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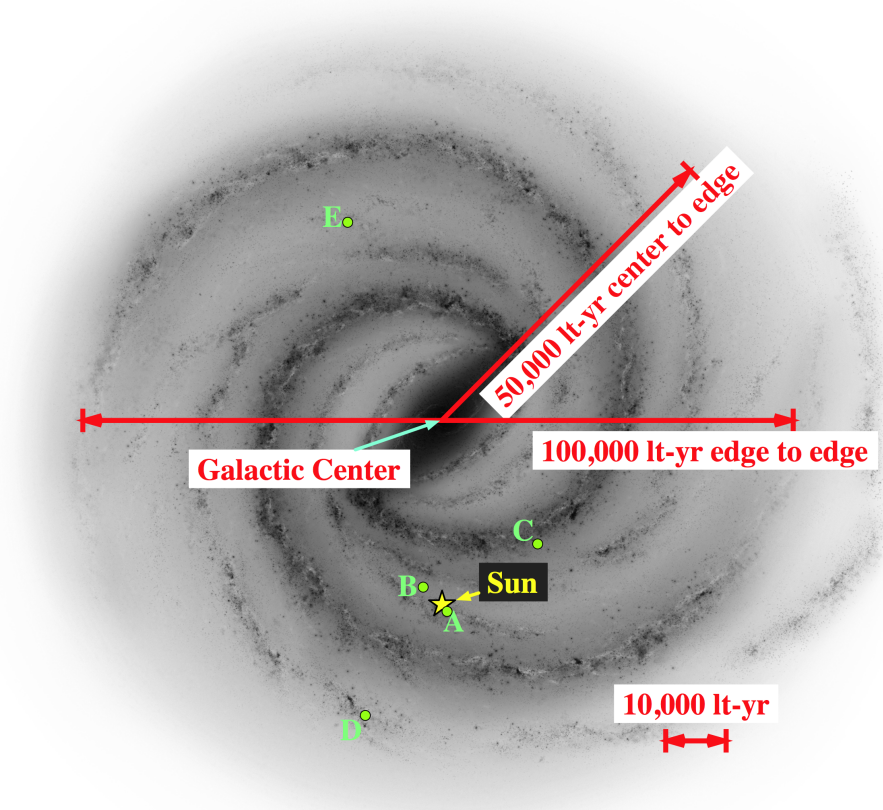
Section: _____

Astron 104 Laboratory #11

The Scale of the Milky Way

Section 14.1–14.3

This tutorial will give you a better understanding of the size of the Milky Way Galaxy as it relates to other distances in the Universe. Below is an artist's drawing of the Milky Way: because we are located within the Milky Way, we are unable to take a picture of our entire galaxy, but we can mostly figure out what it looks like. On this figure, 1 cm is roughly 10,000 lt-yr.



1. The Sun's position in the Milky Way is shown in the picture. What is the distance from the Sun to the center of the Milky Way? You can read it off using the scale provided, or use a ruler and measure.
2. The table below lists five bright stars in the night sky. Write the letter of the dot (A through E) on the picture above that best represents the location of each star. You can use letters more than once.

Star	Distance from the Sun (lt-yr)	Letter
Sirius	9	
Vega	26	
Spica	260	
Rigel	810	
Deneb	1,400	

3. We normally consider Deneb to be a bright but distant star at 1,400 ly away. Compared to the size of our galaxy, is Deneb truly distant? Explain.
4. Are the stars from question 2 inside or outside the Milky Way Galaxy? Explain your reasoning.
5. The table below lists three Messier Objects and their distances from the Sun. Write the letter of the dot (A through E) on the picture above that best represents the location of each object. You can use letters more than once.

Messier Object	Distance from the Sun (lt-yr)	Letter
M45 Open Cluster (Pleiades)	380	
M1 (Crab Nebula)	6,300	
M71 Globular Cluster	12,700	

6. Are these Messier Objects part of the Milky Way? Explain your reasoning.
7. The Crab Nebula has a width of about 11 light years. If you wanted to accurately draw the Crab Nebula on your diagram, would you use a crab-shaped blob or a tiny dot at the location you indicated? Explain your reasoning.
8. The Sun is much smaller than a nebula. We used a dot to represent the Sun's location in the picture. Is this dot too small, too large, or just the right size to represent the size of the Sun on the picture? Explain your reasoning.
9. The Milky Way Galaxy is one of the largest galaxies in a group of nearby galaxies called the Local Group. The following table lists the distances to the centers of three Local Group galaxies. Draw a dot on your picture (if possible) to represent the center of each galaxy. Don't worry about the direction (left/right/up/down) for each galaxy; just place a dot at an appropriate distance from the Sun.

Galaxy	Distance from the Sun (lt-yr)
Sagittarius Dwarf Galaxy (closest to Milky Way)	80,000
Large Magellanic Cloud	160,000
Andromeda Galaxy M31	2,500,000

Do any of these galaxies fit on the page? Which ones?

10. The objects in question 9 are all visible in the night sky from Earth. Are these objects inside or outside the Milky Way? Explain your reasoning.

11. The Sagittarius Dwarf Galaxy is approximately 11,000 lt-yr across. Is this galaxy better represented on your diagram by a blob or a tiny dot? Explain your answer, and make an appropriate sketch to represent the galaxy.

12. Within the Local Group, the two largest galaxies are the Milky Way and Andromeda galaxies. From question 9, we saw that the Andromeda Galaxy was about 2,500,000 lt-yr from us. On the picture, this spot would be 250 cm (about two and a half meter sticks) away from the dot representing the Sun.

The nearest group of galaxies to us (not counting our own Local Group) is the Virgo Cluster, about 60,000,000 lt-yr away. How many centimeters away would this cluster be on our picture?