

Assignment 3 — due Thursday March 11thth [*Revision* : 1.1]

Question 1

In class, I claimed that all stars that undergo a helium flash have essentially the same core mass. In this question, I'd like you to use *EZ-Web* to test this assertion.

- Start by browsing through the on-line grid of *EZ-Web* movies¹, to find the approximate mass range over which stars encounter the helium flash.
- Then, use *EZ-Web*² to narrow down the He-flash mass range to within $0.05 M_{\odot}$.
- Finally, for five models spanning this mass range, determine the mass of the helium core when the helium flash begins.

I've been deliberately vague in the outline above, since I'd like you to draw on your own *initiative* in answering the question. You'll have to learn in greater detail how to run *EZ-Web* and analyze the resulting output; you'll have to come up with a method for dealing with the significant quantities of data produced by the code³; and you'll have to think about how best to attack the overall problem so that *your* effort is minimized. (Half of the battle in being a successful scientist is figuring out how to get to the desired result in the most efficient way possible).

Make sure you fully document all the procedures you follow in answering the question. For instance, I'd like to know what criterion you use to determine if a helium flash occurs (and *when* it occurs), and how you measure the core mass.

Question 2

Answer the following questions from Chapter 3 of *Stellar Interiors*:

- (i). 3.2 — you'll have to think a bit about 1-D random walks. A good starting place is the Wikipedia article.
- (ii). 3.4 — this gives an interesting and useful result
- (iii). 3.6 — you may find eqn. (3.27) useful

¹<http://www.astro.wisc.edu/~townsend/static.php?ref=eZ-web-movies>

²<http://www.astro.wisc.edu/~townsend/static.php?ref=eZ-web>

³See the the *EZ-Web* page for some useful IDL procedures; and you also might want to look into learning Perl, Python, or another scripting language.