Class Project Sheet 1

Due: October 21, 2008, *before class*

Use Bill Paxton's **EZ Stellar Evolution** code
`http://www.kitp.ucsb.edu/~paxton/EZ-intro.html`
The code uses `gfortran` (Linux, MacOS).
There is also the **g95** FORTRAN compiler can be downloaded for most platforms.
`http://www.g95.org`

1. **Stellar Evolution as a Function of Metalicity**
   (a) **Compute the evolution of $Z = 0.02$ and $Z = 0.001$ 25 $M_\odot$ stars**
   (b) **Compare their surface values (temperature, radius) and central values (temperature, density) at the beginning, middle and end of their evolution.**
   (c) **What else is different between these two stars and why may that be so?**

2. **Reaction Rate**
   Look reaction rate comments in `ez_nuclear_data.f` and the rate computation in `ez_nuclear.f` and the general settings in `star_controls.f`.

   Compare central abundances, temperatures, and density, stellar radius, luminosity, and surface temperature, as a function of time during hydrogen burning (hydrogen is present).

   (a) Use a solar metalicity star ($Z = 0.02$) of 25 $M_\odot$.
   How does the evolution change if you decrease and increase the reaction rates in the CNO cycle by a factor 10?
   (b) **What happens if you switch off "C12 + p (CN cycle)" or "O16 + p (ON cycle)"?**
   (c) **What happens if you switch off the three pp-chain reactions "He3 + He3", "Be7 + p", or "Be7 decay"?**
   (d) Now use a solar metalicity star ($Z = 0.02$) of 1 $M_\odot$.
   What happens if you switch off the CNO?
   (e) **What happens if you switch off the three pp-chain reactions "He3 + He3", "Be7 + p", or "Be7 decay"?**

   For each case, please explain what happens and why.

   Please document your results using plots.