

“HR Diagram of M80” Laboratory Exercise

Part 4: Magnitudes and color-magnitude

Purpose: HR Diagrams are central to understanding stellar evolution. Here, we'll take real Hubble Space Telescope data, and make an HR diagram out of it.

Method: Download the data to your computer. Import it into Excel, and make a color-magnitude diagram, which is the same as an HR Diagram. You'll need to put your answers in a separate Word or PDF document and submit via Blackboard.

When you did Part 3, you made a Color-Magnitude diagram, which is a variant of the HR Diagram, using the Hubble data.

- 1) Define the magnitude system of brightness.
- 2) Suppose you have a star measured for its brightness using the Magnitude system of measurement in two filters; one “red” and one “blue”. If you take “blue magnitude minus red magnitude” and the result is a large positive number, the star must therefore be “red”. Why?
- 3) What about if the value is a large negative number?
- 4) What about if the value is right about zero?

Consider that your eye uses three special cells that act like filters. One type of cell in your retina is sensitive to light at the blue end of the spectrum. Another type of cell is sensitive to the middle or green part of the visible spectrum, and finally, yet another type of cell is sensitive to the red end of visible light. There are a lot of these cells and they are bunched very closely together in your eye's retina. Now, a spectrograph puts light through a prism or grating. You take a picture of that in some way, and then measures the brightness of light at specific frequencies or wavelengths.

- 5) Which astronomical tool most closely resembles what your eye does: Differences of filters or a spectrograph? Justify your answer.
- 6) What's the magnitude of the brightest stars on your plot of the “First 250”?
- 7) What's the magnitude of the dimmest stars on your plot of the “First 250”?
- 8) What's the range of colors in your “First 250”?
- 9) Are most of the stars in your First 250 red or blue or in between?

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