

Lab 11. The Size & Shape of the Galaxy

Equipment

- Celestial Sphere, preferably with Milky Way drawn onto it.

Mini Lecture prior to Lab

- Maybe start with a picture of a Sb or Sc Spiral Galaxy – Apparently our Galaxy looks like that, but the challenge question is how do we know this? We can only see our Galaxy from within. Show pictures of the Milky Way. How does this tell us the Shape and Size of our own Galaxy?
- Mention the Shapley-Curtis Debate (which was the Pre-Lab) – analyze their data to see how this led us come up with the current model of the shape and size of our Galaxy.
- Maybe remind the students about RA and Dec.

General Procedure and Lab Setup

- With the celestial sphere in front of them, let the students visualize that they are standing on the globe inside the celestial sphere. At any one time RA and Dec would then tell them where on the sky they would see each globular cluster.
- Ask the students to locate the galactic center (and the rest of the Milky Way) on the celestial sphere.
- Please check the students' answers to question 7. If they did not get this right they will not be able to do the drawings of questions 8 and 10.
- After students have done the x/z plot, please quiz them on question 2 of Part IB.
- Part II can be done at home.

Notes & Suggestions

- If you have it bring a toy galaxy, or make one out of clay. Try to have the students visualize what they would see if they were located in the disk.
- Although students will often say they can visualize what they are doing (and they might), it never hurts to check. One method is to ask them to orient the Celestial Sphere like they did in the Sky-Lab (with New York of the Globe pointing to the ceiling, and the N-S axis towards Polaris (a point in the classroom, preferably close to the real position of Polaris)). Then ask them to show where they would see the Galactic Center and the rest of the Milky Way if projected onto the classroom walls. Since the Earth spins on its own axis, you might also ask them to show you the apparent path of the Galactic Center projected onto the classroom walls. This will also help them with Figures 4 and 5.
- Interpreting the $x-z$ plot is often a little easier, but here too, some students have problems visualizing that drawing and might copy the location of disk, bulge, and halo from their neighbors. The trick is to really be able to visualize what Figure 1 would look like if inserted into Figure 6 – combined with what we really do see (i.e. the strip of the Milky Way) on the sky (which is also in Figure 6).

General Concepts & What students might get out of this Lab

- A sense of how the Size and Shape of the Galaxy was discovered

Scientific Methodologies

- 3-D visualization techniques
- Analyzing plots, and visualizing what information these plots are providing
- Critically interpreting the data they plotted – are these data consistent with data obtained by others?
- A sense of how science (the methodology) is done, and to decide between right and wrong
- Realizing that there are not always right and wrong answers, rather only “more likely” answers