

Make your own Galaxy

Introduction

The Hubble Space Telescope has revealed a universe full of galaxies, and stunning detailed structures within nearby galaxies. A galaxy is a gravitationally bound system of stars, gas, and dust. They range in size from a few thousand light years to a few hundred thousand light-years in diameter for the luminous matter. In this activity, you will apply mathematical concepts of scale to make a model of our Galaxy, the Milky Way. You will use your model and data to elaborate on the question: do galaxies collide?

On a clear dark night, you can see hundreds of bright stars.

The scale factor of my model is: _____ light-years per centimeter.

Where are most of the bright stars you can see without optical aide in your model?

STAR AND CONSTELLATION	DIAMETER SUN = 1	DISTANCE FROM SUN LIGHT-YEARS	MASS (ESTIMATED) SUN = 1	RATIO DISTANCE : DIAMETER	SCALE DISTANCE FROM SUN SUN DIAMETER = 1
Spica, Virgo	8	261	18		
Rigel, Orion	70	815	10		
Betelgeuse, Orion	600	489	15		
Deneb, Cygnus	200	1402	25		
Altair, Aquila	2	17	1.8		
Vega, Lyra	2.7	26	2.7		
Antares, Scorpius	800	391	15		
Sirius, Canis Major	1.6	8.5	2.3		

1 light-year = 9.4605×10^{15} meters Sun's radius = 6.9599×10^8 meters Sun's mass = 2×10^{30} kilograms

Elaborate

There are three galaxies beyond the Milky Way that you can see without optical aide: Andromeda Galaxy, Small Magellanic Cloud, Large Magellanic Cloud.

How does the ratio of the separation of galaxies to their size compare to stars?

GALAXY	LUMINOUS DIAMETER LIGHT-YEARS	DISTANCE FROM MILKY WAY LIGHT-YEARS	MASS SUN = 1	RATIO DISTANCE : DIAMETER	SCALE DISTANCE FROM MILKY WAY MILKY WAY DIAMETER = 1
Milky Way	100,000		2×10^{11}		
Andromeda Galaxy	125,000	2,500,000	3×10^{11}		
Large Magellanic Cloud	31,000	165,000	2×10^{10}		
Small Magellanic Cloud	16,000	200,000	6×10^9		

Sun's mass = 2×10^{30} kilograms

Do you think galaxies collide? Why or why not?