ASTR345 Assignment 6 - due nominally by Fri Dec 5, but I will accept it any time before Fri Dec 19

Find the distances to, and ages of, the globular clusters Messier 13 and Messier 15. A pair of scissors and a bright light may be useful.

On a separate sheet, you are given a calibrated HR diagram (Fig 23.5; absolute magnitude, $M_V$, vs B-V color index), an HR diagram for M13 (Fig 23.6), and an HR diagram for M15 (Fig 23.7); the latter two diagrams show apparent magnitude, $m_V$, vs B-V color index.

Distances: find that the B-V scales are identical for each of the three HR diagrams. To make the main sequences for any two HR diagrams overlap requires a vertical shift. If you compare the calibrated HR diagram (Fig 23.5) with either of the two star clusters (Fig 23.6 or .7), you should see that the amount of this shift is $m_V - M_V$. Since $m-M$ is the distance modulus, you can find the distance to each cluster straight away.

Compare (i.e., calculate a percent error) your distance with the accepted distance, which can be found from the Messier deep-sky catalog at the website of the Students for the Exploration and Development of Space (www.seds.org). Your answer will not be very close to the accepted value. Why not (i.e., what information do you need to estimate the distance better)?

Ages: by overlapping the calibrated HR diagram with those of each globular cluster, you can estimate the absolute magnitude of the turnoff point for the cluster. Use the relations given in class that translate stellar luminosities to main sequence lifetimes, and estimate the age of each cluster.

Show the full work in your assignment, including your measured values for $m-M$, the $M_V$ at turnoff, the distance to each cluster in both parsecs and light years, and the age of each cluster in years.