

Imaging a Galaxy Earth & Sky

Name: _____

Introduction

The night sky isn't all just stars: there are galaxies and nebulae, too. Astronomers have discovered that nebulae are giant clouds of gas and dust, while galaxies are collections of stars much like our home Milky Way. In this activity you will examine the color properties of a galaxy.

Pre-test

1. Are all parts of a given galaxy the same color?

Eyepiece observation

First you need to choose a galaxy to image. Your best option is M33, the Triangulum Galaxy, but you can consult with the TA about other targets.

Get the telescope and camera ready for observing (as in previous labs). Since you will be taking longer exposures, the CCD temperature should be set to -5°C or below. This will minimize the dark current. Find M33 in ACE's Messier catalogue and move the telescope to it. Once you're ready to observe, turn off the monitors, lower the lights, and take a look through the eyepiece. (Make sure the focus is at the eyepiece setting.) You'll probably want to use the hand paddle to center the galaxy. Also, remember to try using averted vision (looking out of the corner of your eye).

1. Draw a sketch of what you see in the eyepiece:

Imaging

Once you're done with eyepiece observations, slide the mirror to the camera position and move to the warm room. First, change the focus to the CCD setting. Then, use the controls in the ACE **Observations** window to take a 30 second unfiltered image. Once the image has downloaded, use the **Process > Calibrate** command to clean up the image. (Remember to also adjust the **Screen Stretch** settings.) Then use the **Center CCD** window in ACE to center the galaxy, and take another 30 second image.

2. Draw a sketch of what the galaxy looks like on the screen:

Once the galaxy is properly centered, change to the red filter in the **Expose** tab of the **MaxIm CCD** window. From this window take a 5 minute exposure. Once the image is downloaded, be sure to save it with a recognizable filename (e.g., m33-r.FITS). Repeat this procedure for the green and blue filters.

Image comparison

When you have a good image through each filter, open them all in MaxIm DL and use **Process > Calibrate All**. Adjust the **Screen Stretch** for each one. Then go to **View > Line Profile**. This opens a window where you can examine pixel values more closely. For this activity, use the **Line** mode. Now when you draw a line on an image by clicking and dragging, the window displays the pixel values along the line.

3. Draw a line in one of the images that goes along the long axis of the galaxy (i.e., through the center out to where the brightness begins to vanish). Sketch the line profile graph below, while being sure to note the vertical scale. Draw a similar line for the other two images and make similar sketches. Make sure you label which filter each graph is for:

4. What is the overall shape of the line profile? What does this tell you about the brightness of galaxies?

5. How does the line profile differ among the color filters? What conclusions might you draw about the distribution of color in a galaxy?

Post-test

1. Are all parts of a given galaxy the same color?