

Imaging Globular Clusters

An Introductory Project

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Summary

This is a straightforward project to image a number of globular clusters in colour. Globular clusters are collections of a million or so stars orbiting around our Milky Way Galaxy. Along with individual old stars, they form a sort of halo around our galaxy.

Students can make basic measurements of their globular clusters using a simple spreadsheet based measuring tool, the Jpeg Viewer.



Planning

1. **Look at the calendar** If possible, choose an observing date and time when the Moon is not visible, as this will give a better image. However, since globular clusters are typically quite bright, it will usually not be too serious if you are unable to observe when there is no Moon.
2. **Book** Book your observing slot.
3. **Choose targets** Once you know when you will be using the telescope, you can choose a number of globular clusters to observe which will be higher than 30 degrees above the horizon (so that the atmosphere does not cause a lot of absorption).

To find suitable objects for any time of the year use the Faulkes Observations Planner (or planetarium software). In a half hour session you should be able to obtain a dozen or more images, assuming that each takes about two minutes, including the time for the telescope to slew from one target to the next.

Observing (obtaining data)

1. **Observe** Use the telescope to get a colour image of each globular cluster. Use an exposure time of 10 seconds for each of the separate red, green and blue component images.
2. **Save** When your observing session is over, you will be taken to a web page with thumbnails of all the images you have obtained. Click on each of these in turn. This causes a larger version to open on screen. Hover over each larger image using the mouse, and when the 'save' icon appears in the top left hand corner, click on this and save the image to a suitable place on your hard disc.





Analysing

Studying your globular clusters

1. **Print** Open each of your colour jpeg images in a program like *Paint Shop Pro* or *Photoshop Elements*, and print it out using the best quality available to you.
2. **Read** If you haven't already read about what globular clusters are and how they are formed, do so now, for example, using the article by Carole Stott referred to above under 'Resources'.
3. **Examine** Examine each globular cluster carefully, looking at the overall shape, the colours of individual stars, and any other features you can see.
4. **Write** Describe your observations in your own words.
- 5.

Measuring your globular clusters

1. **Open viewer** Open the *JPEG Viewer* spreadsheet.
2. **Get image** Click the *Get new image* button in the toolbar and open each globular cluster in turn. For each follow the next few instructions.
3. **Enter distance** Enter the approximate distance to the cluster, which should be given on the Observations Planner. (When you do this, make sure the unit is set to 'kly'.)
4. **Measure** Use the green shape buttons in the toolbar to make different measurements, (e.g., how big is the globular cluster? How many individual stars can you make out in a small square region in different parts of the cluster? Is it possible to estimate how many stars there are altogether in the cluster?) For further details on using the JPEG Viewer, look at the instructions.



Evaluating

1. What factors might have limited the quality of the images you obtained, for example poor atmospheric seeing conditions, bright moonlight, twilight?
2. Are there any ways that you would improve on what you have done if you were to do the project again using the same target globular clusters? For example, would you use different exposure times or different filters?
3. Can you think how you might learn more about the globular clusters you have imaged by using different filters (broadband and narrow band)?