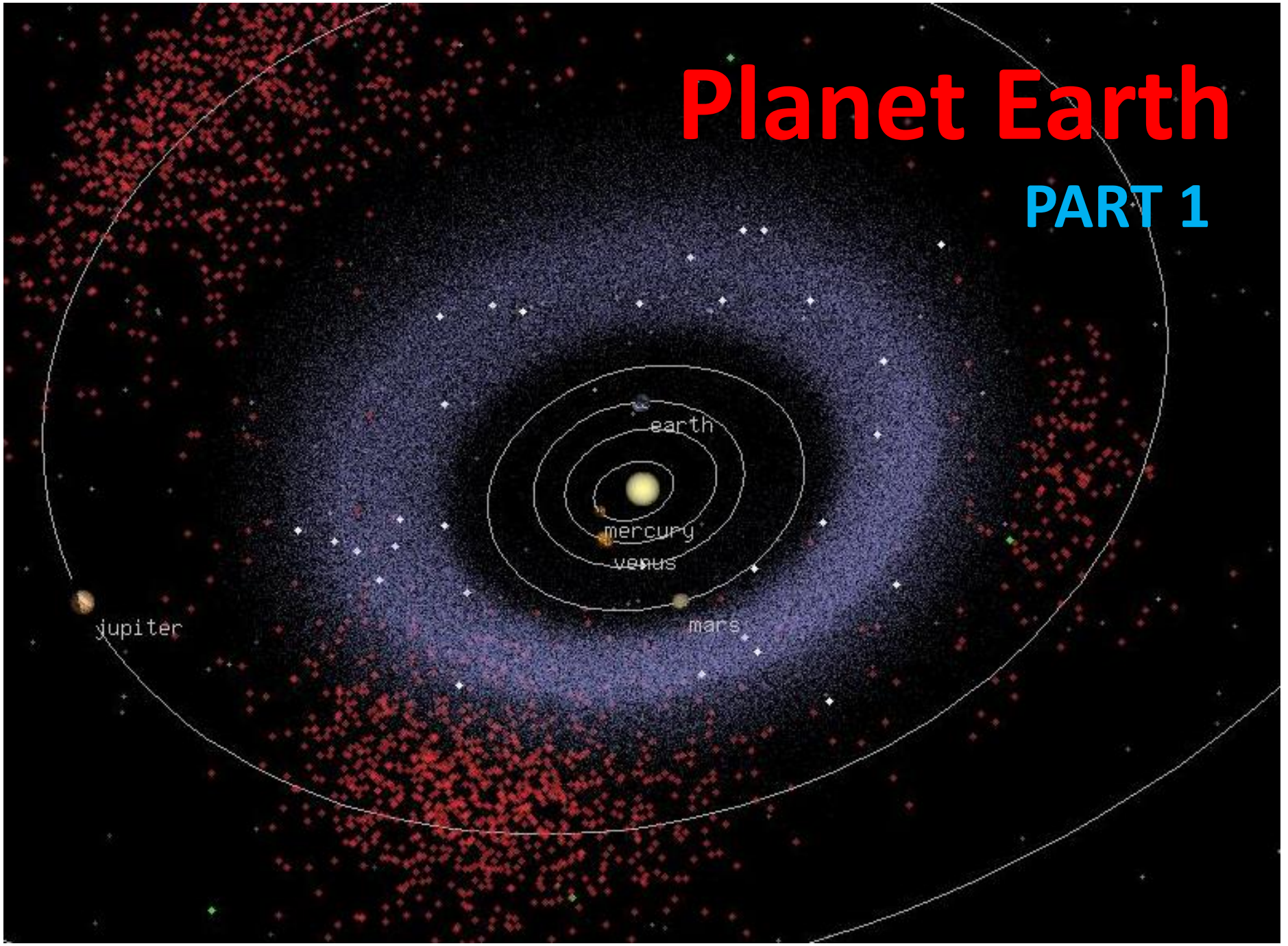
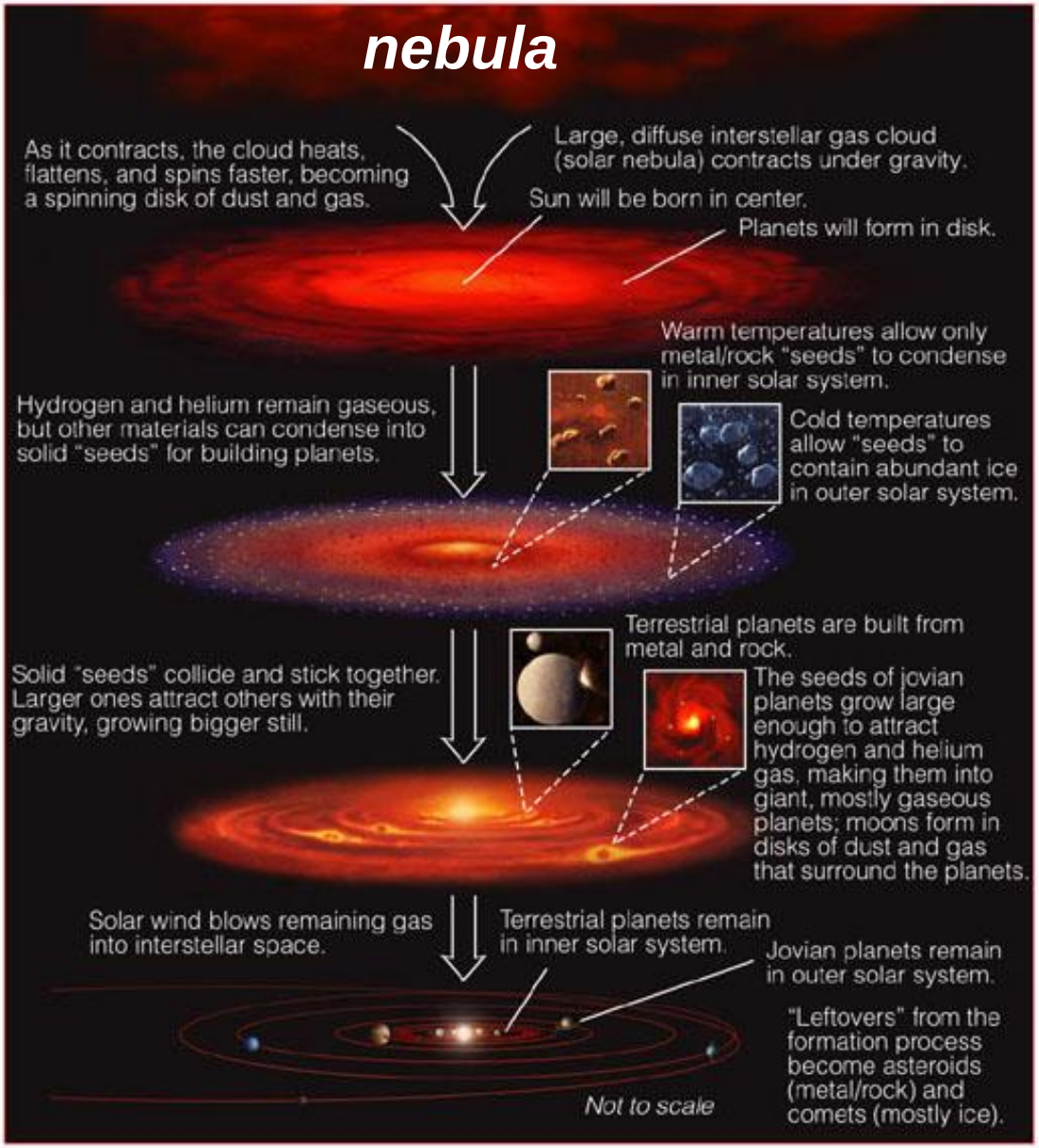

Planet Earth
PART 1
earth
mercury
venus
mars
jupiter

The Formation of the Solar System

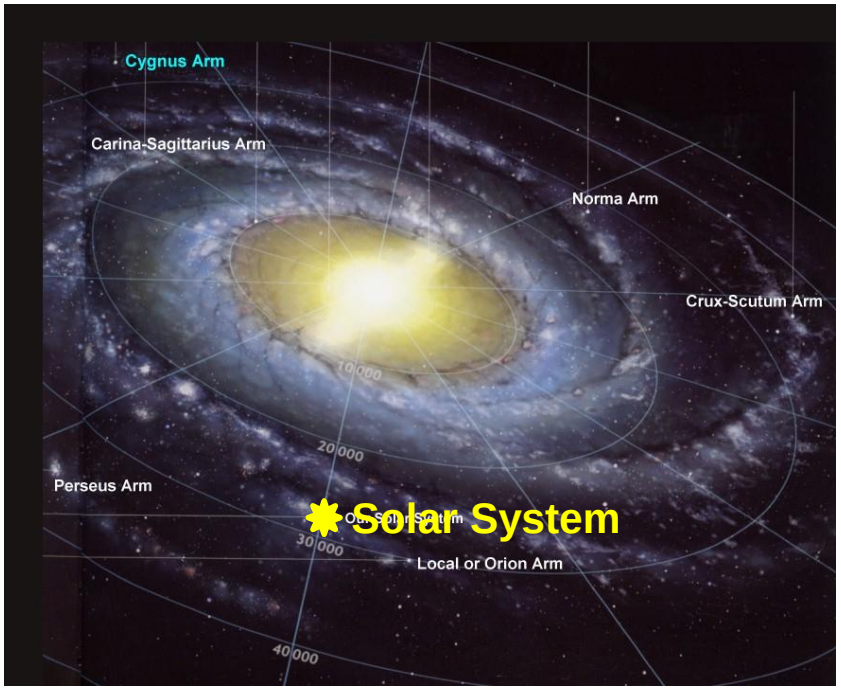


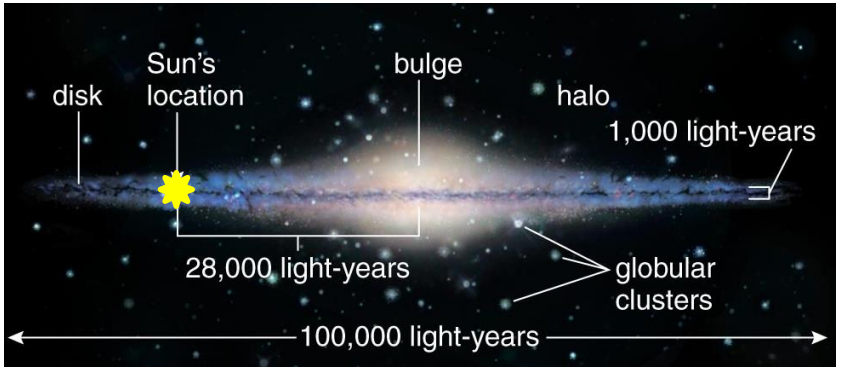
Solar System formed about 4.6 billion years ago, when gravity pulled together low-density cloud of interstellar gas and dust (called a *nebula*).

The Sun, planets, moons, comets, asteroids are believed to form within ~100 million years.

Our Galaxy: the Milky Way

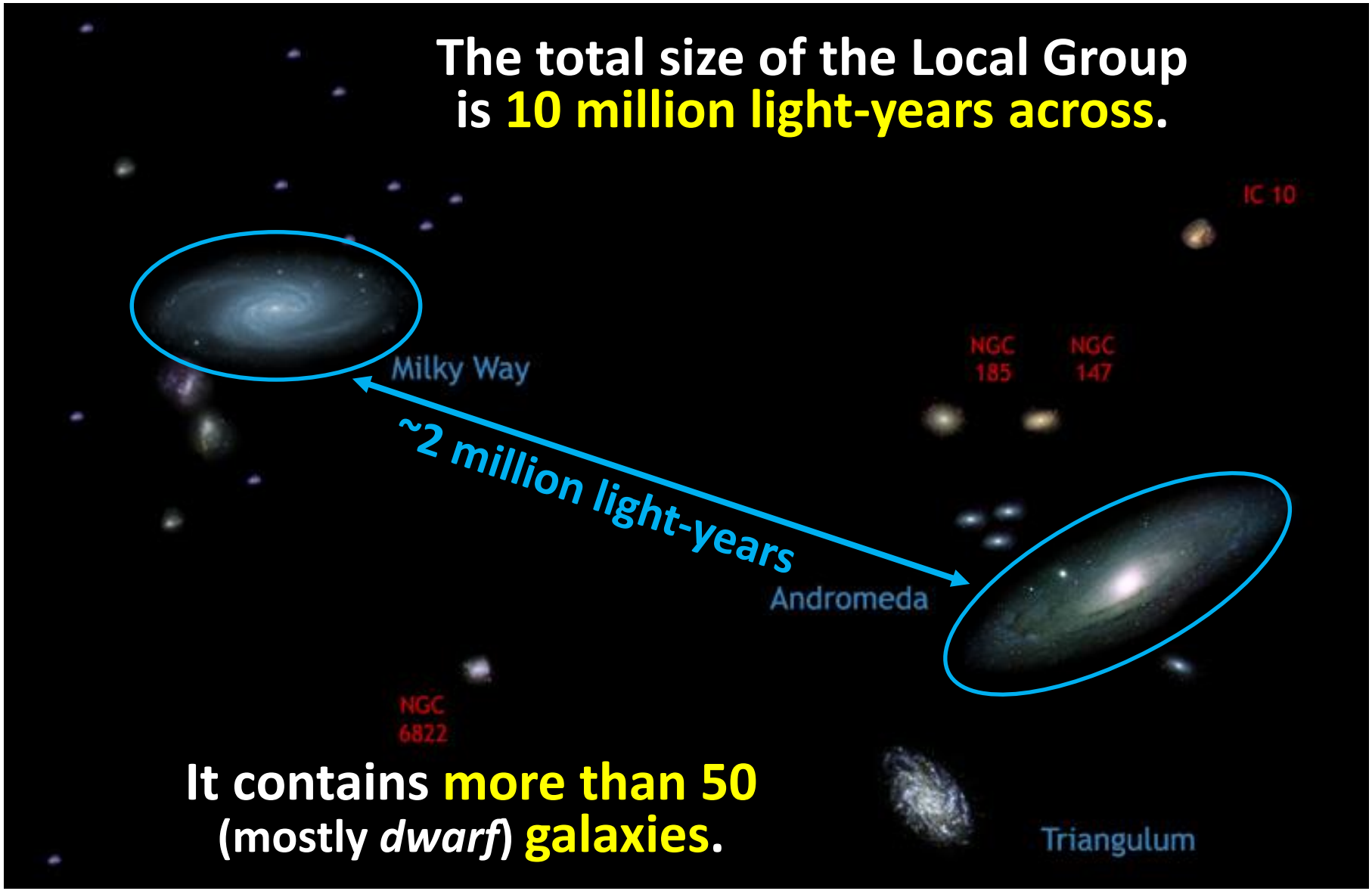
- A **galaxy** is a large, massive system consisting of stars, an interstellar medium of gas and dust, stellar remnants, and dark matter, all bound together by gravity.
- Probably ~200 billion galaxies in the observable Universe.
- The **Milky Way** is a barred spiral galaxy (we think!) some ~100,000 light-years in diameter, which contains 100–400 billion stars. It may contain at least as many planets as well!
- Most galaxies in the Universe appear to be the size about 1/100 of the Milky Way with only a few billion stars.





1 light-year = 5.88 trillion miles

Our Local Group of Galaxies



Back to Earth…

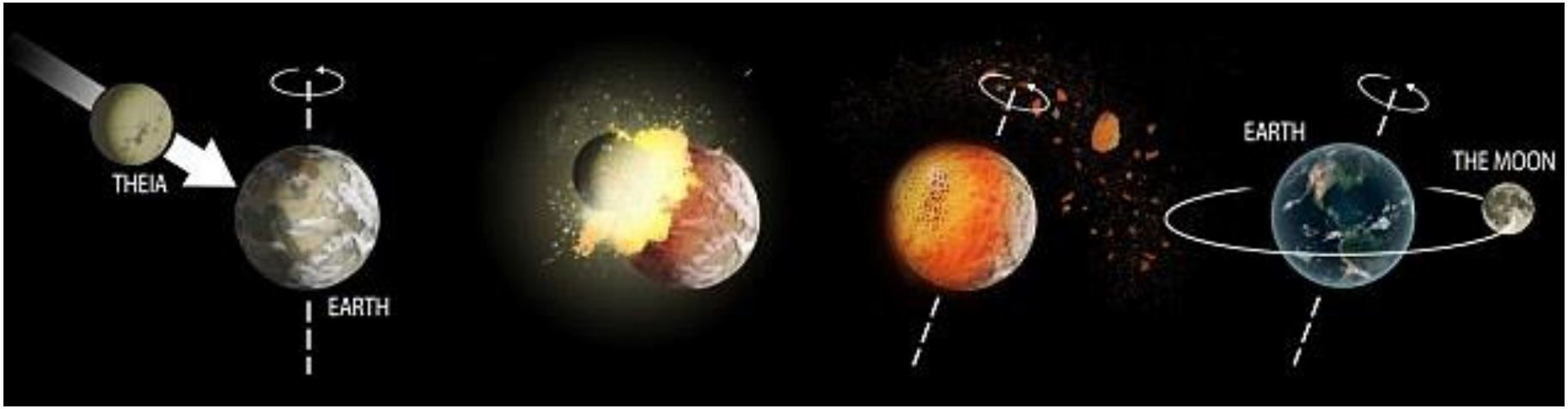
Earth Facts

- Earth is a terrestrial planet (rocky body), *third* from the Sun.
- Earth has a *single natural satellite*, the Moon.
- Earth has LIFE!
- Of the four terrestrial planets in the Solar System:
  - Earth is the largest both in size and mass.
  - Earth has the highest density, the strongest magnetic field, and the fastest rotation.
  - Earth has the highest surface gravity equal to 9.798 m/s.

From the Earth's surface, the apparent sizes of the Sun and the Moon are approximately the same.

Formation of our Moon

The Giant Impact Hypothesis (GIH)



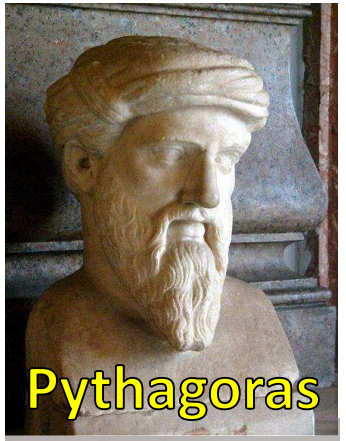
- **GIH suggests that the Moon formed out of the debris left over from a collision between Earth and an astronomical body the size of Mars, approximately 4.5 billion years ago, about 20 to 100 million years after the Solar System coalesced.**
- **The colliding body is sometimes called Theia.**
- **Mystery: Earth and Moon have almost identical composition which is difficult to explain within the Giant Impact Hypothesis…**

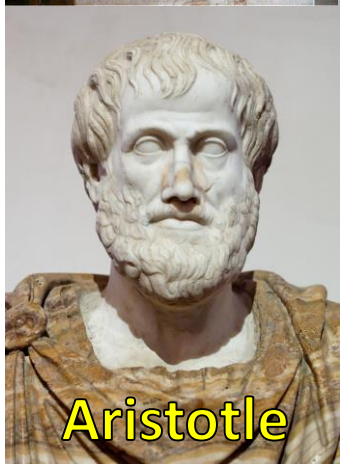
Earth Shape and Size

- Earth's shape is nearly round/spherical with a mean radius of approximately 6371.0 km (3959 miles).
- Notion of spherical Earth was first made by Pythagoras in 6th century BC.
- Aristotle (4th century BC) provided physical and observational arguments supporting the idea of a spherical Earth:

  - Travelers going south see southern constellations rise higher above the horizon.
  - The shadow of Earth on the Moon during a lunar eclipse is round.

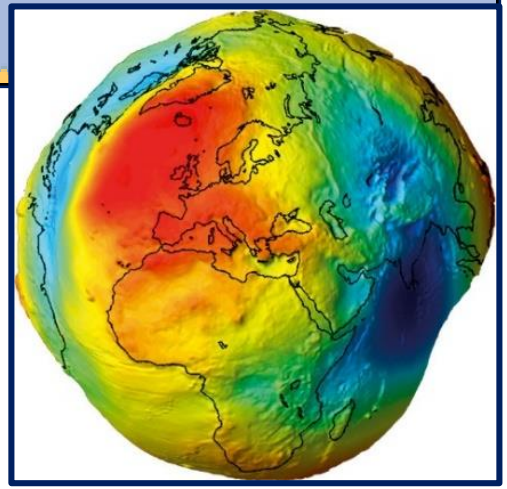
- Earth's circumference was first estimated by Eratosthenes (3th century BC) as 250000 *stades*.





Earth Shape and Size

- **Ferdinand Magellan (1480-1521) led the 1st expedition around the world that proved that Earth is round.**



- **Actual Earth shape is a sphere flattened along the axis from pole to pole such that there is a bulge around the equator (resulting from the planet's rotation): the diameter at the equator is 43 km (27 mi) larger than the pole-to-pole diameter.**

The Globe

The Globe is a three-dimensional scale model of Earth (also called geographical globe or terrestrial globe).

- The earliest known example of the terrestrial globe was constructed by Crates of Mallus (who lived on the territory of modern-day Turkey) in the mid-2nd century BC.

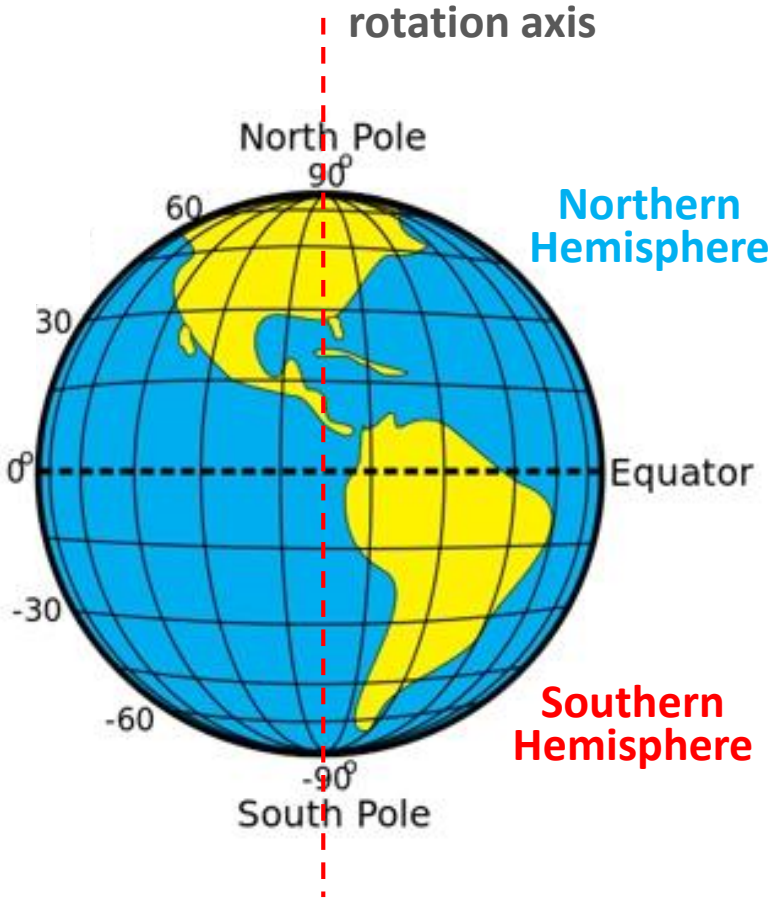
- The oldest surviving terrestrial globe is the Erdapfel ("earth apple"), created in 1492 by Martin Behaim in Nuremberg, Germany. Overlaid with a meticulously painted map, it shows an enlarged Eurasian continent, an oversized Japan and an empty ocean between Europe and Asia.

- The world's largest geographical globe is the Unisphere in Queens, New York (12-story high!).

Earth's Axis, Poles and Equator

Our planet Earth spins around on an imaginary line running through it. This line is called the Earth's axis. The two points where axis meets the surface are called the Geographic North Pole and the Geographic South Pole.

- **The area around the North Pole is called the Arctic, while the area around the South Pole is called the Antarctic.**
- **The Equator is an imaginary line on the Earth's surface which is at equal distance from the North Pole and South Pole. It is about 40,075 km (24,901 mi) long; 78.7% is across water and 21.3% is over land.**
- **The Equator divides Earth into the Northern Hemisphere and Southern Hemisphere.**



North Pole vs South Pole

Arctic	Antarctic
What kind	of surface?
How much ice	does it have?
How much oil	does it store?
How	cold?
Unique	fauna?