



Astronomical!



The Size of the Universe

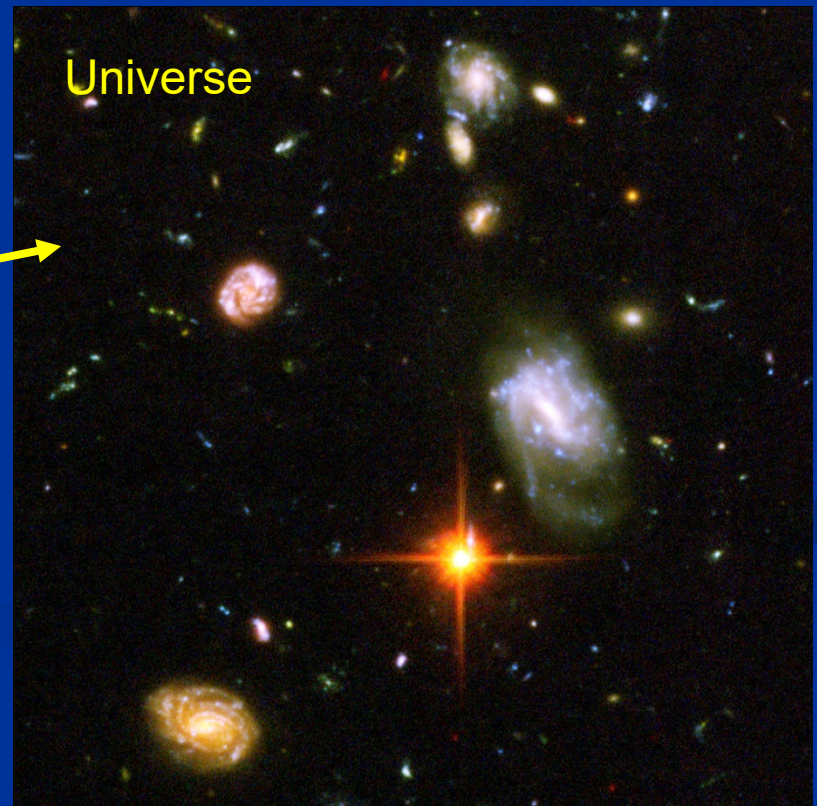
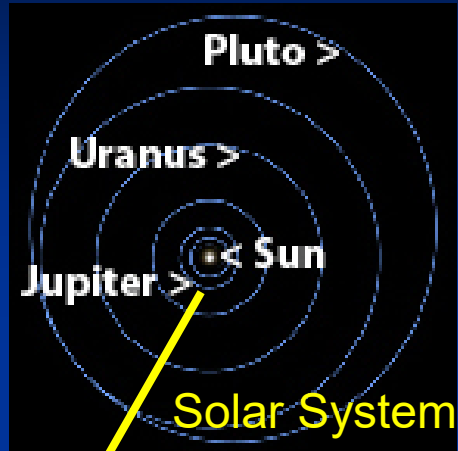




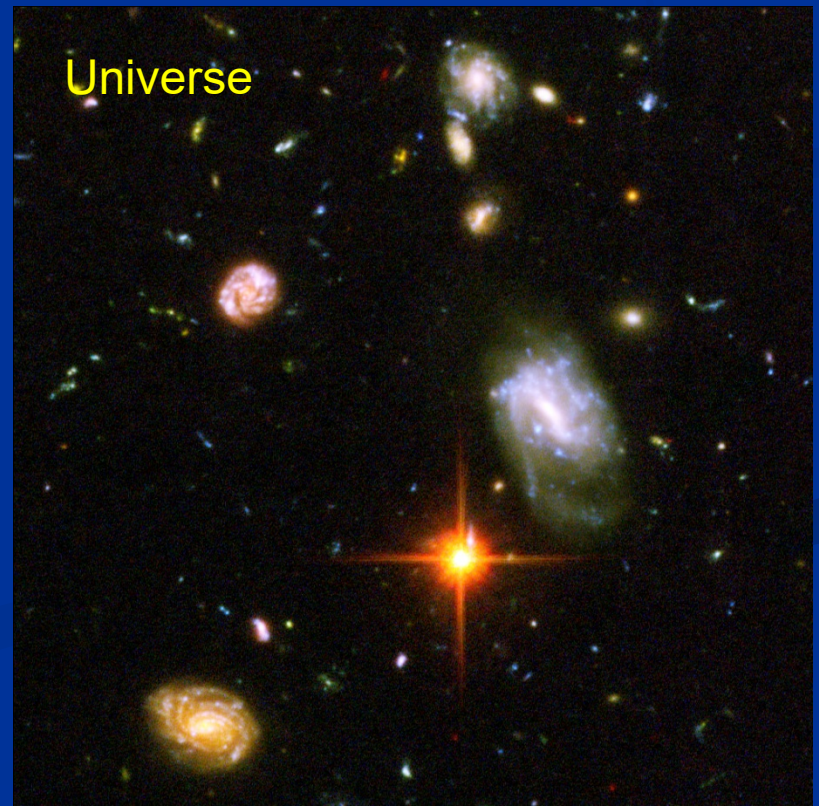
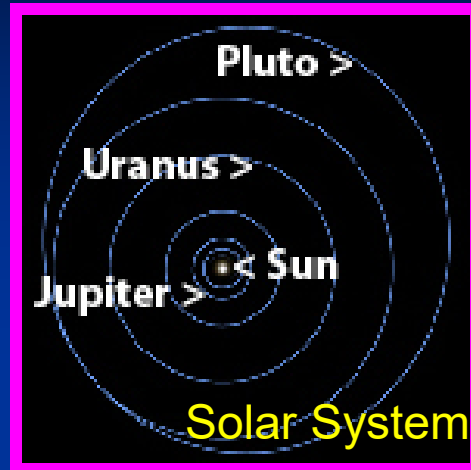




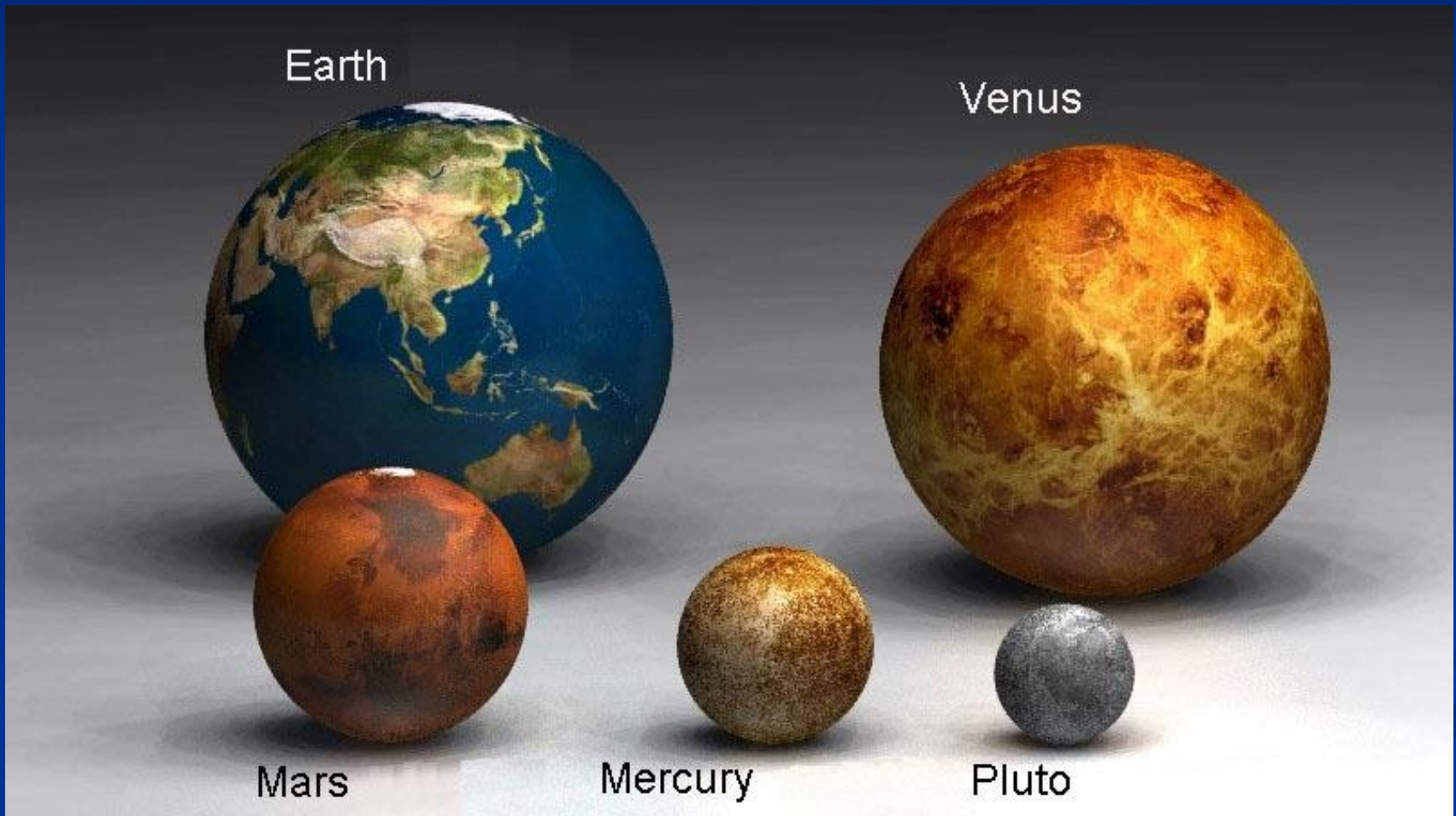
What's the Difference?



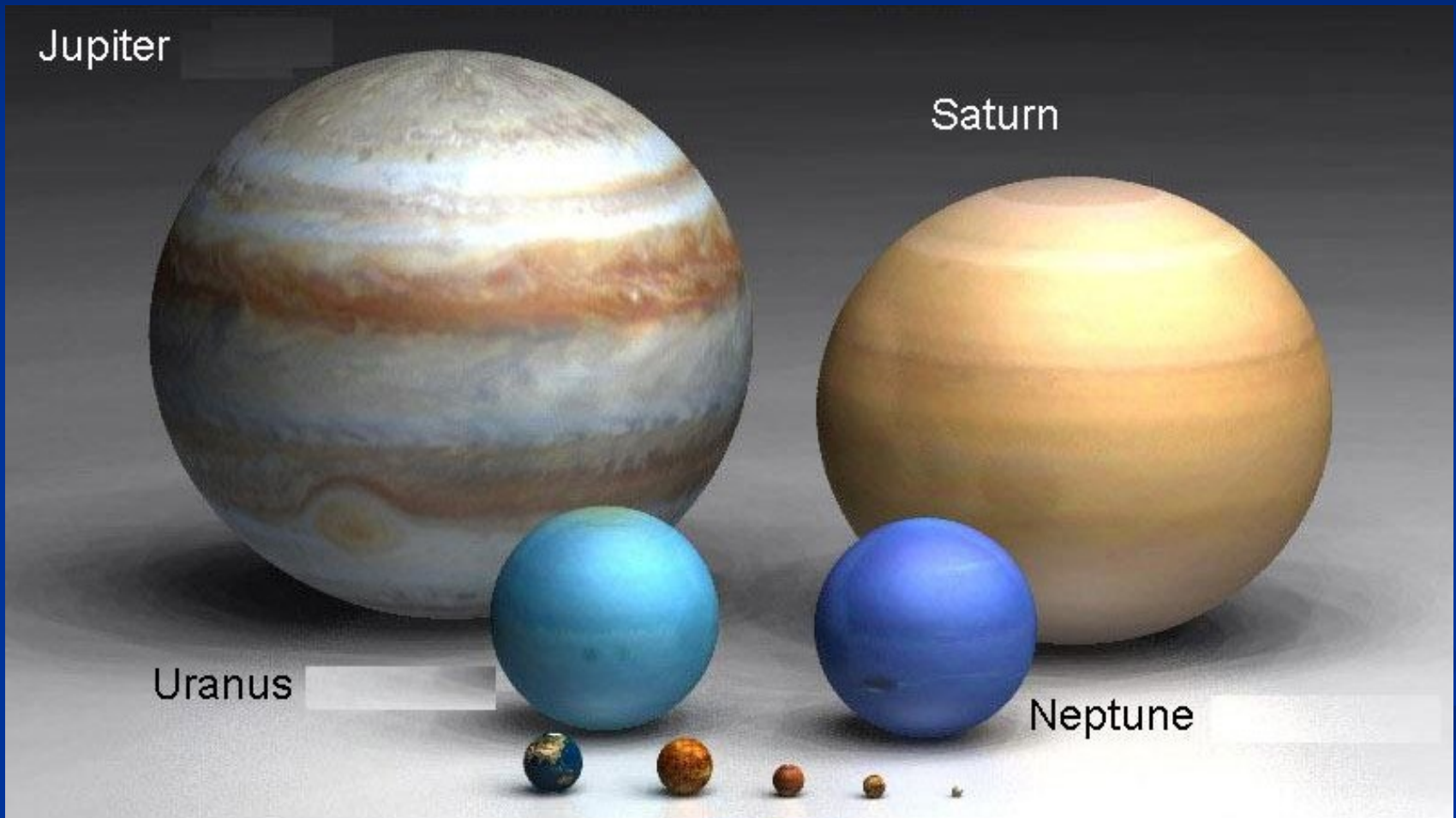
The Solar System



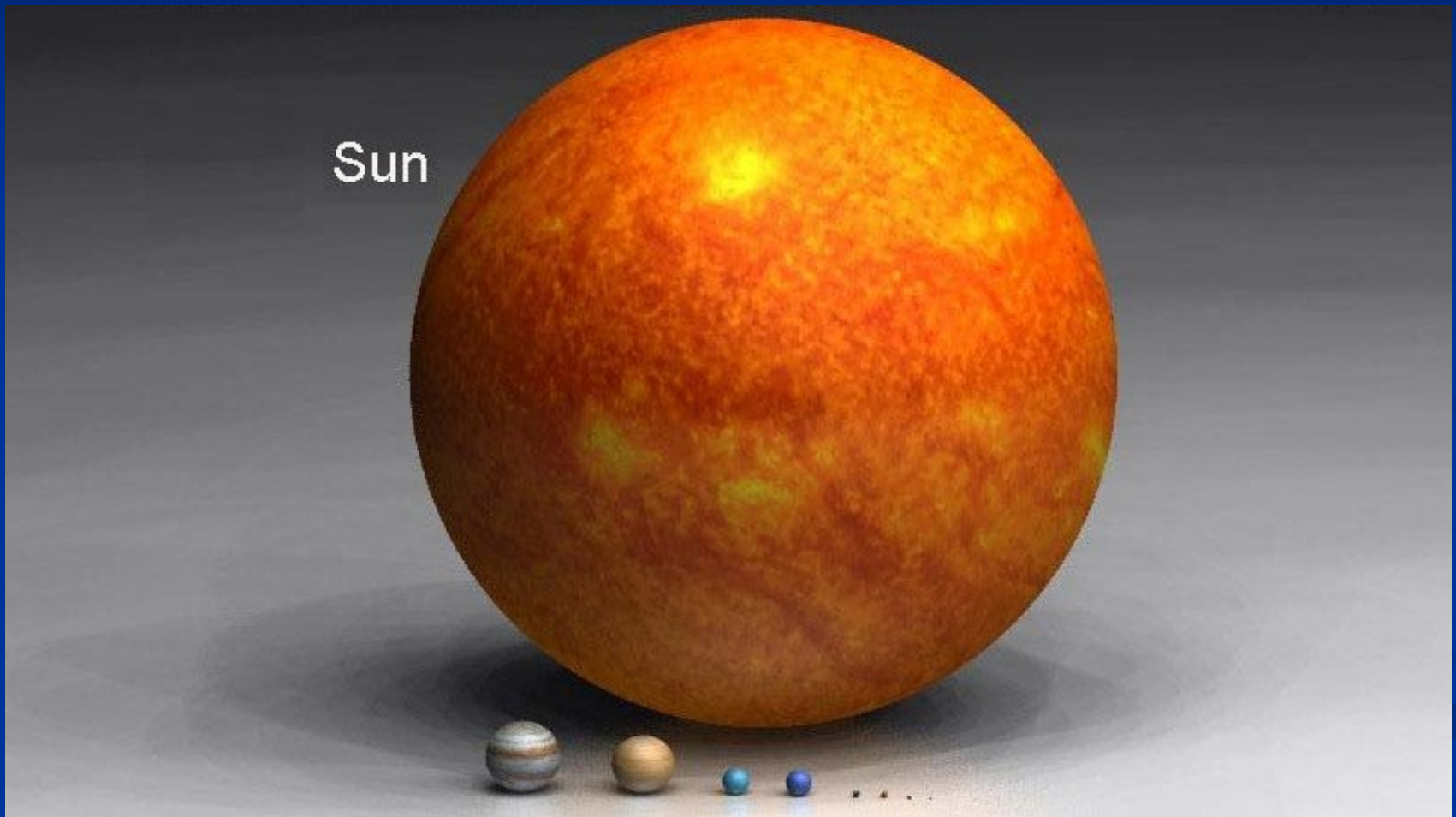
The Size of the Planets



The Size of the Planets



The Size of the Planets





Astronomical Term

Astronomical Unit (AU)

- Mean distance from the Earth to the Sun
- 92,955,807 Miles
- Handy for measuring distances in the Solar System.



Distances in AU

■ Planets

Mercury: 0.387 AU
Venus: 0.723 AU
Earth: 1.000 AU
Mars: 1.524 AU

Jupiter: 5.203 AU
Saturn: 9.582 AU
Uranus: 19.201 AU
Neptune: 30.07 AU

■ Other

Ceres: 2.767 AU
Pluto: 39.53 AU
Eris: 67.958 AU
Sedna: 85 AU

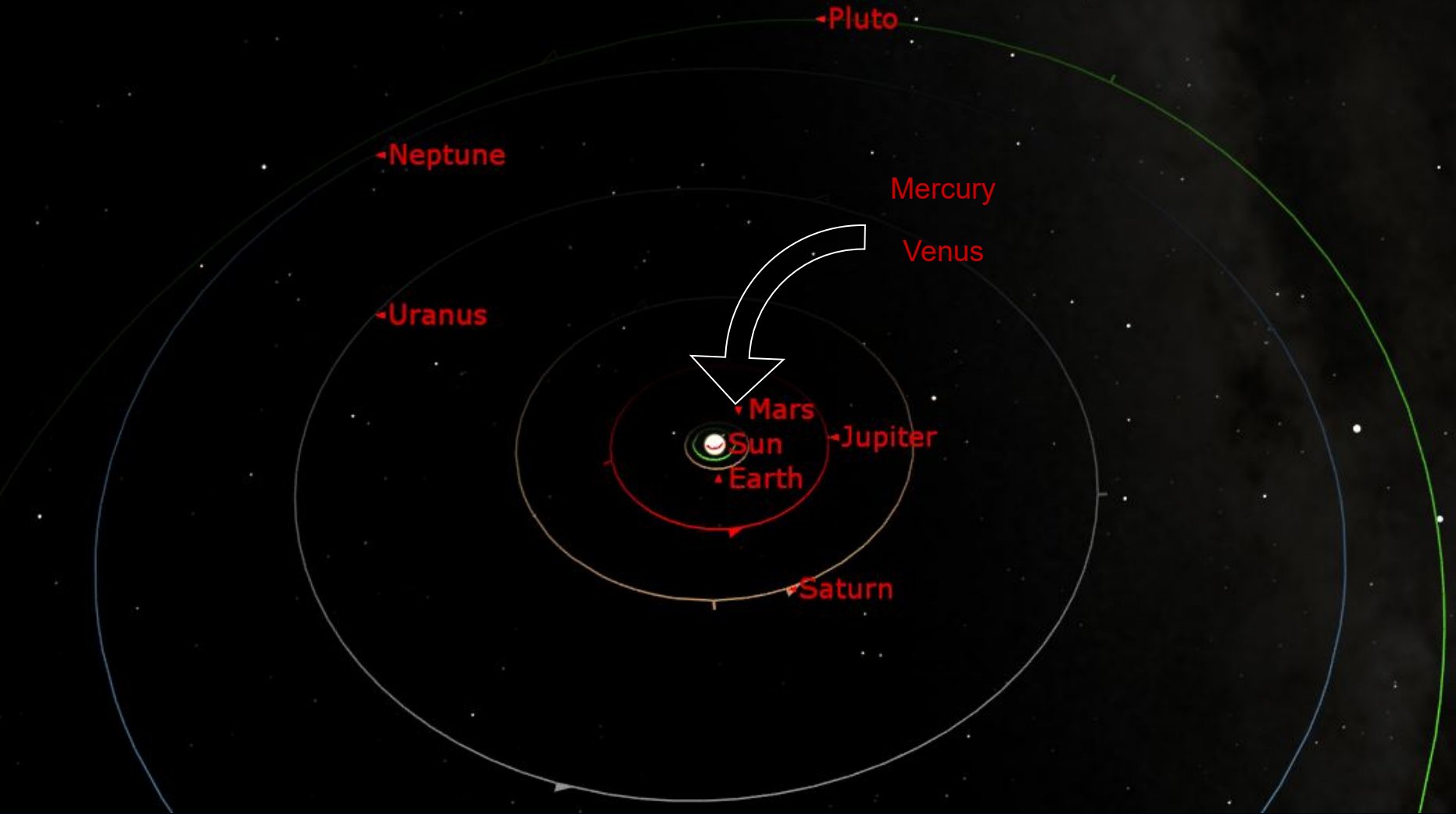


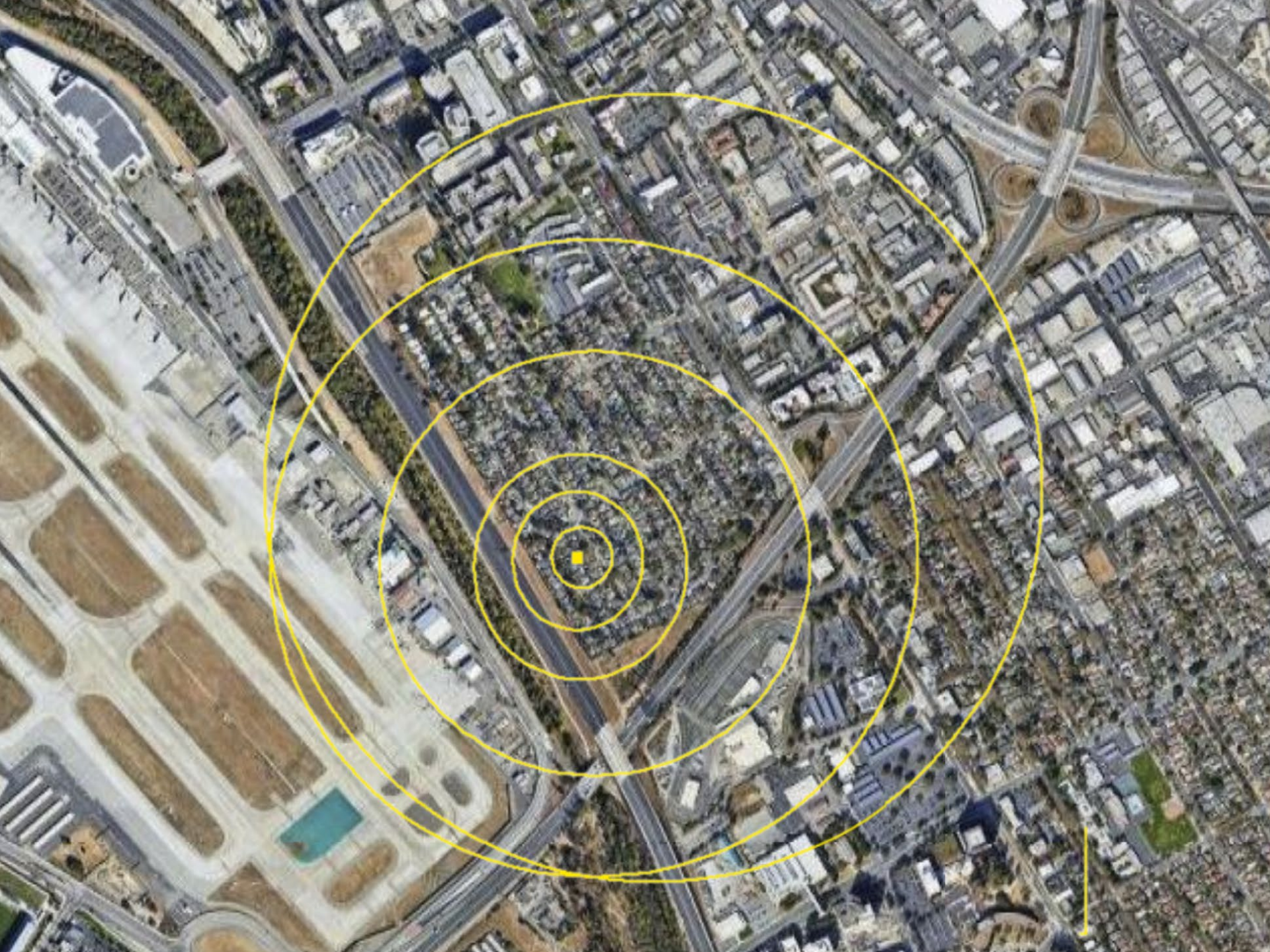
A Boeing 747 Cruising at 550 MPH.

- To travel from San Francisco to New York takes about 6 Hours.
- To travel all of the way around the Earth takes less than 2 days.
- To get from Earth to the Sun would take 18 Years!
- To get from the Sun to Pluto would take 700 Years!
- To get to the nearest star would take 4,718,913 years



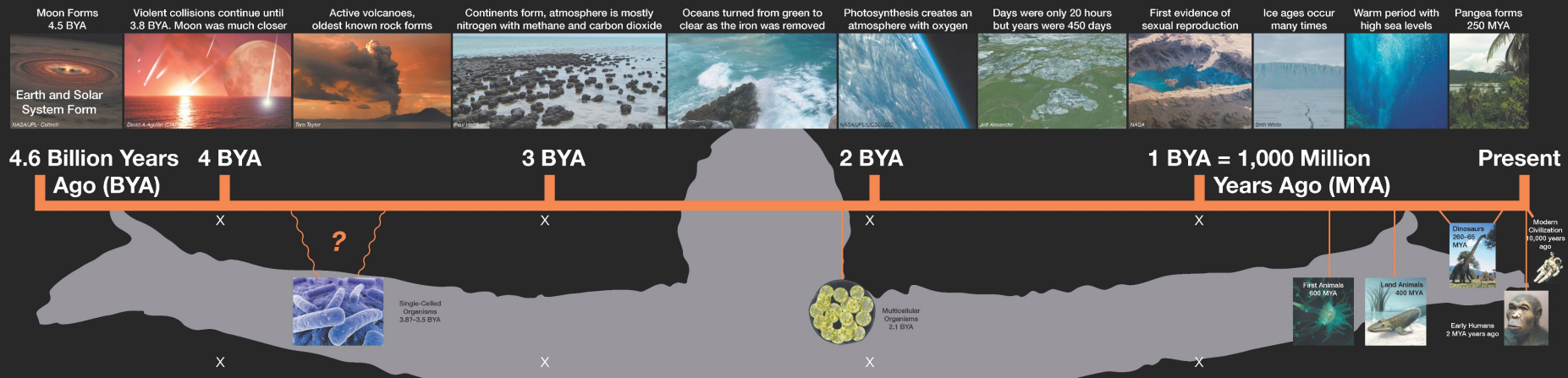
Solar System







Earth Timeline



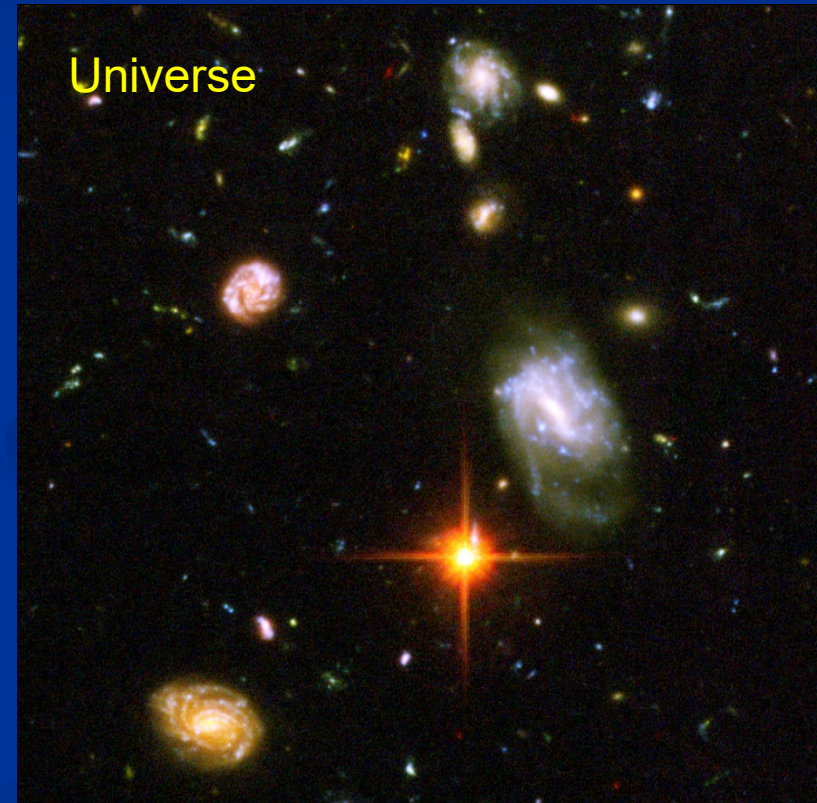
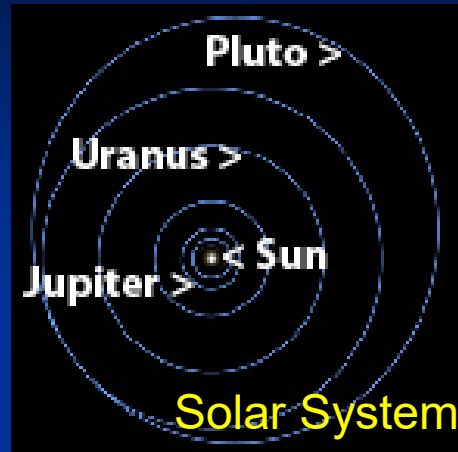


How Big is One Billion?

- A Rich Uncle leaves you One Billion Dollars
- He puts it in a trust that will pay you \$10,000 per day.
- How long will it take to receive one billion dollars?

**IT WOULD TAKE
278 YEARS AND 288
DAYS!**

The Galaxy



Milky Way Galaxy





Astronomical Term

Light Year.

- It is a distance measure, not a time measure
- A light year is the distance light travels in one year.
- Light travel at 186,000 Miles Per Second and can go around the world more than 7 times in one second.
- Equal to 63,240 AU.



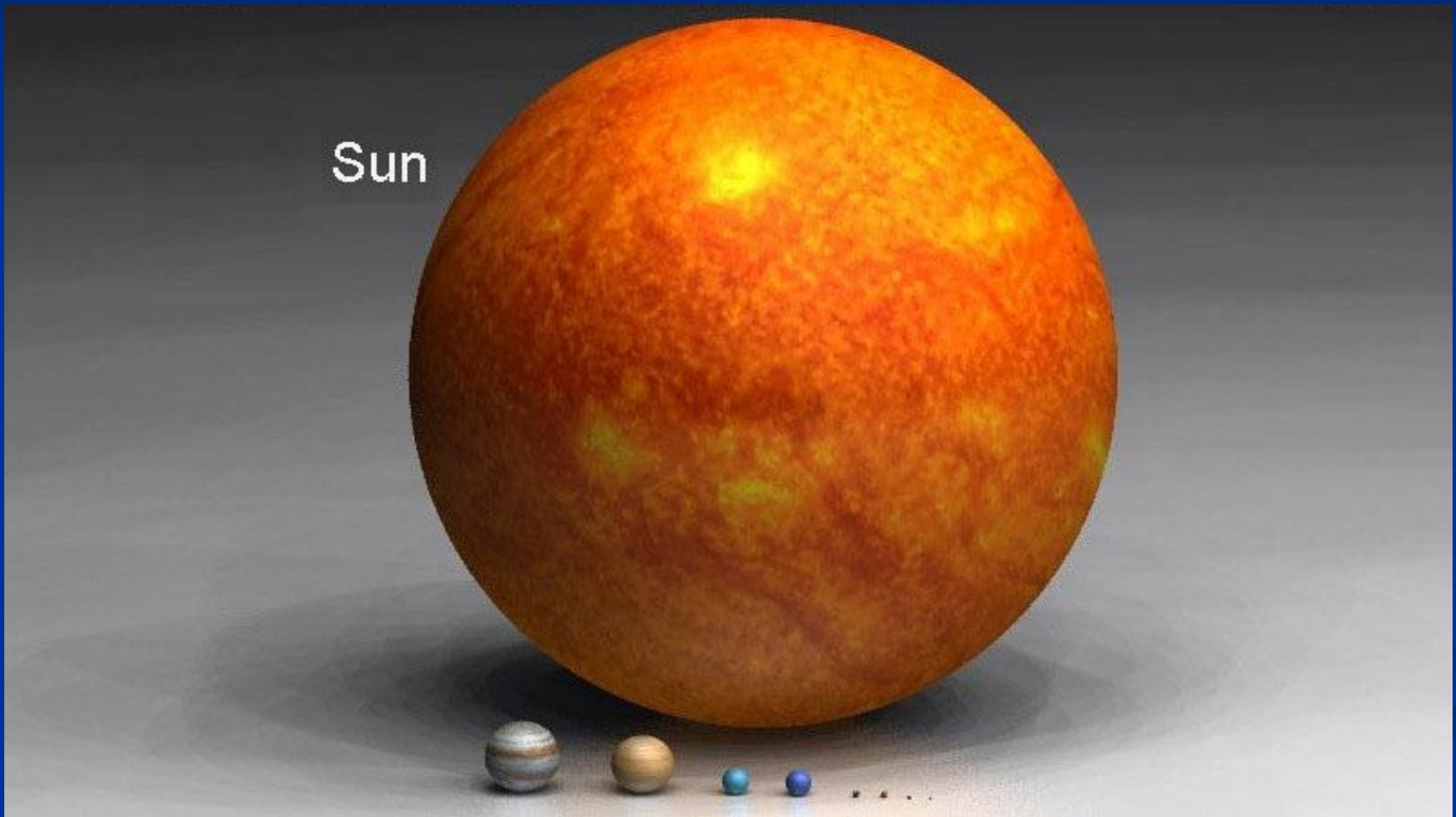
Astronomical Term

Parasec

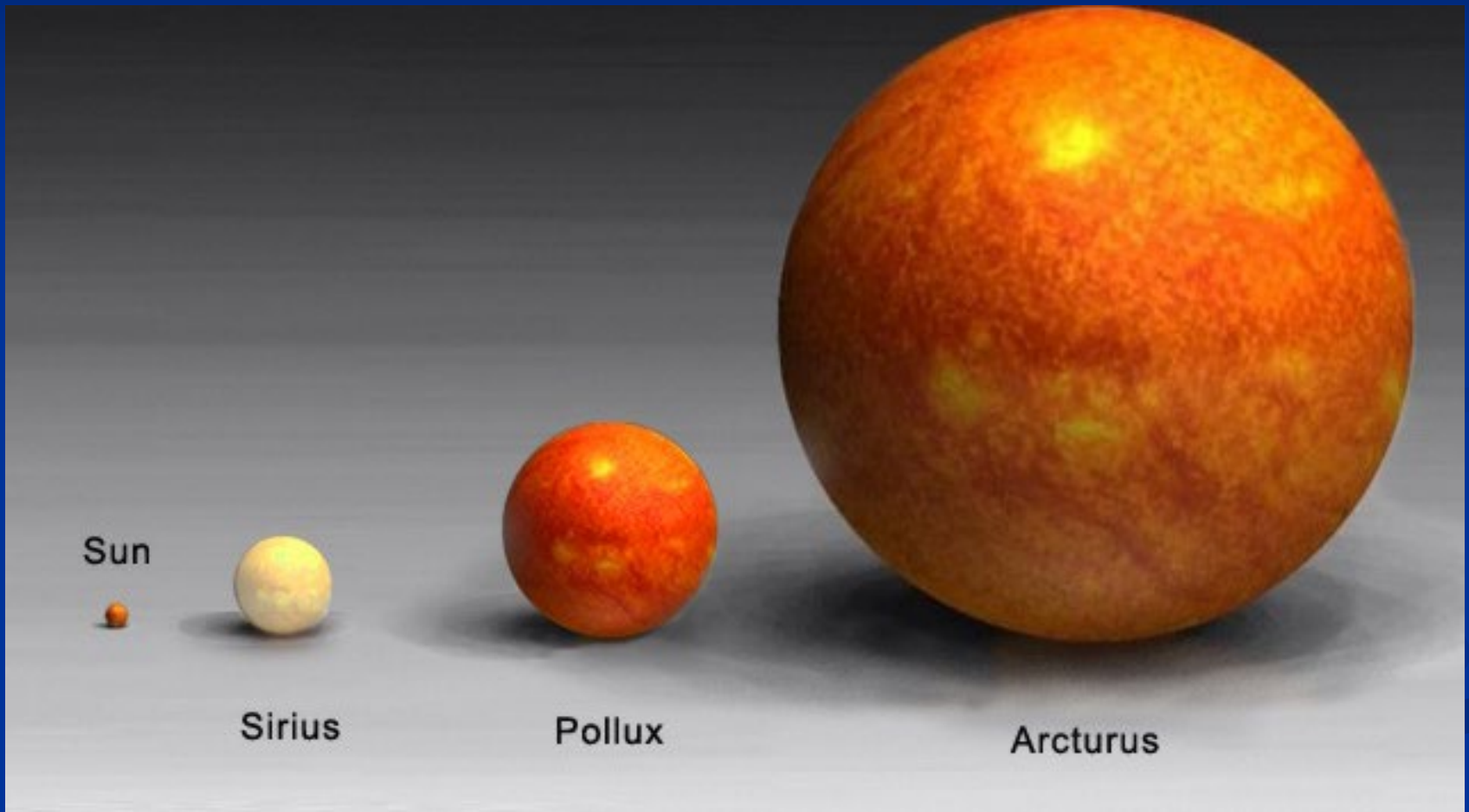
- parallax + second
- The distance to an object having a parallax of one second as seen from points separated by one astronomical unit
- Equal to 3.26 light-years



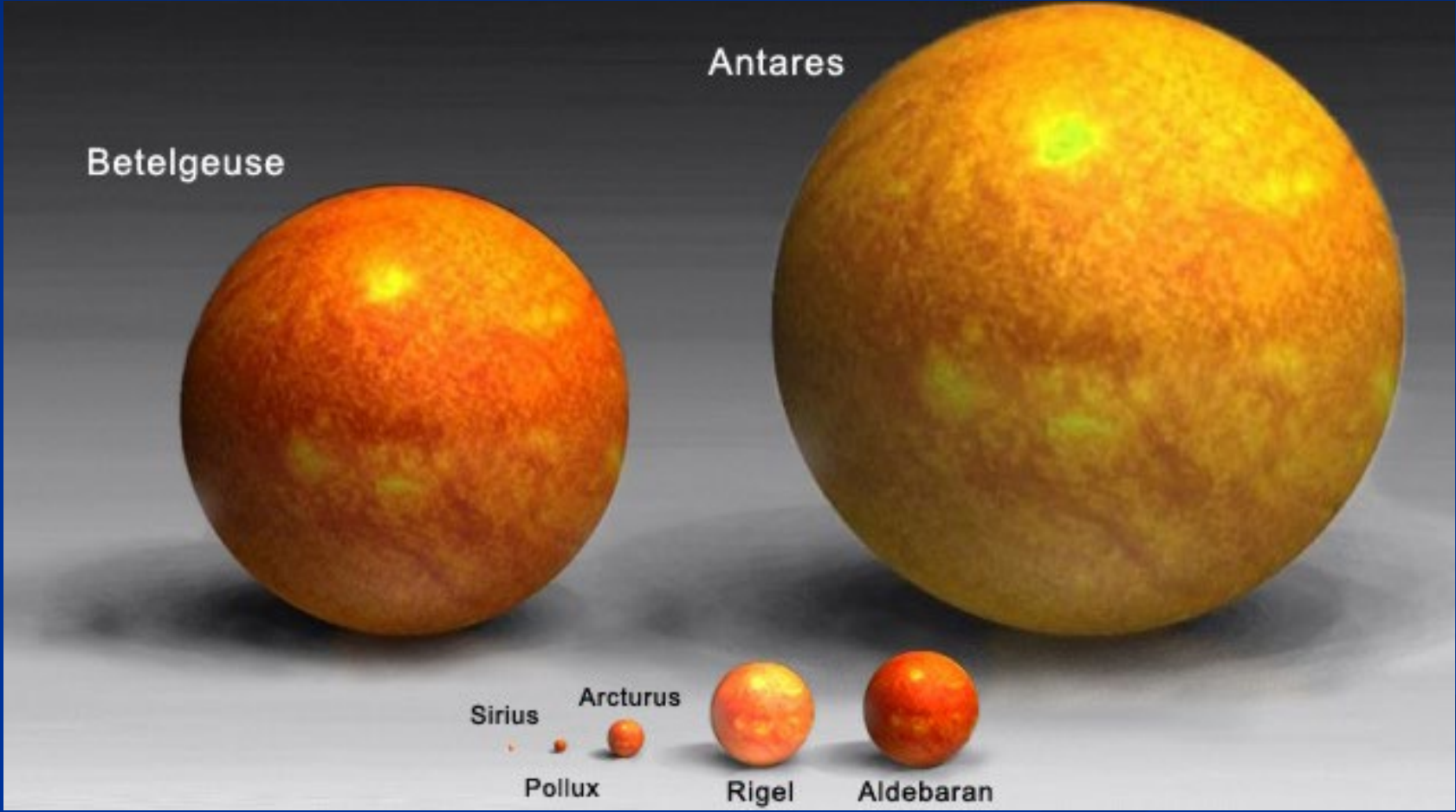
The Size of the Sun



The Size of the Sun



The Size of the Sun



The Distance Between Suns

Shrinking the sun to the size of a golf ball.



The distance to the nearest star (Proxima Centauri) would be 770 miles.

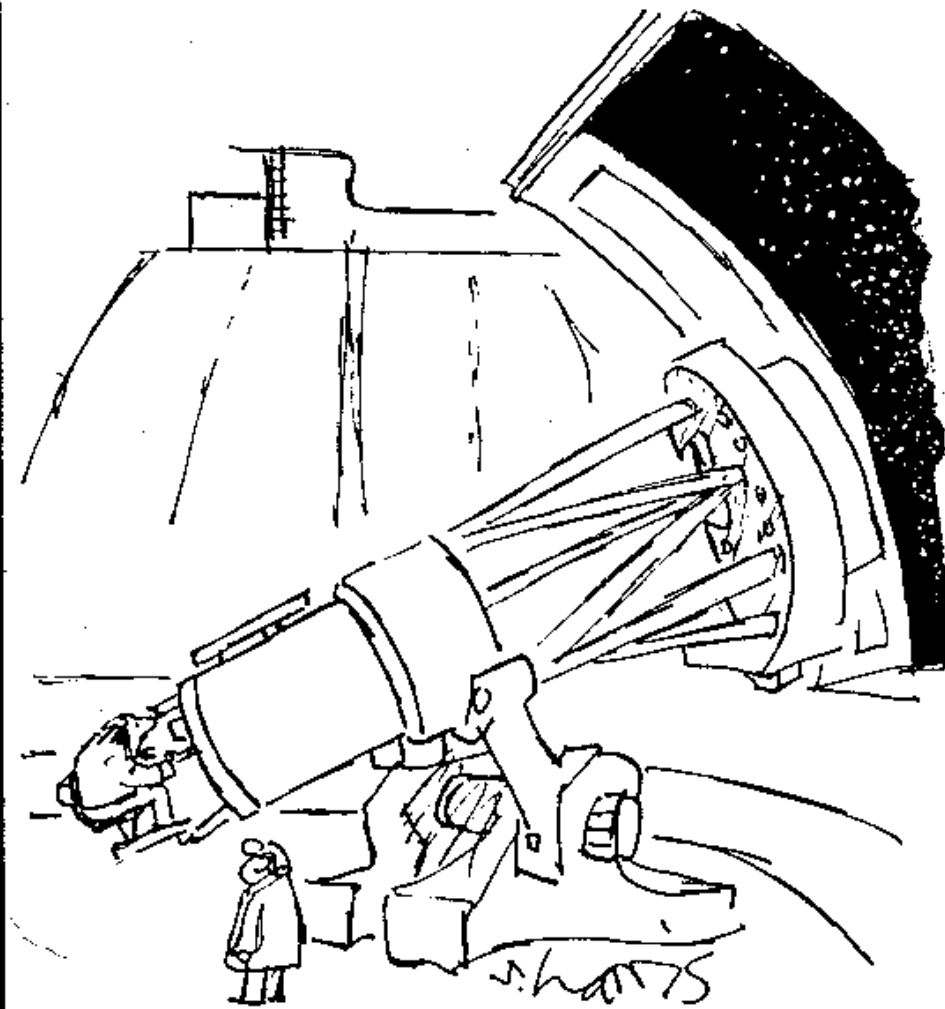




How Many Stars in our Galaxy?

400 BILLION Stars!!!

400,000,000,000



“Let’s see, now ... picking up where we left off ...
one billion, sixty-two million, thirty thousand,
four hundred and thirteen ... one billion, sixty-
two million, thirty thousand, four hundred and
fourteen ... ”

How Many Stars in our Galaxy?

- ❖ Take a Football Field
- ❖ Build a 8 foot wall all around it
- ❖ Fill the field with birdseed

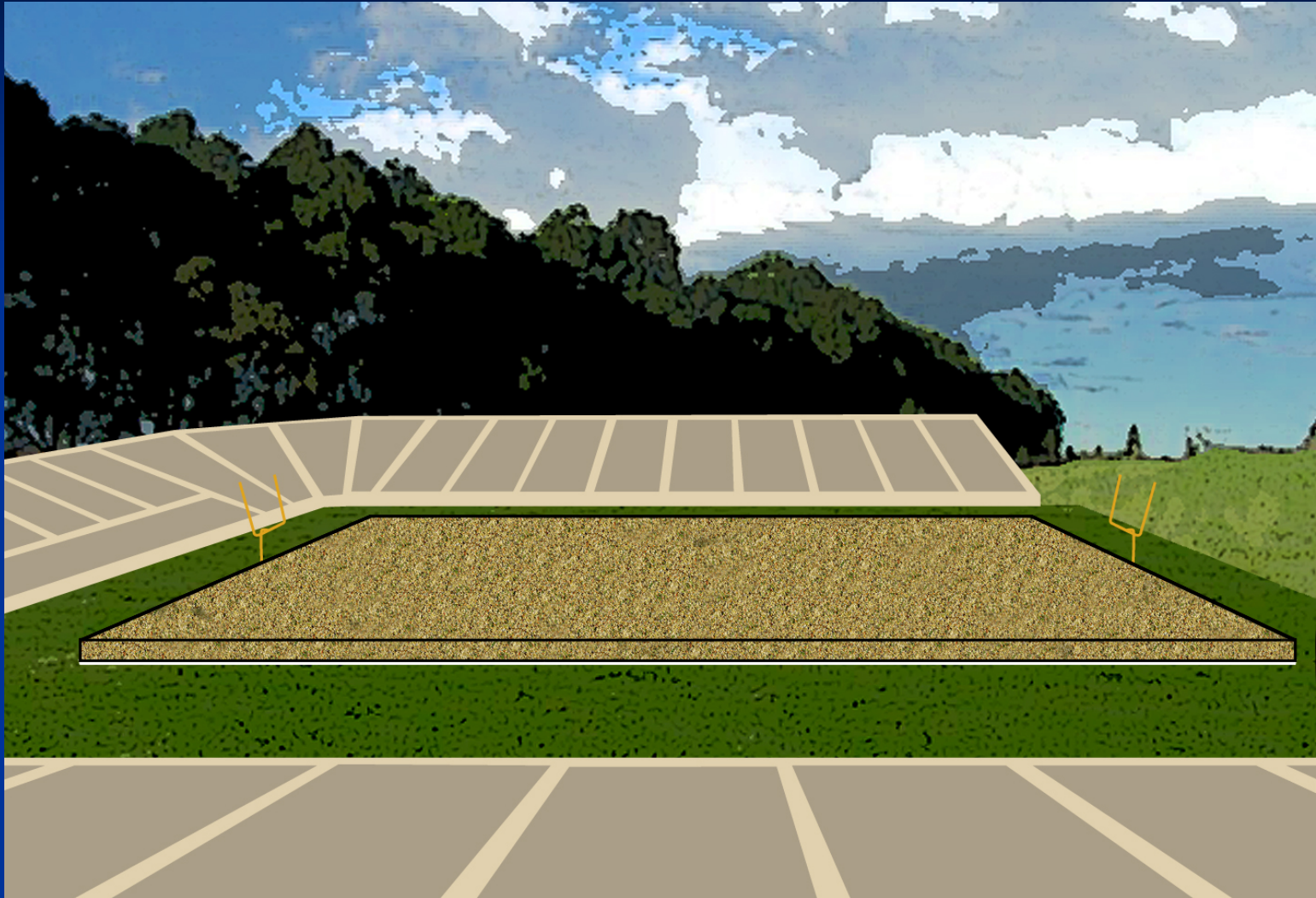


How Many Stars in our Galaxy?

There would be about as many seeds on the field as stars in our galaxy



400 BILLION Seeds



400 BILLION Stars

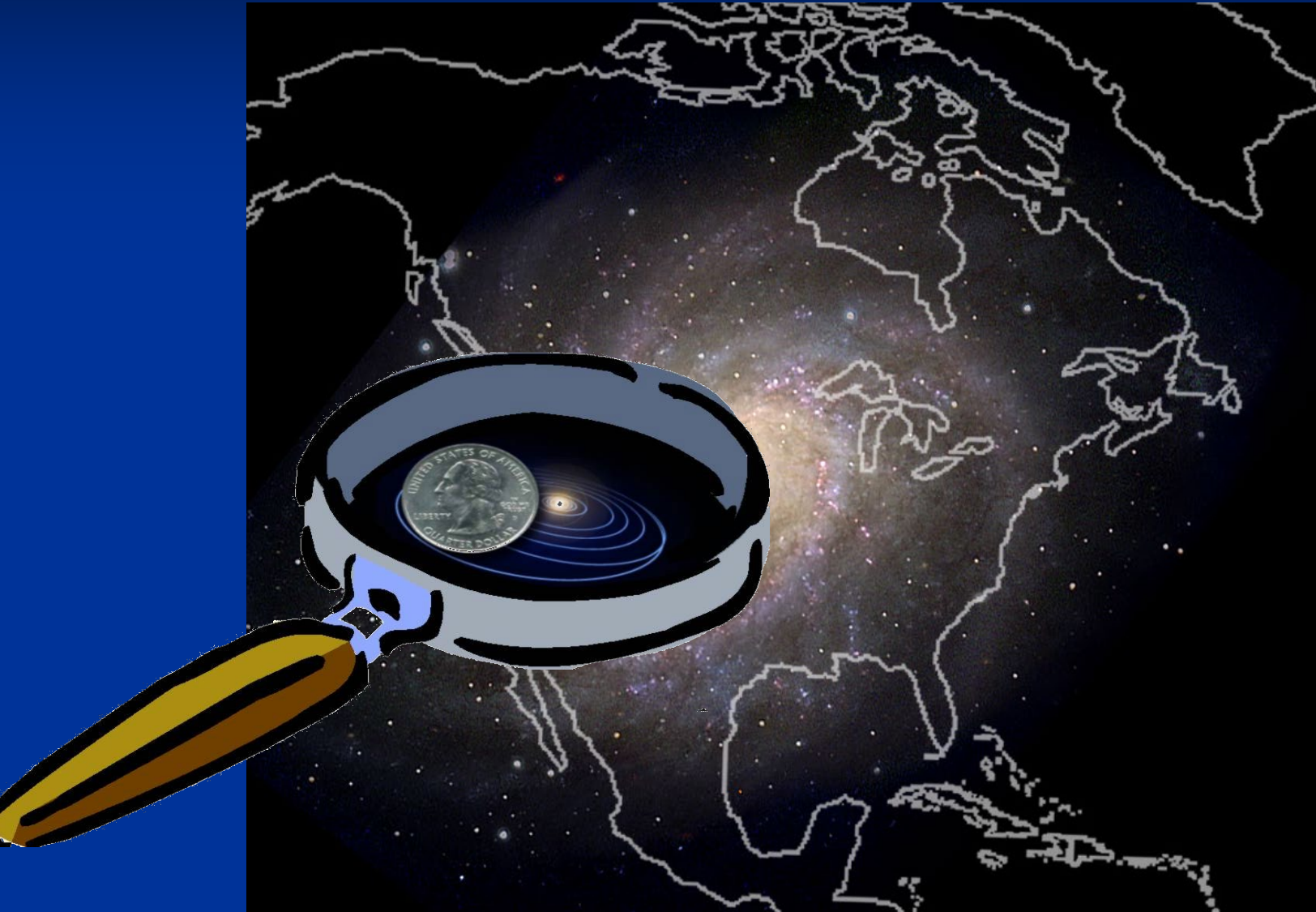
The Size of the Galaxy

Imagine the Solar System so small that that distance from the sun to Pluto is the diameter of a quarter.

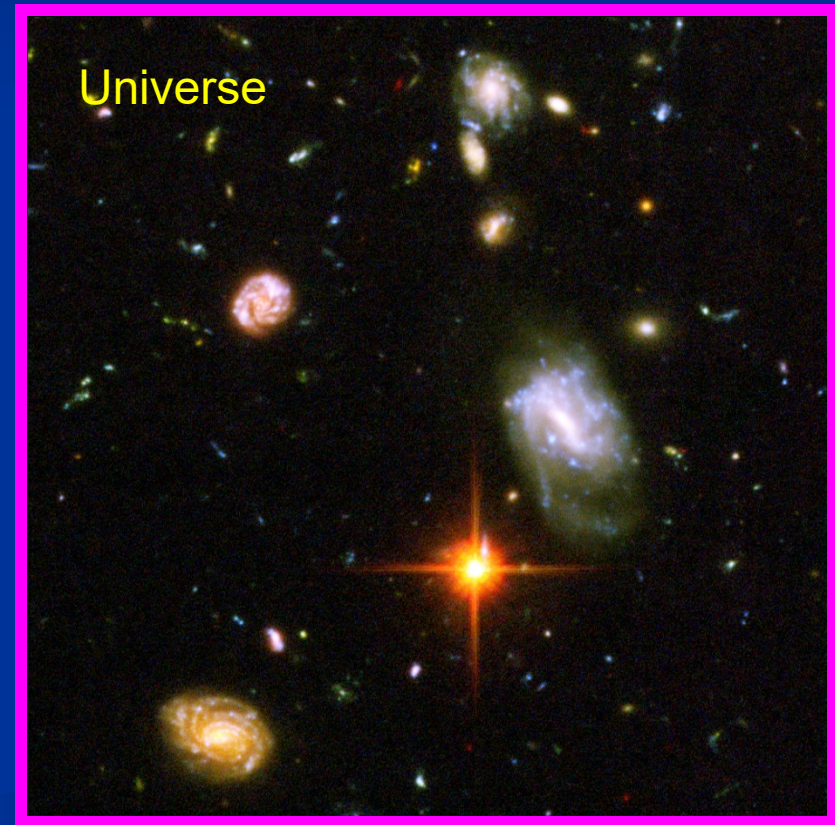
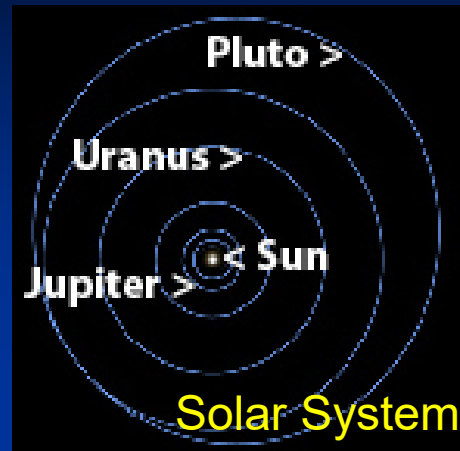


THEN...

...the Galaxy would be the size of North America



The Universe



M31 Andromeda Galaxy

8 Feet



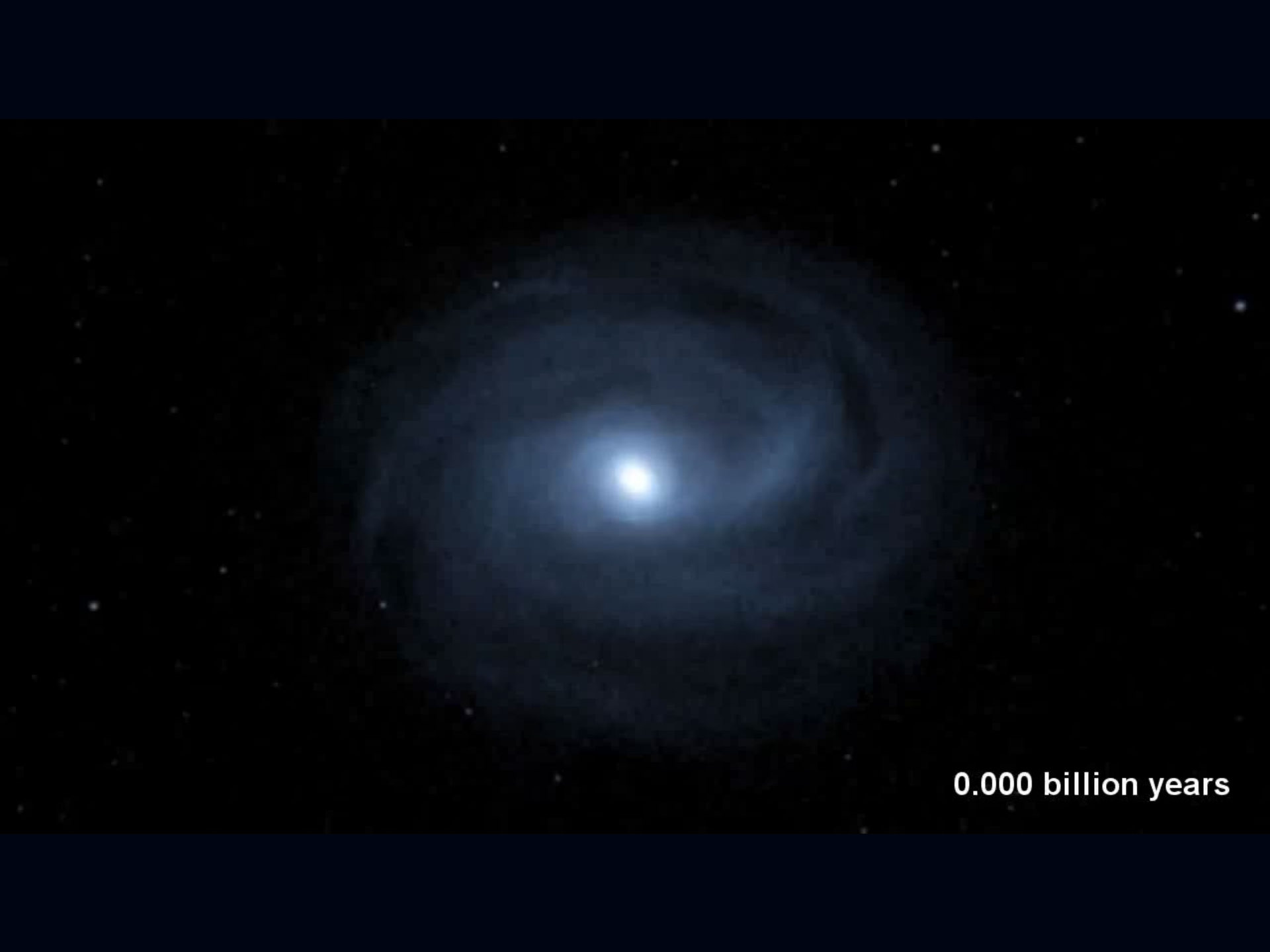
The Nearest Galaxy to the Milky Way
is the Andromeda Galaxy

2,300,000 Light Years



Andromeda and Milky Way Galaxies will collide

- Hurtling together at 245,000 MPH
- Will Collide in about 4 Billion Years
- Collision will take billions of years
- Earth will have been burned up by the Sun by then
- Most stars won't collide - there is too much distance between them.



0.000 billion years

M33 Pinwheel Galaxy
8 Feet



M81 Bode's Galaxy
16 Yards



M33 Whirlpool Galaxy
50 Yards



M104 Sombrero Galaxy
67 Yards



A visualization of the cosmic web, showing a complex network of blue and purple filaments and nodes against a dark background. The nodes represent galaxy clusters, and the filaments represent the large-scale structure of the universe.

How Many Galaxies in the Universe?

2 trillion Galaxies!!!

2,000,000,000,000

How Many Galaxies in the Universe?

The wall would need to be 20 feet high



How Fast Are You Moving When Sitting Still?

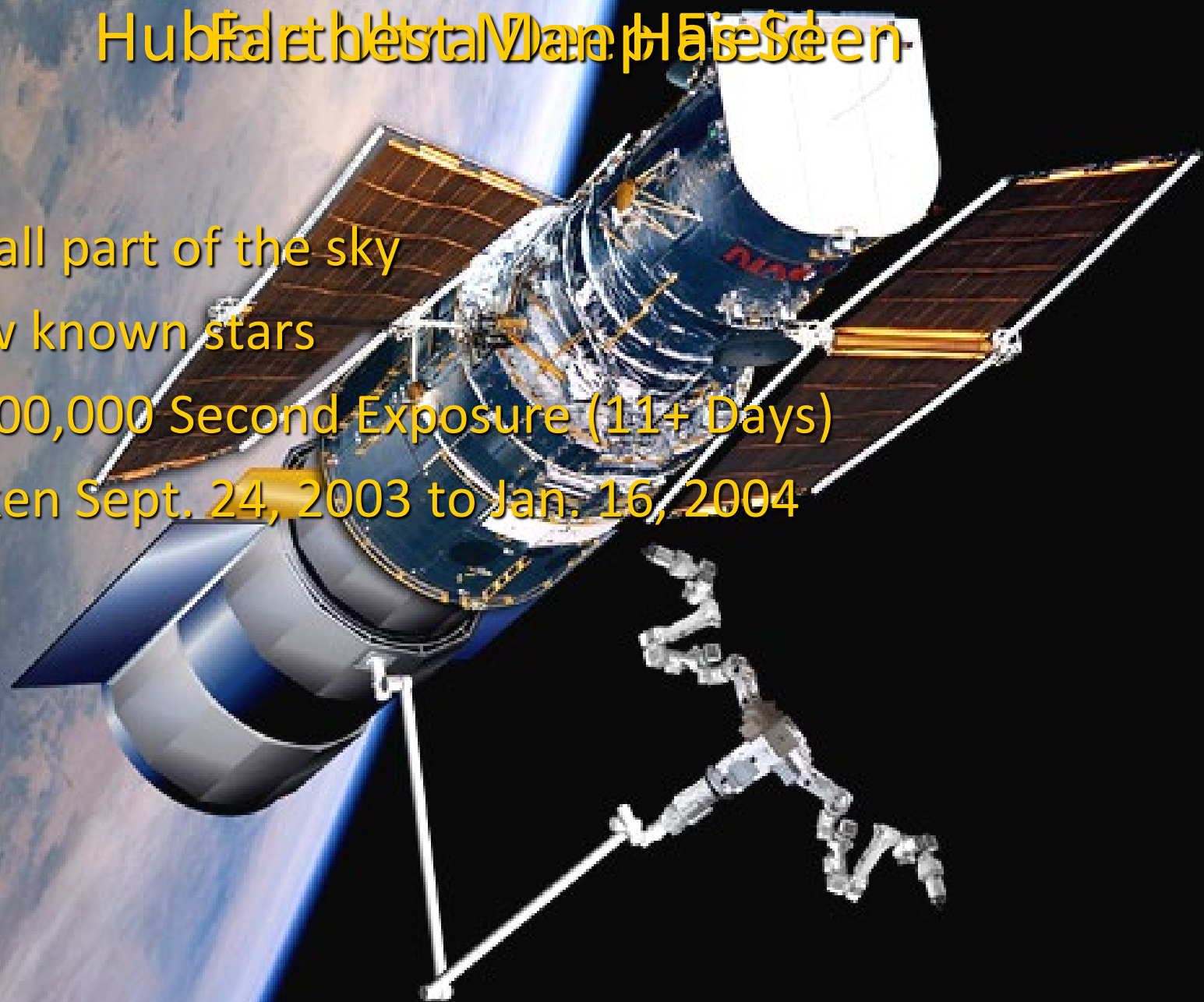
- Earth Rotation – 1000mph toward the East.
- Earth's orbital motion 66,000mph (that speed could get you from SF to Washington DC in 3 minutes.)
- The Sun orbits the Milky Way in 225 Million Years meaning a speed of 483,000mph.
- Our motion relative to the Universe is 1,300,000mph.

Farthest Man Has Seen



Hub Farthest Star Map Has Been

- Small part of the sky
- Few known stars
- 1,000,000 Second Exposure (11+ Days)
- Taken Sept. 24, 2003 to Jan. 16, 2004



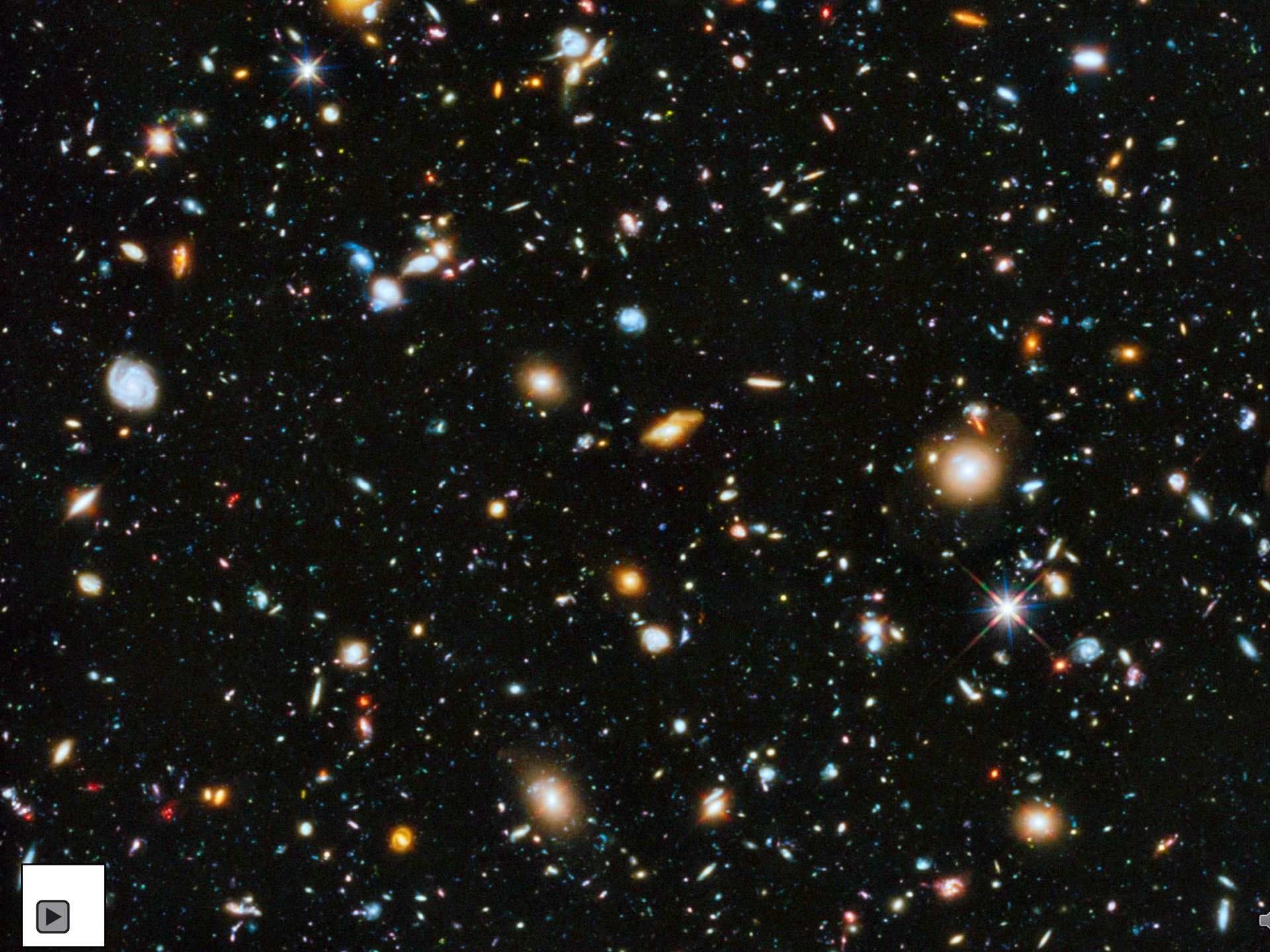
The Galaxies seen are as far as 13 Billion Light Years Away.

Light left these galaxies when the universe was only 5% of its current age.

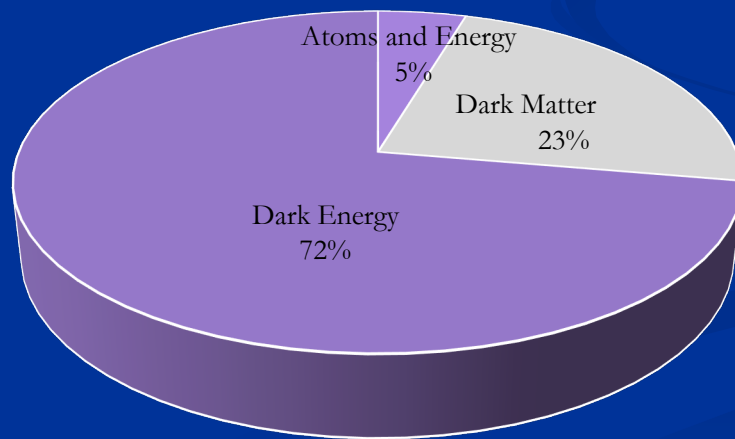
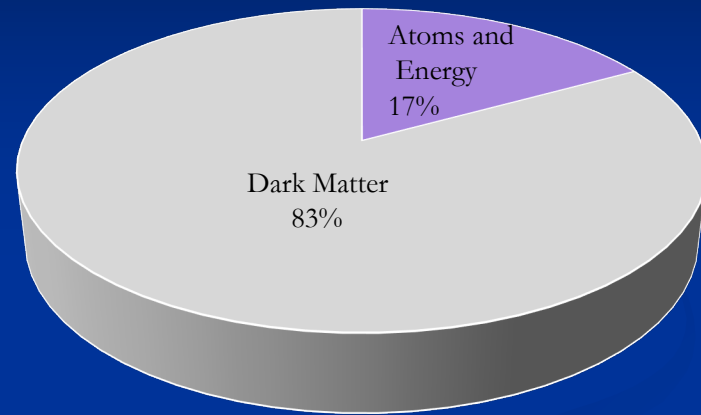
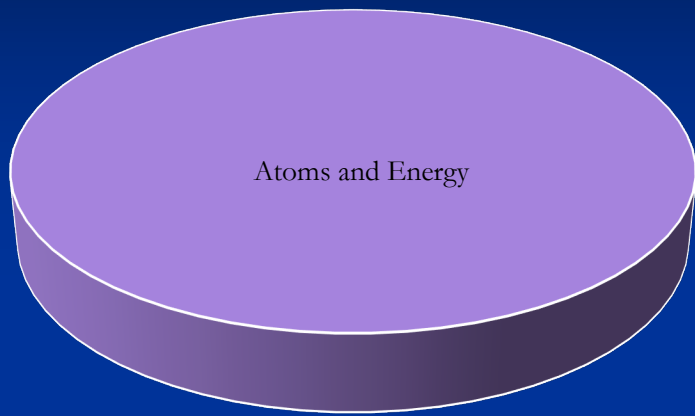
If the Milky Way were the size of a CD, these galaxies would be 10 miles away.

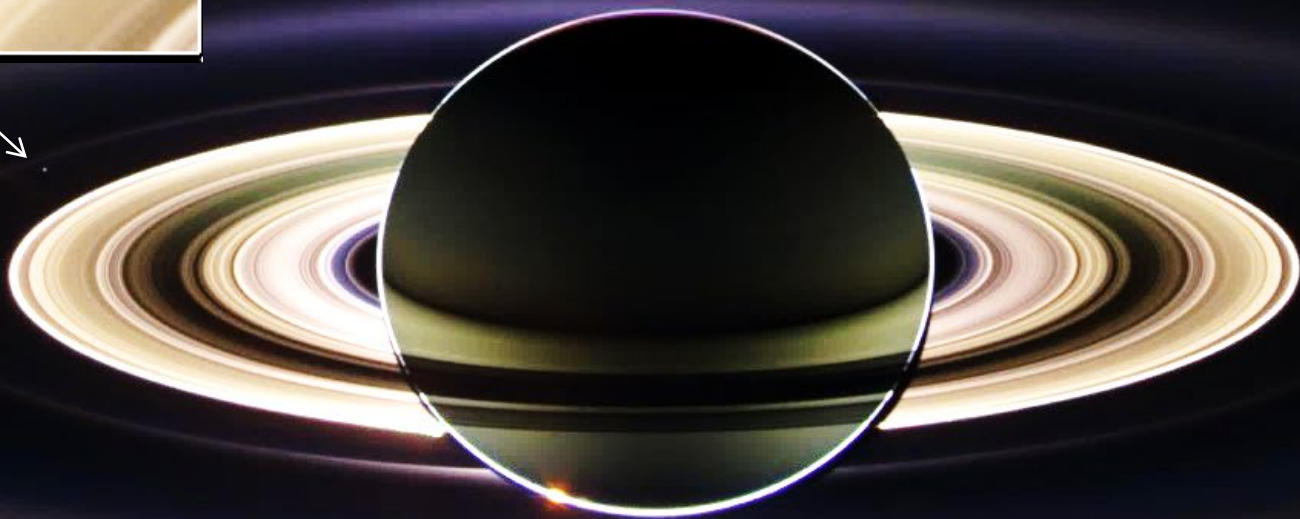
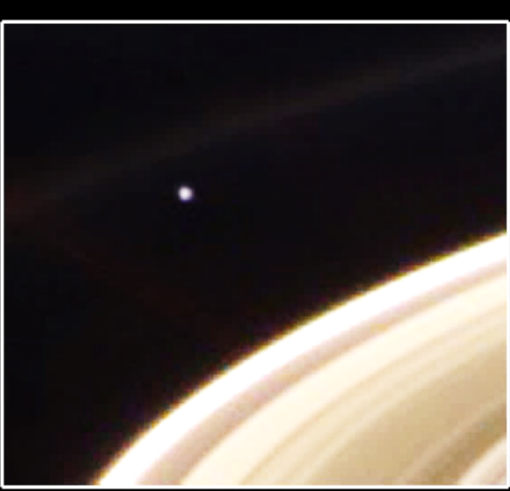
















Questions?