

# **Distance Modeling for Astronomy**

*Compiled by Deborah Price, August 2021*

When sharing distance in space, it's good to try to relate it to things people can understand. Distances are so vast in the universe that we really don't have anything to compare it to. The Earth is just a tiny speck of dust! Here are some ideas you can share.

## **The Earth and the Moon**

Our Moon is approximately 225,000 miles away from earth—this varies because the Moon travels in an elliptical orbit. The Moon is also approximately 2000 miles in diameter and the Earth is approximately 8000 miles in diameter. To illustrate this, get a regular-sized hula hoop, and a ball that is roughly  $\frac{1}{4}$  the diameter of the hula hoop. To illustrate the distance from Earth, measure out about 80 feet from the hula hoop—in this model, that is how far away the Moon would be from Earth.

Now imagine the International Space Station flying in Earth's orbit. It is only about 200 miles from the surface of Earth. In this same model, the ISS would only be about an inch from the edge of the hula hoop.

## **Solar System**

The Earth is about 93 million miles from the Sun. In the whole model of the Solar System, this is a very small amount compared to traveling out to Pluto, which would be over 7 billion miles, or 80 times the distance from the Earth to the Sun. Our entire solar system is not even one light year across.

## **Light Years**

A light year measures the distance that light travels in one year, which is approximately 6 trillion miles. Light travels at the speed of over 168,000 miles per second. The closest star you can see in the Northern Hemisphere (other than the Sun) is Sirius (in the constellation Canis Major), which is 8.6 light years away. Most stars are tens and hundreds of light years from Earth.

## **The Milky Way Galaxy**

Imagine that our entire solar system is the size of a quarter. The Sun is now a microscopic speck of dust in the center of the quarter. On this scale, the diameter of the Milky Way galaxy would be about the size of the United States. In this model, the closest star to Earth (Proxima Centauri in the Southern Hemisphere) and any planets around it would be another quarter, two soccer fields away. Most stars have a lot of space between them.

## **There is a lot of Space in Space!**

Although scientists aren't completely sure how big our entire universe is, we know that (as Carl Sagan said) there are billions and billions of stars AND galaxies out there! Our Milky Way is only one of billions. The universe is one big place and we are a tiny speck here on Earth. That's a good reason to protect our planet.