

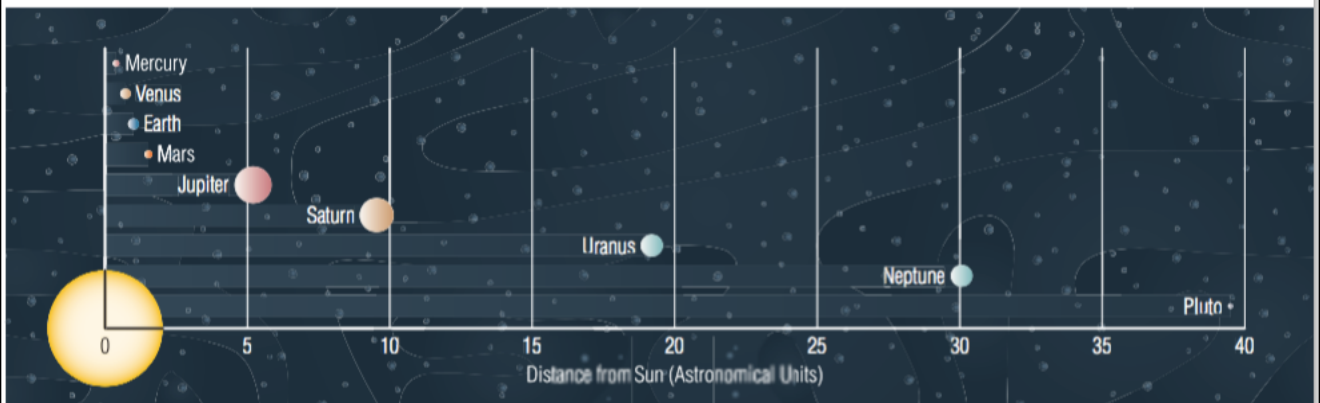
The Scale of the Universe

The universe is a big place, but it can be hard to imagine how big it really is...

For example, the distance from the Earth to the Sun is 149597871 km or about 19000 trips from Victoria, B.C. to St. John's, Newfoundland, or 3740 trips around the Earth...

To simplify measurements, we use some larger units of measure than kilometers. We give that Earth-Sun distance the name astronomical unit. However, even within our solar system distances in AU become large.

Jupiter is 5.5 AU from the Sun, while Neptune is already at 30 AU. The Voyager 1 space probe (at the edge of our solar system) is at 127 AU, and barely a fraction of the way towards any near by star.

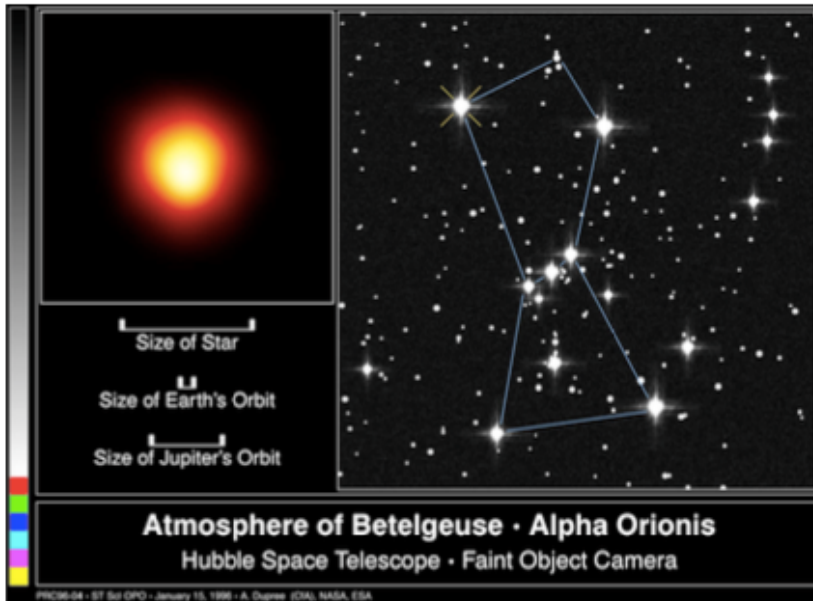


So if we consider how far light can travel in a year, we end up with about 9.5×10^{12} km (trillion). Or about 63240 AU. = 1 Ly

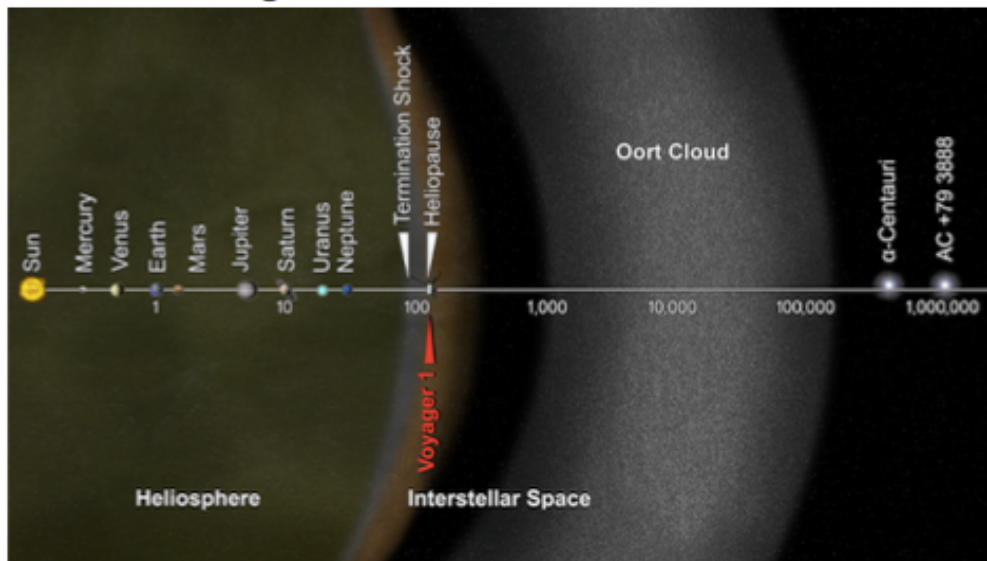
Now we start dealing with reasonable numbers. The distance to Proxima Centauri is now only 4.28 light years.

$4.28 \times 63240 = \text{---} \text{ AU ?}$ 270667.2 AU

Even to a star a bit further away, Betelgeuse (in Orion), is only 642.5 ly.



The nearest star, Proxima Centauri, would be 272000 AU from Earth. Once again, we hit large numbers before we start to get anywhere meaningful in the universe...



So we need a bigger unit of measure. And for this we turn to light. Light takes about 8 minutes to travel from the Sun to the Earth.

But even this unit of measure starts giving us large numbers when for instance, we look to the center of the galaxy 27000 ly.



And the solar system isn't even on the edge of the Milky Way. The whole galaxy is estimated to be between 100000 ly and 120000 ly in diameter!

In fact, our nearest galactic neighbour, the Andromeda galaxy is 2.5 million light years away (and nearly 200000 ly in diameter)

While the observable universe (we can't see all of it, since the light hasn't made it here yet...) is 46 billion light years in any direction. (The universe is only 13.8 billion years old, but in the time it has taken the light to reach us, scientists believe those objects have moved to a distance of 46 billion light years away)

Your Task: There are 8 planets in the solar system + SUN means you will be in groups of 9.

Each person in your group must be either a planet or the sun. In your groups, create an accurate scale model of the solar system given the following information:

Planet	Distance from the Sun (AU)
Mercury	0.39
Venus	0.72
Earth	1
Mars	1.52
Jupiter	5.27
Saturn	9.54
Uranus	19.19
Neptune	30.06

You must be able to explain your scale by the end of class. Hint you may need a metre stick/measuring tape and some masking tape