

Binary Stars - astro8501 - 6944

Problem Sheet 1

1. Find the *wikipedia* page on binary stars. Read it and note as many inaccuracies as you can find! Do you trust *wikipedia*? How useful is it as a resource?
2. Name five famous binary stars. Use the SIMBAD web resource to find their Hipparcos numbers and distances. Are they all true binaries or are some triples/quadruples etc? Is this statistic biased?
3. Use the *binary_c online* page to evolve a few binaries of your choice. Give details of their starting conditions and note what happens during their evolution. Try to run some binaries with low mass stars ($M < 1 M_{\odot}$), intermediate mass stars ($M < 8 M_{\odot}$) and massive stars ($M > 8 M_{\odot}$). Is there anything you do not understand? Bring your questions!
4. Given the Kroupa, Tout and Gilmore (1993) initial mass function, what is the average mass of a *single* star or *primary* star in a binary? What is the average *total mass* of a binary star given a distribution of secondary masses which is flat in $q = M_2/M_1$ between $q = 0$ and $q = 1$? What assumption that goes into this secondary-mass distribution is incorrect and when might it be important to improve it? Speculate on the lower and upper limits of the binary *separation* distribution – what defines them? Is the distribution $N(a) = dN/da \sim 1/a$ realistic for all a ? After whom is this distribution named?
5. A problem for the computer-literate! Locate the bright star catalogue (see the lecture course web page). Download the data. Use it to find the nearest neighbour angular distribution as shown in the lecture. You will have to do roughly the following:
 - a) Convert from the given co-ordinates (RA and DEC) to spherical co-ordinates for each star
 - b) For each star find the angular distance to all the other stars and hence the nearest neighbour
 - c) Bin the distribution of nearest neighbours
 - d) Repeat the process for a *random* distribution of stars

Questions, problems, errors? Contact Robert Izzard by email: izzard@astro.uni-bonn.de