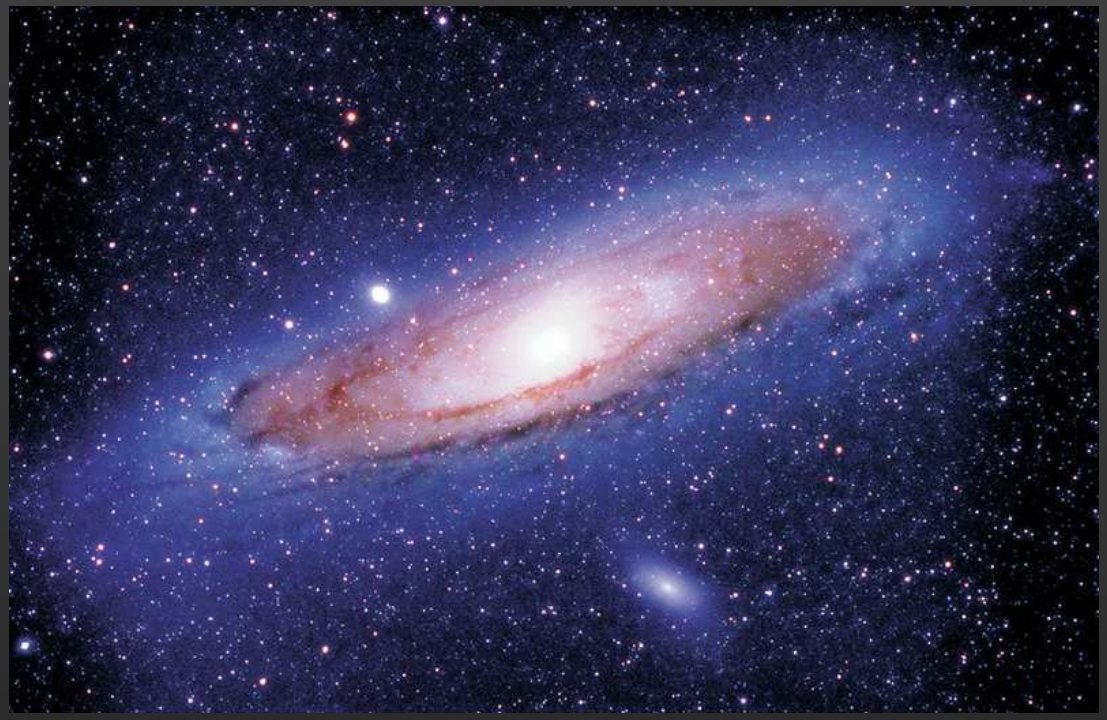






Our Galaxy: 100 billion stars

Multitude of Galaxies



Andromeda (M31)

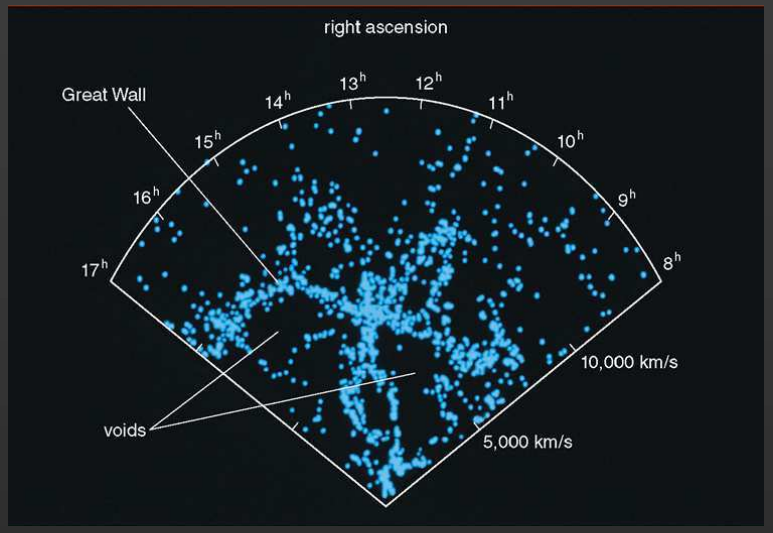
Whirlpool (M51)

Milky Way is a ***typical*** Galaxy!

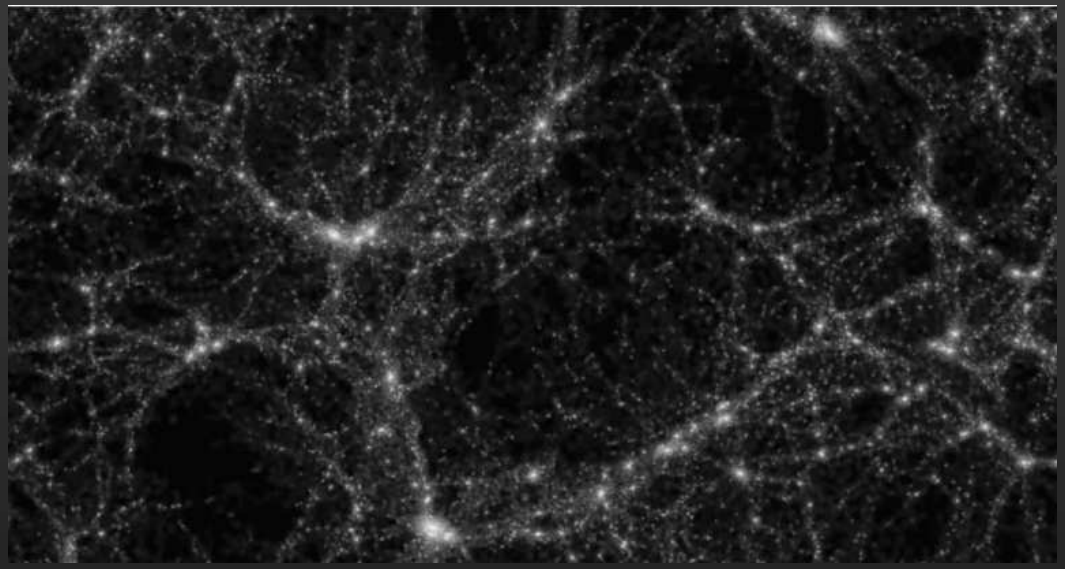
Universe at the Grandest Scale I

The Hubble Deep Field: few 1000 galaxies

Universe at the Grandest Scale II



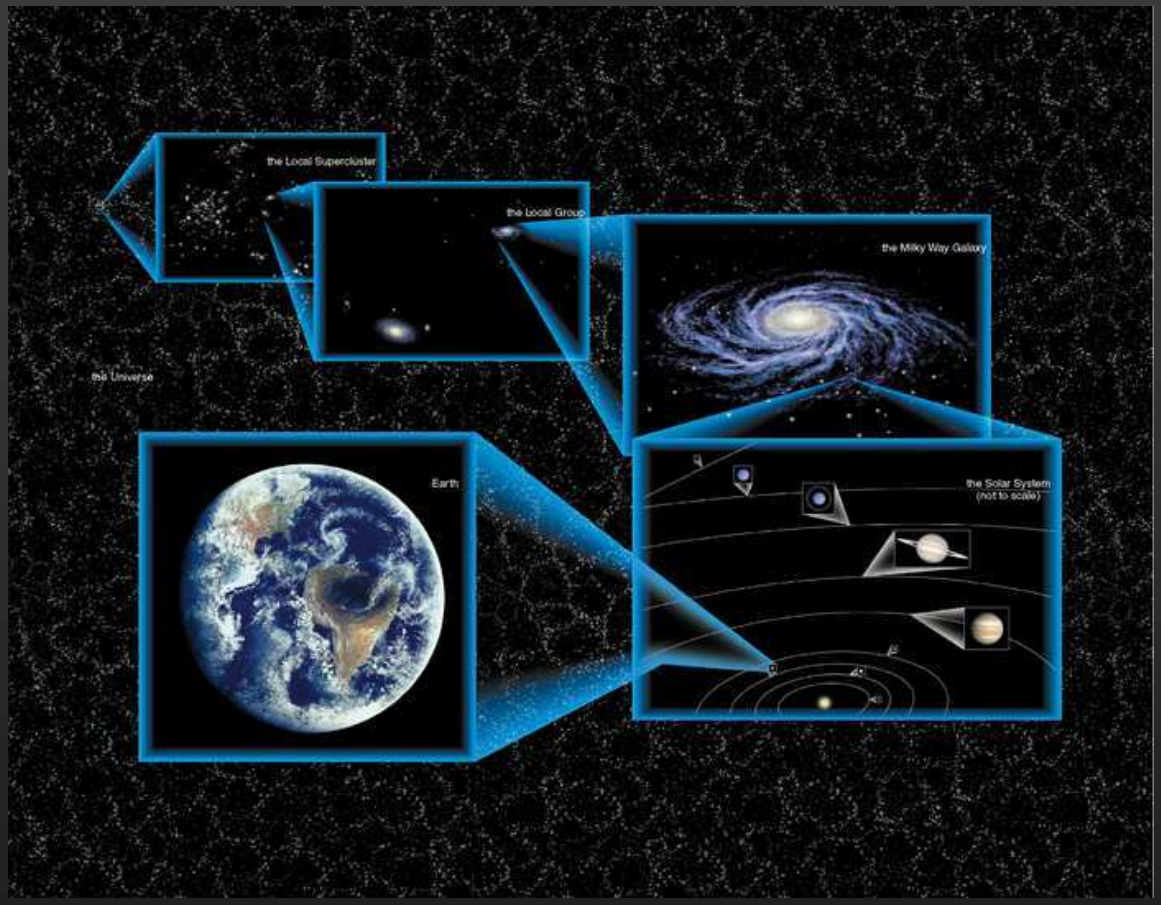
Luminous Matter
(Galaxies)



Dark Matter

From Home to Immensity:

Journey through Space

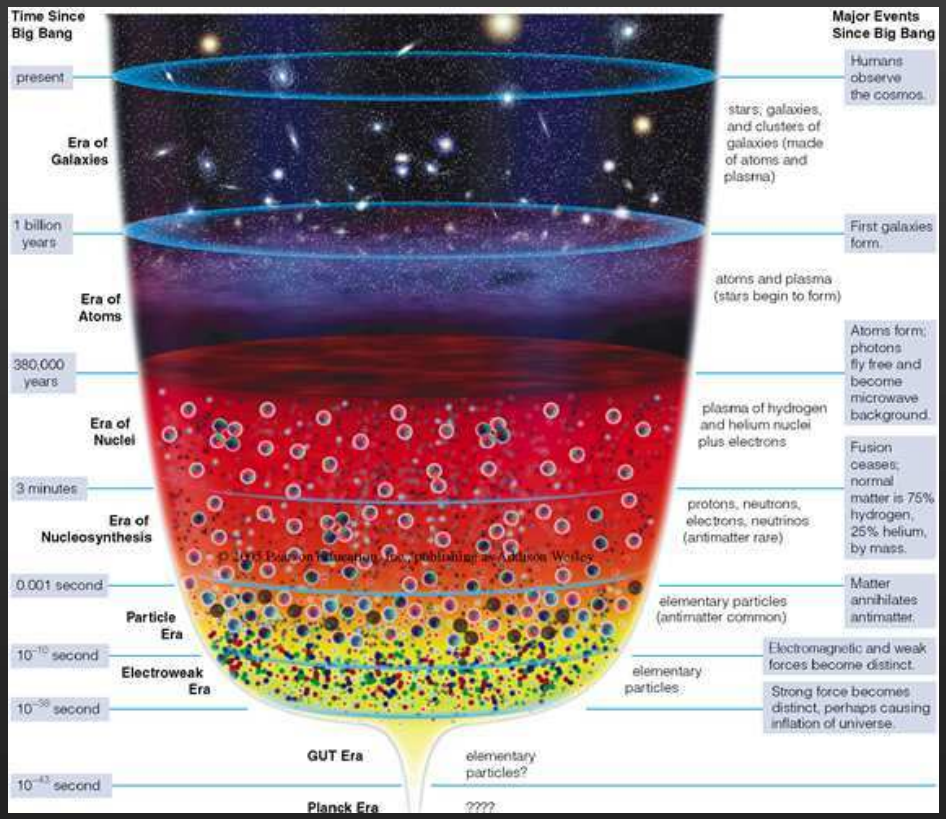


An infinite universe, no center, no edge!

From the Big Bang to Eternity:

Journey through Cosmic Time

space



time

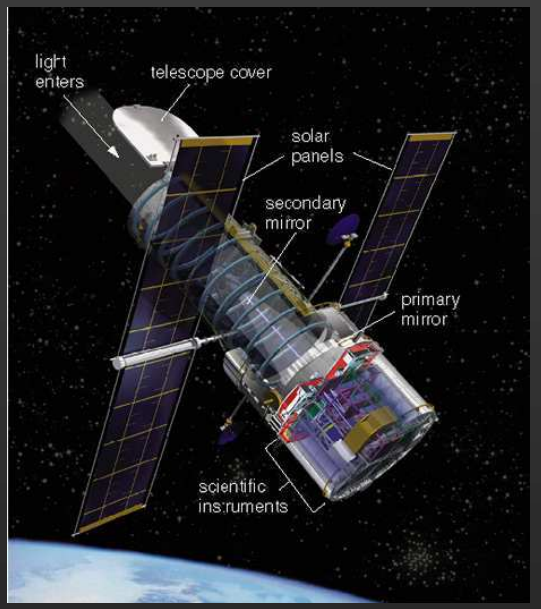
Big Bang

A universe of finite age, but with eternity ahead!

Cosmic Calendar: Human History in Perspective

A Brief History of Astronomy:

From Pre-history to the Modern Age



Two millennia of discovery!

Every culture looks up to the heavens:

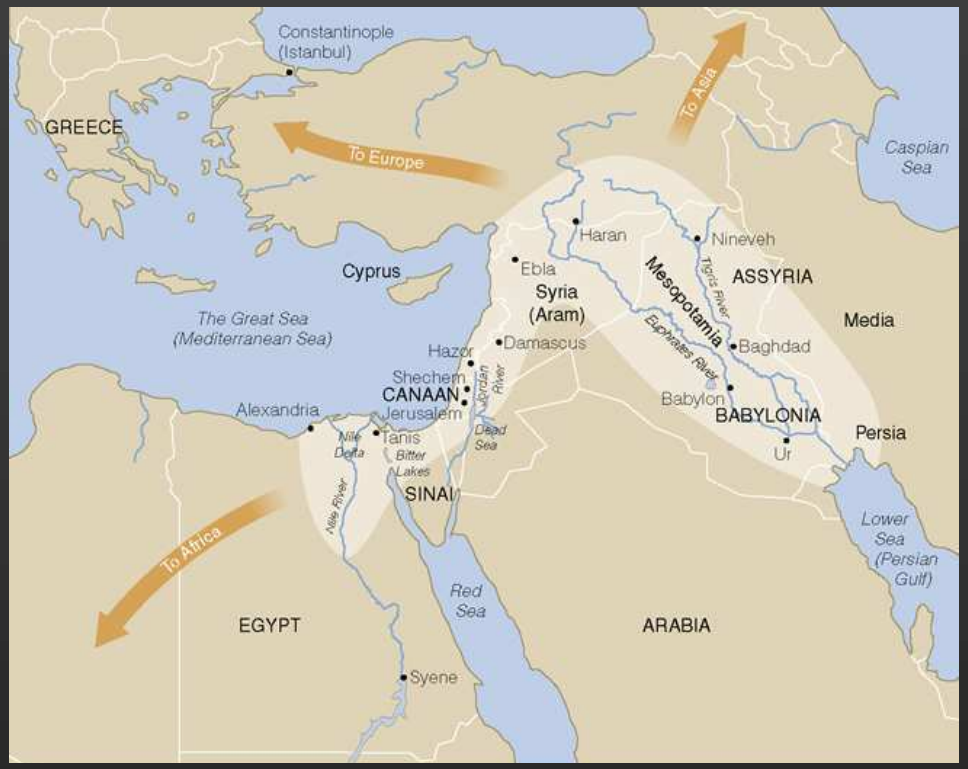
Mayan

China

Polynesia

The Stone Age (~100,000 - 2,000 BC)

Dawn of Civilization



Babylon, Egypt: Technology, astrology, calendars

→ no science yet! → Greece (600 BC)

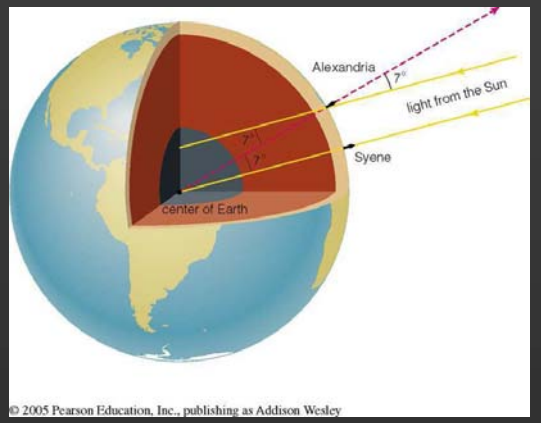
Antiquity (1,000 BC - 500 AD)

Raphael (~1510): School of Athens

Antiquity (1,000 BC - 500 AD)

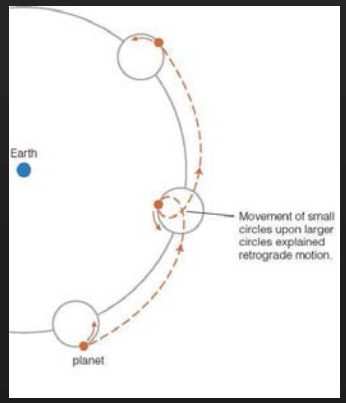
Great Library of Alexandria

Eratosthenes (2nd BC)



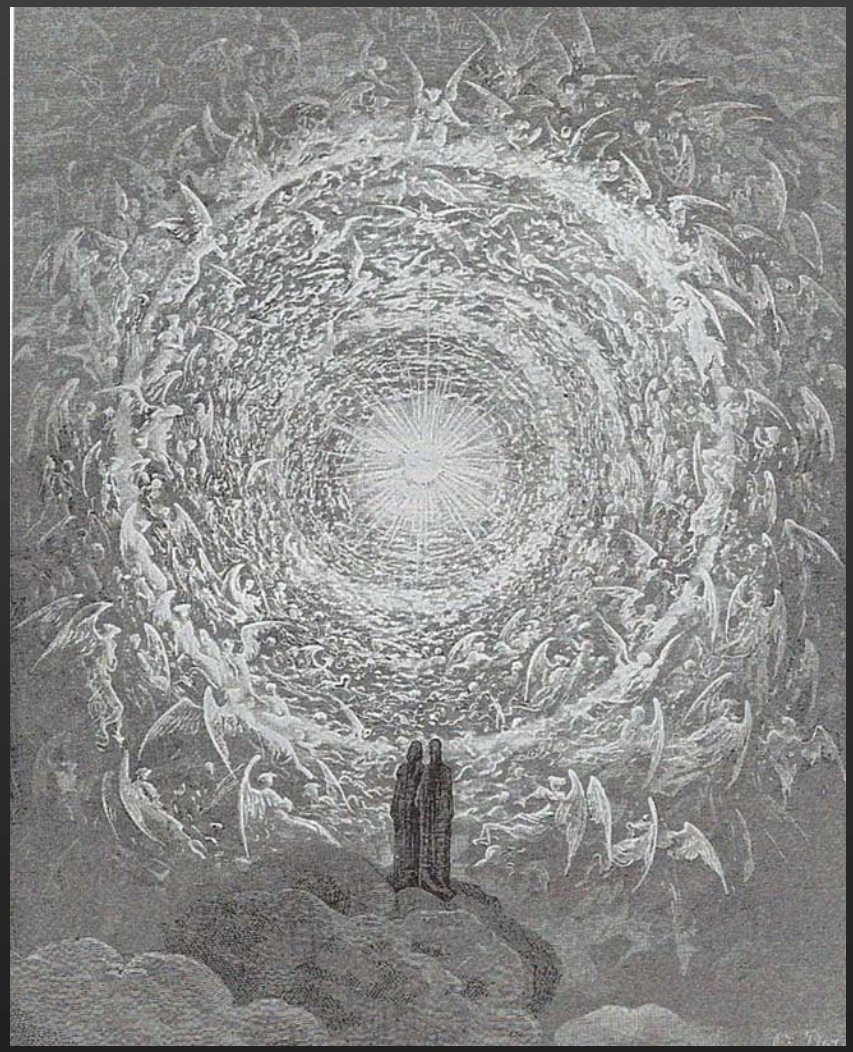
- Earth is Sphere
-Measure size

Ptolemy (150 AD)



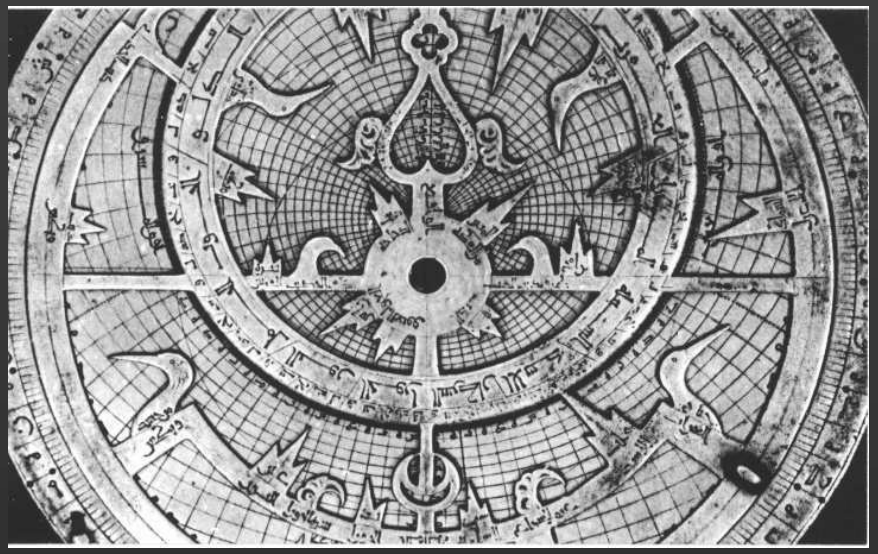
- Intricate model for planetary motion
- Geocentric system

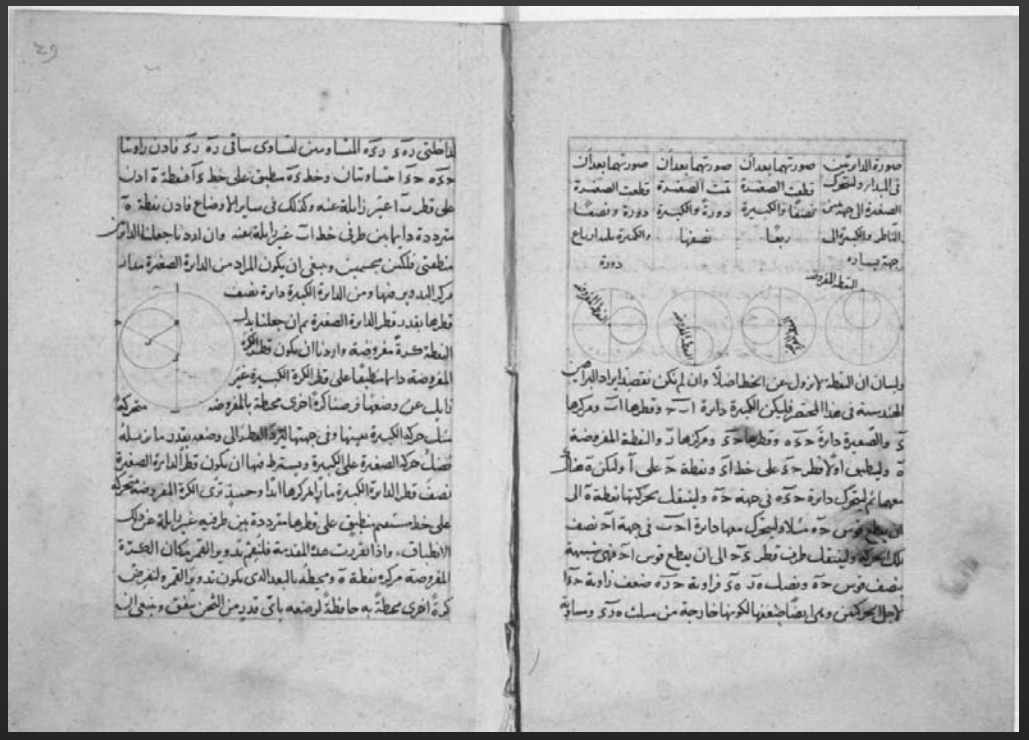
Middle Ages (500 - 1492 AD)



Dante’s Paradise (The Empyrean)

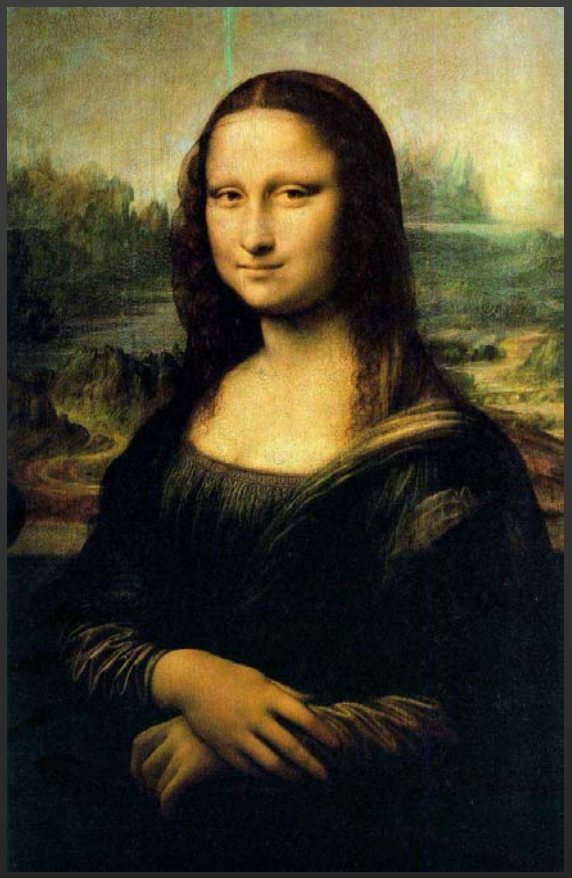
Middle Ages/Islam (7th cent. - 1,600)





Preserve and develop classical heritage!

Renaissance (1450 – 1600 AD)



(Leonardo da Vinci, La Gioconda)

Rebirth of activity in arts and sciences!

Renaissance (1,450 – 1,600 AD)

Copernicus
(1473-1543)

Copernican Revolution: (De Revolutionibus, 1543)

Earth-centered → Sun-centered universe

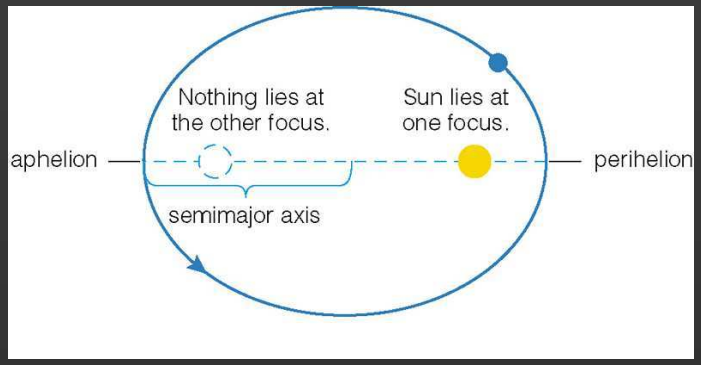
The Baroque Period (1600 – 1750 AD)

(Rubens, Battle of the Amazons)

The Scientific Revolution!

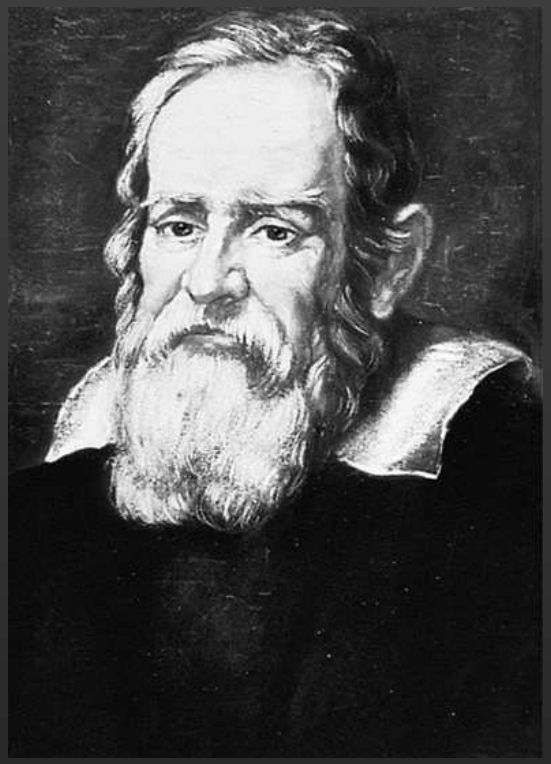
The Baroque Period (1600 – 1750 AD)

Kepler (1571-1630)

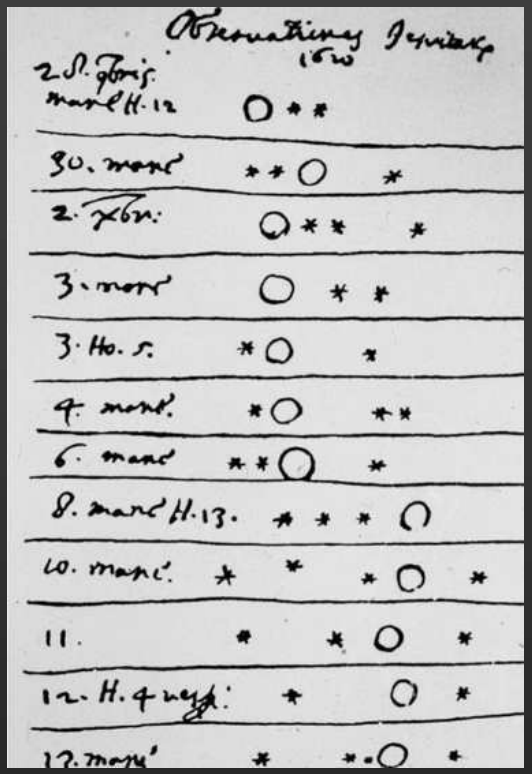


- Planets move in elliptical oribits around Sun

The Baroque Period (1600 – 1750 AD)



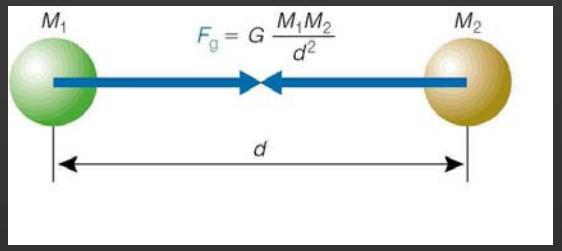
Galileo (1564-1642)



Telescopic Discoveries

The Baroque Period (1600 – 1750 AD)

Newton (1642-1727)



Law of Universal Gravity

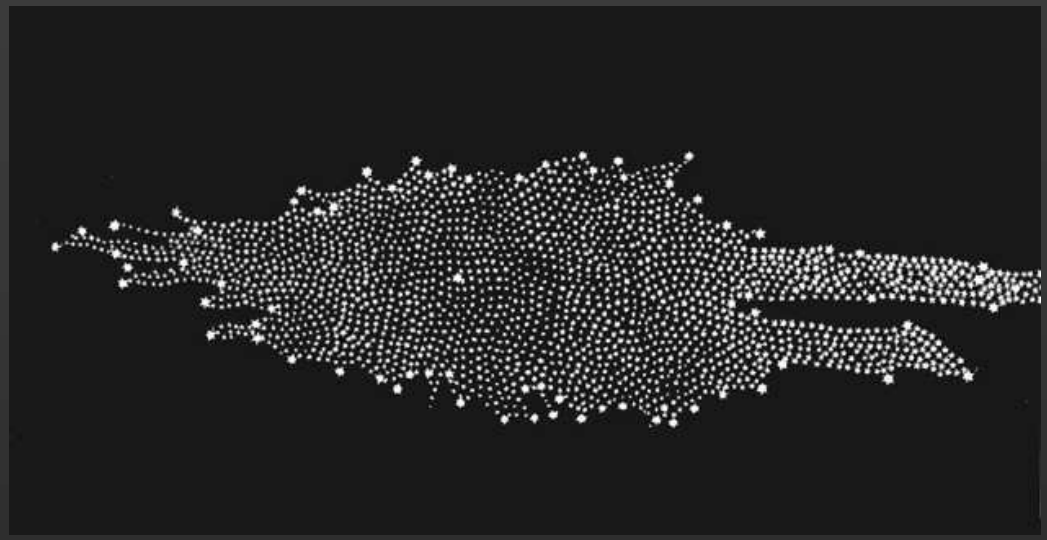
The Enlightenment (1750 – 1830 AD)

(Portrait of Denis Diderot → Encyclopedie)

Science comes of Age!

The Enlightenment (1750 – 1830 AD)

Sir William Herschel
(1738-1822)



Shape of Milky Way Galaxy

→ Discoverer of Uranus, 1781

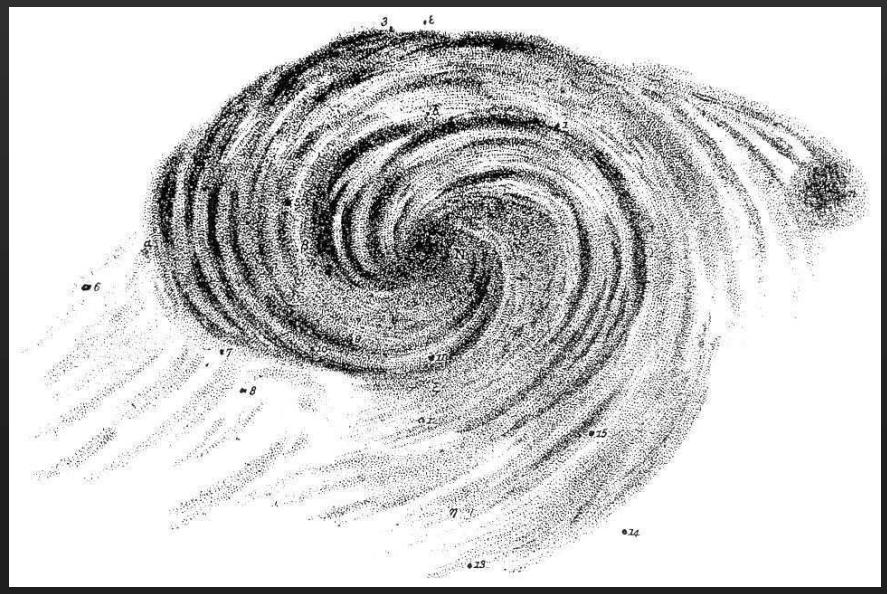
The Victorian Age (1830 – 1900 AD)

(Crystal Palace, London, Great Exhibition of 1851)

Dynamic interplay between science and technology!

The Victorian Age (1830 – 1900 AD)

William Parsons
(1800 – 1867,
3rd Earl of Rosse)



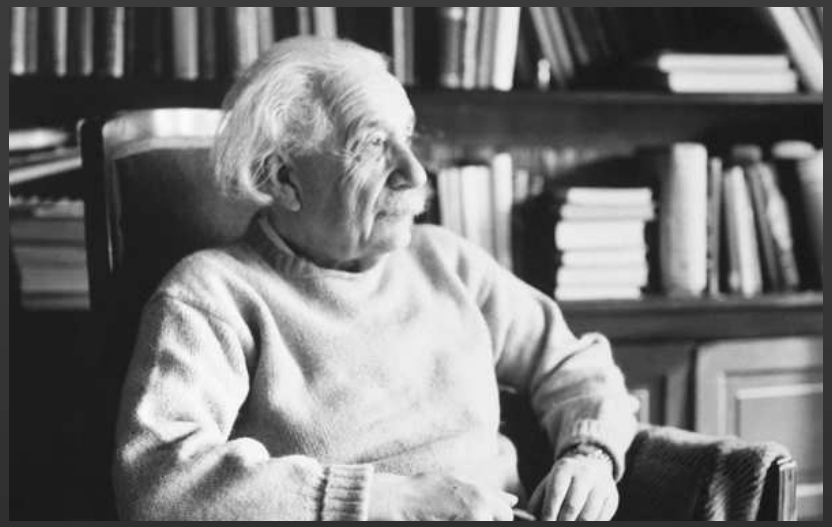
Spiral Nebulae

The 20th Century

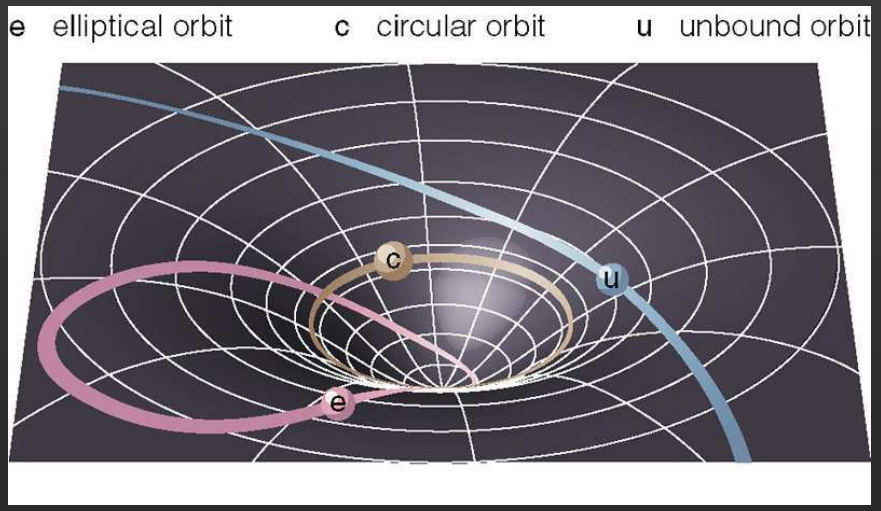
(Picasso, Guernica 1937)

Towards our modern view of the universe!

The 20th Century



Einstein, 1879 - 1955

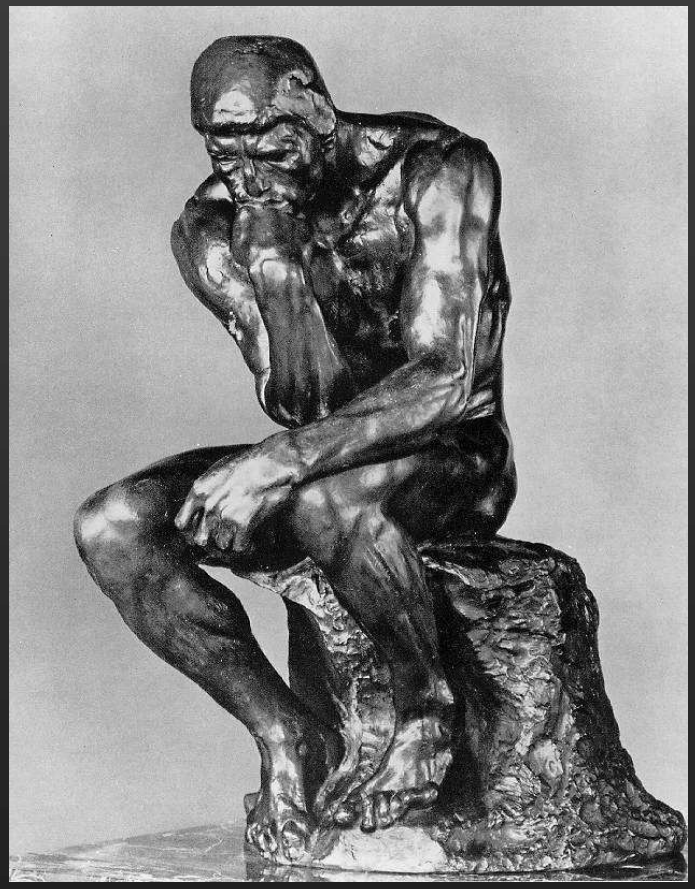


General Theory of Relativity:

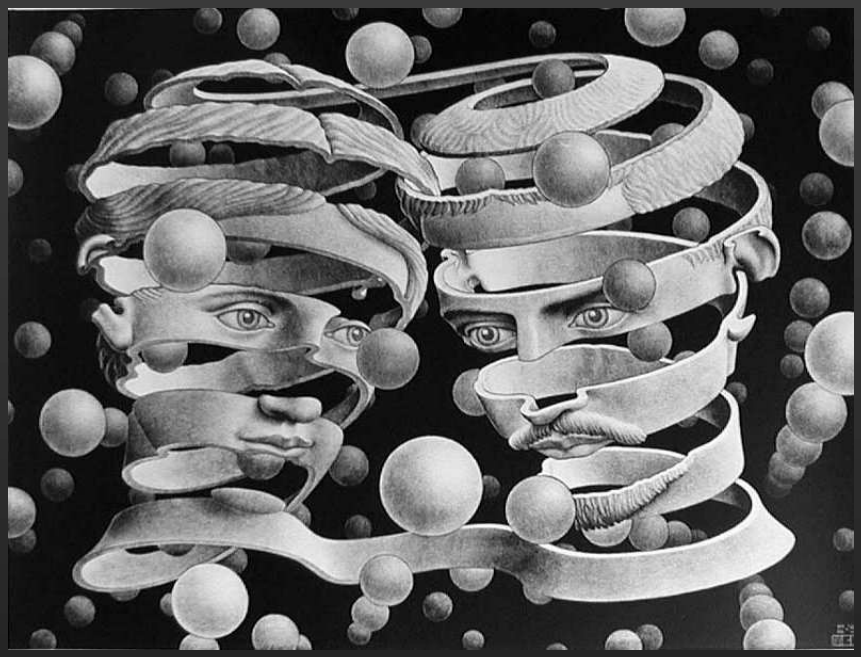
Gravity = curved spacetime

History of Astronomy:

The Story of Humanity



Auguste Rodin,
The Thinker (1880)



M. C. Escher,
Bond of Union (1956)