

# A SENSE OF PLACE



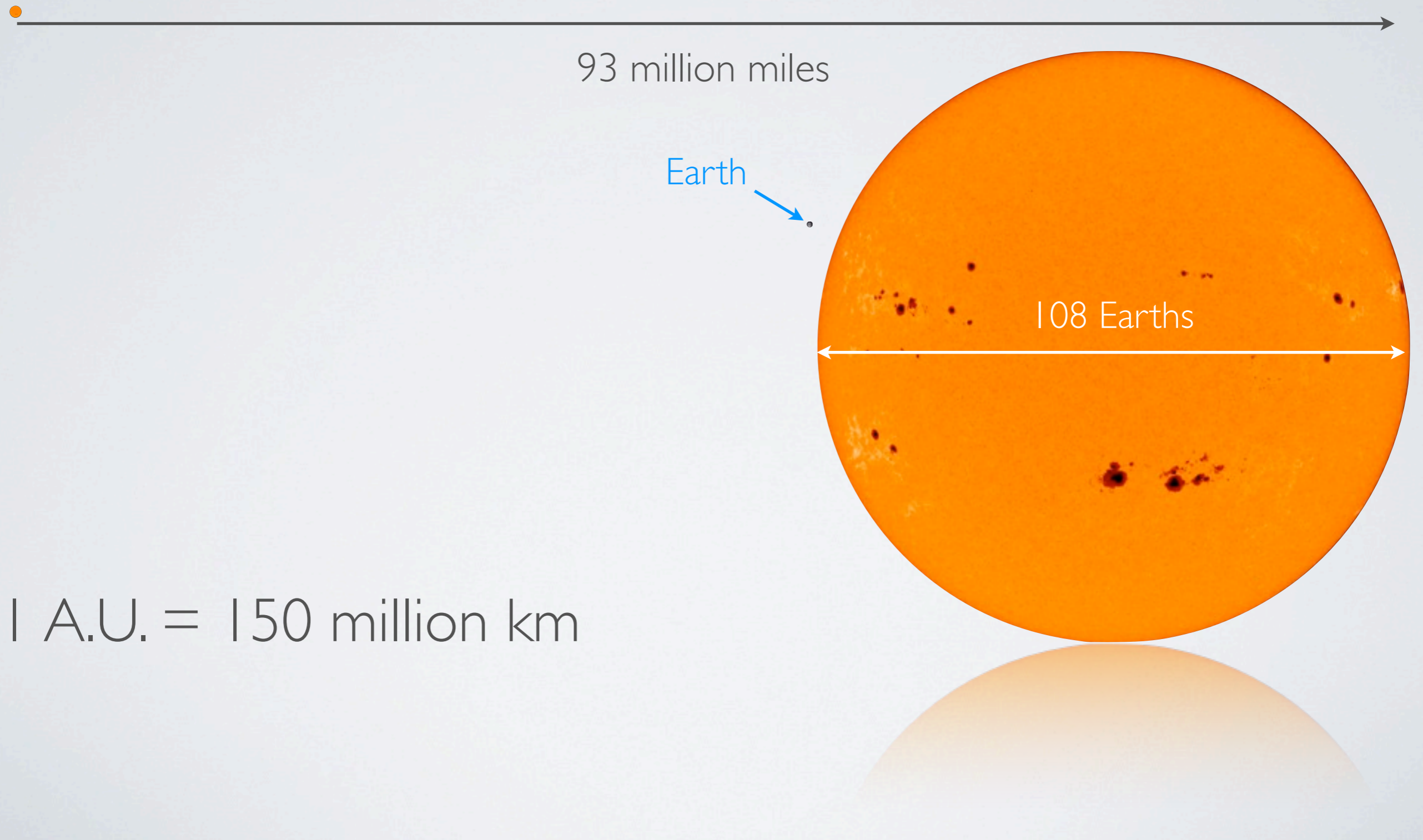
Earthrise over the Moon seen for the first time (Apollo 8, December 1968)

# TENTATIVE STEPS



Actual distance to the Moon: 240,000 miles (400,000 km)  
Diameter of Earth: 8,000 miles (12,000 km)  
Diameter of Moon: 2,000 miles (3,000 km)

# THE ASTRONOMICAL UNIT



1 A.U. = 150 million km

Over 1 million Earths could fit inside the Sun.  
Diameter of Sun: 800,000 miles (1.4 million km)

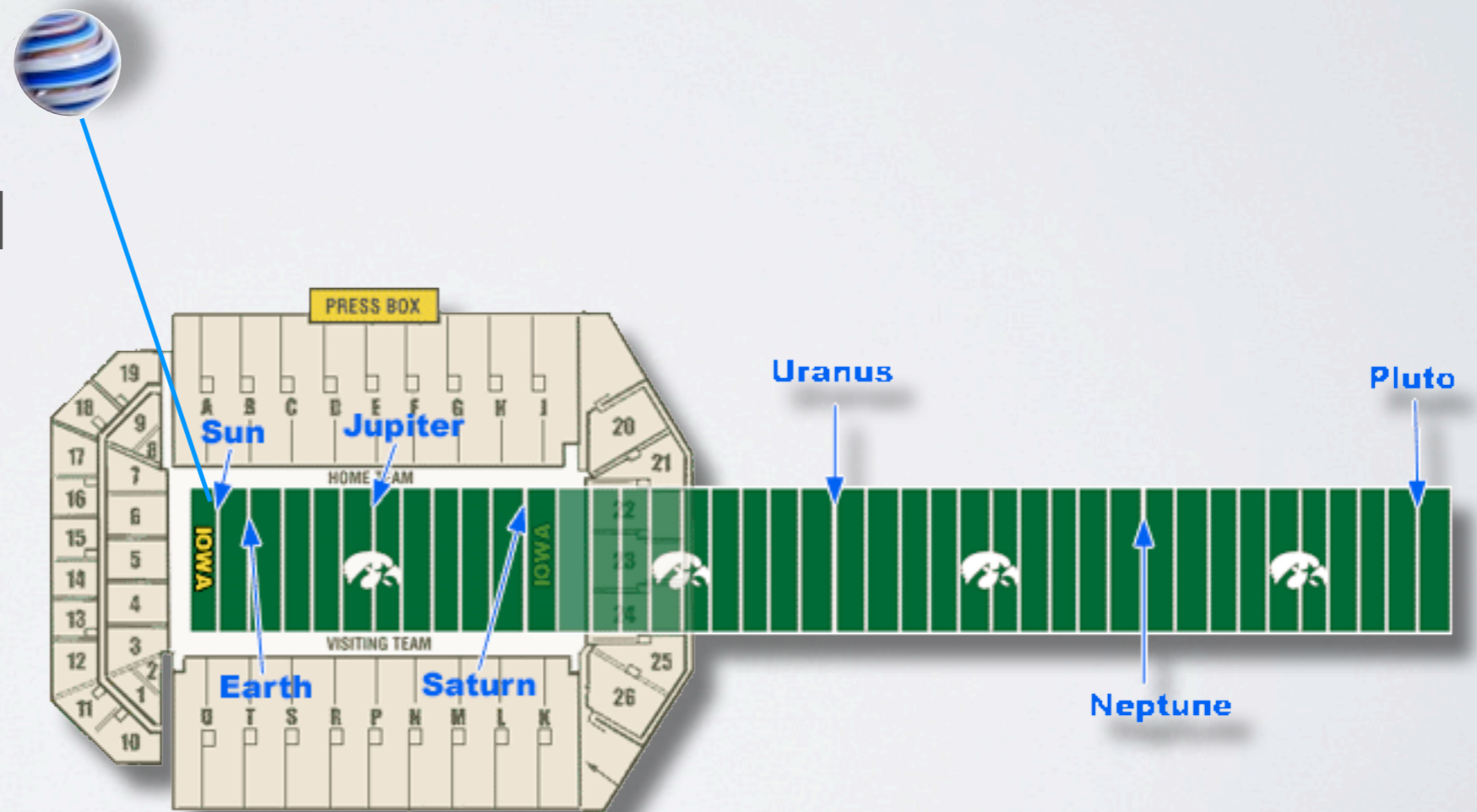
# ASTRONOMICAL UNIT:

The average distance between the Earth and the Sun.

We are actually closer to the Sun in January than in July!

# A SCALE SOLAR SYSTEM

- 1 A.U. = 10 yards
- Sun: 1 inch
- Earth: grain of sand



Mercury at 4 yard line, Venus at 7 yard line, Earth at 10 yard line, Mars at 15 yard line.

Jupiter at 48 yard line of opposing team, Saturn at 2 yard line. Uranus 200 yards from "sun". Neptune 300 yards from "sun."

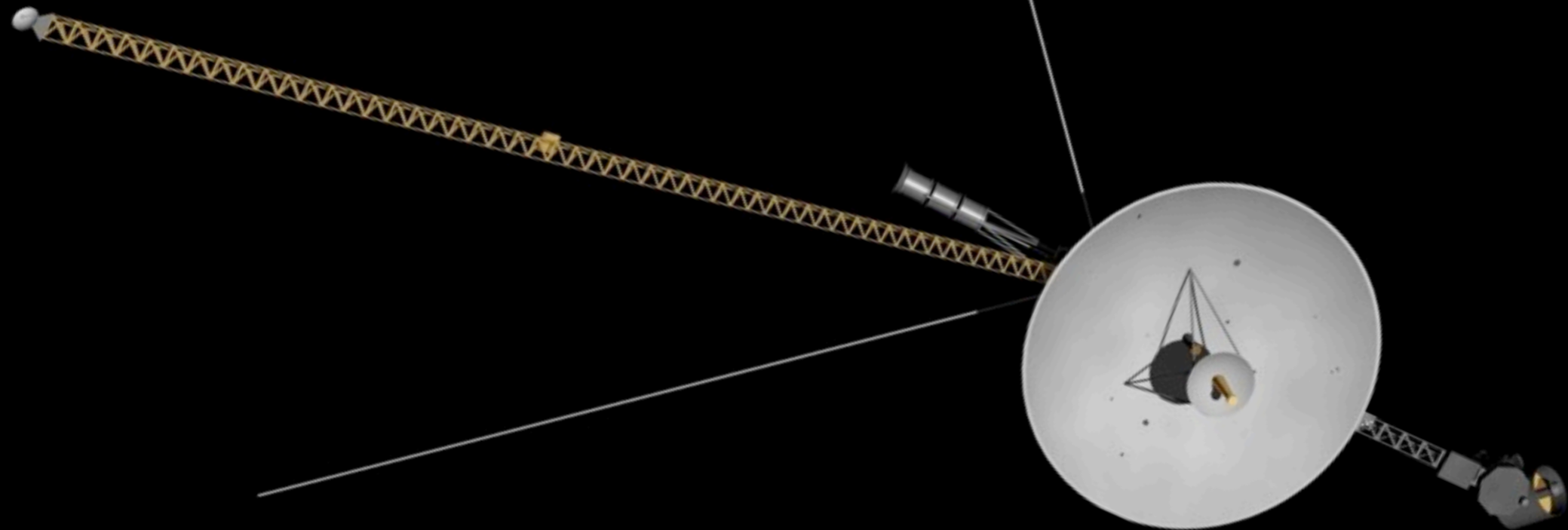
Pluto 390 yards from "sun."

Jupiter (the largest planet) would be the size of a small pebble.

Our Moon—the most distant objects humans have visited—would be a mere 3/8 inch from Earth.

# 110 ASTRONOMICAL UNITS

Our most distance emissary



Voyager 1

Voyager I and II were launched in 1977. They carry gold records and instructions for constructing a record player. The records contain sounds from Earth, music and greetings in a hundred languages. The computers onboard are the equivalent of Apple II's.

# LEAVING HOME

Kirkwood

Walgreens

Voyager I  
(110 A.U.)

Pluto  
(39 A.U.)

Sycamore Mall

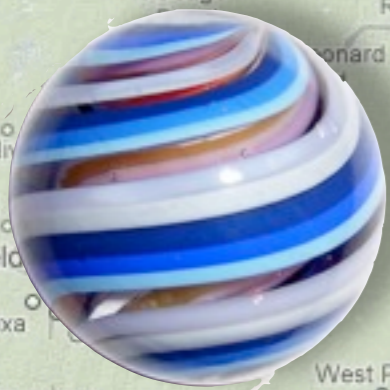
We expect that Voyager I (a bit farther from Earth than Voyager II) will leave our solar system and enter interstellar space in about five years—distance 120 A.U. or so. Voyager I is traveling at 3.5 A.U. per year. At this rate, it may encounter another star system in 50,000 years or so.

# OUR NEAREST NEIGHBOR

4.3 Light-years

Sol

Alpha Centauri



Our sun's nearest neighbor is 25 trillion miles away. Alpha Centauri is actually a triple system composed of one star identical to our sun, one slightly smaller and cooler, and a third (technically the closest) that is about 1/10 the mass of our sun—Proxima Centauri.

## LIGHT-YEAR:

The distance a beam of light—traveling at 300,000 km/s—covers in one year.

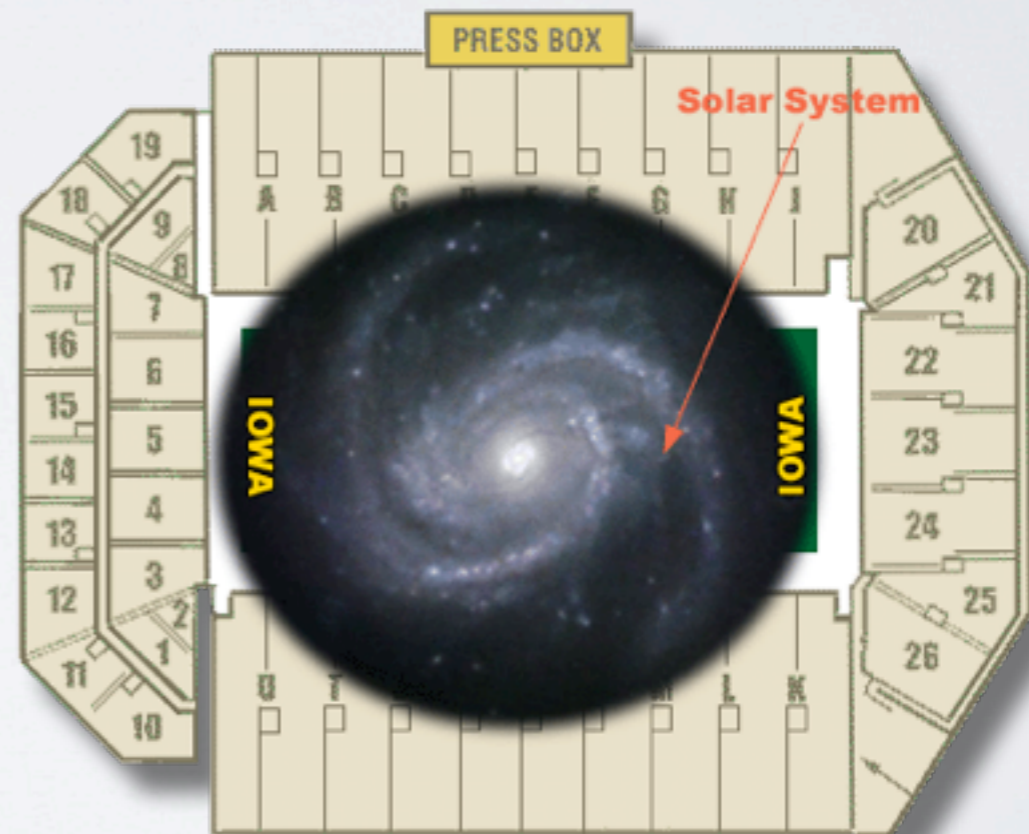
That's fast—670 million mph!

A beam of light could circle the earth seven times in one second.

Light from our sun reaches Earth in 500 seconds (8 min 20 sec).

# OUR GALACTIC HOME

- Milky Way: diameter = 100 yards
- Light-year = 1 mm
- Sun at 20 yard line



The Milky Way is 100,000 light-years in diameter and contains 100 billion stars!  
At this scale, Alpha Centauri is only 1/6 inch (4.3 mm) away.  
The part of the galaxy we see at night is an area about 20 yards in diameter.

# ISLAND UNIVERSES

M31

(College Green Park)

2.25 million light-years  
(1.3 miles)

Milky Way  
(Kirkwood)

©2009 Google - Imagery ©2009 DigitalGlobe, USDA Farm Service Agency, GeoEye, TerraMetrics, Map data ©2

The nearest prominent galaxy to the Milky Way is about 50% bigger.  
It is on a collision course with us and will merge with the Milky Way in about 4 billion years.  
The light we see from M31 left the stars in that galaxy when Homo habilis walked on Earth. That's over 2 million years ago!  
Light from the most distant galaxies has been traveling over 12 billion years to reach us.