



Expedition to the Expanding Universe - Distances to Galaxies

Don't forget to record data and observations as you work through this activity. All of the questions and reminders from the activity are listed in order below.

Observe and Appreciate - Comparing Two Fields of View

1. Insert an image of any field of view from Navigator that contains at least one galaxy. Record your observations of the field. Note the plate scale of the image. [Where's that?](#)

2. Insert an image of one of the Abell clusters. Be sure the scale matches the one for your image above. Record your observations of the field of view.

3. What evidence is there in the image that the galaxies are actually located in the same region of space rather than just in the same line of sight?

4. What do you think these two images say about the structure of the universe? Don't forget to add your poetry if you are so inspired.

Order Galaxy Clusters Using Visual Clues

5. List the order of the galaxy clusters. Enter your results in the table below in the column titled "Visual Distance Order."

Record the Redshift to Each Cluster

6. Scanning around the Navigate tool, you soon discover that not all the galaxies in the cluster have the same redshift. Why do you think this is the case?
7. Given the above observation, outline a set of procedures for determining the average galactic redshift for each cluster.
8. Using the method you recorded above, determine the redshift to each galaxy cluster. Record in the table below.

Distance and Redshift Data for Abell Clusters			
Cluster	Visual Distance Order	Relative Distance Calculation	Average Redshift
0085			
0779			
1132			
1650			
2034			
2199			
2670			

Calculate the Relative Distance to Each Cluster

9. You have your galaxies listed in order of increasing distance based upon visual clues in the images. Why not just graph the galaxies using this data? Why bother doing any more calculations?
 10. Describe the method you chose for calculating the relative distances to each galaxy.
 11. Using the method you described, determine the relative distances to each galaxy. (Don't forget that the relative distance is the inverse of the measurement you made.) Record your results in the table.
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Create Your Graph and Interpret Your Results

12. Using the information from the table you created, plot redshift on the Y-axis and relative distance on the X-axis. You may choose to do this by hand on graph paper or insert the data into a spreadsheet. Insert a copy of your graph in the space below.

13. What conclusions can you draw from this graph? What additional information would you like to have?