Minilab #2: Create a white dwarf by mimicking a common envelope phase

- For this lab, we'll make a more realistic C/O white dwarf by mimicking a star in a binary system that overflows its Roche lobe when it's on the asymptotic giant branch and loses its hydrogen-rich envelope in a common envelope.

- We'll do this by starting with a main sequence model, rapidly removing mass once the star reaches a certain carbon core mass until the radius shrinks, and then letting the resulting hot core cool off.

- The first step is to read through **`inlist_makewdviaRLO`**. We'll assign each table an initial main sequence mass and associated carbon core mass limit. Within each table, you'll perform a small convergence study by changing **`varcontrol_target`** and **`mesh_delta_coeff`** by factors of 2 or so. Those with faster computers should make these values smaller and vice versa.

- Remember to compile at the beginning!

- When the star's carbon-rich core runs into the **`c_core_mass_limit`** limit, the run ends, and **`MESA`** will save the file as **`AGB.mod`**.

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- Now we want to rapidly remove mass. First, we have to turn off the **`c_core_mass_limit`** flag and turn on the Roche lobe overflow flags. These remove mass with the given parameters until the photosphere shrinks within **`photosphere_r_lower_limit`**.

- Then, restart from **`AGB.mod`** and save the model at the end of this phase as a different model, **`donewithRLO.mod`**. To do so, turn on and off the appropriate flags in **`star_job`**, and **`./rn`**.

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- Now we have a hot exposed AGB core that is starting to cool. Turn off the Roche lobe overflow flags, and turn on the last stopping condition so that the run will stop when the central temperature reaches 2 x 10^7 K.

- Restart from **`donewithRLO.mod`**, and wait for the run to complete!

- You'll notice that the resulting C/O WD is not 50/50 C/O like the simple WDs we made in the first minilab. The helium shell is not able to burn completely, so there is a remnant layer of helium on top. Find the **`total_mass_he4`** at the end of the run in **`LOGS/history.data`**. Report your total ^{4}He mass and the final total WD mass on the Google spreadsheet.

- (The terminal outputs masses for **`He_core`** and **`C_core`**, which denote the outer mass extent of the He- and C-rich cores, respectively. Due to the shape of the helium abundance profile, the difference between the two is not the same as **`total_mass_he4`**. If you're waiting for others to finish, find out what **`MESA`** uses to determine the location of the He- and C-rich cores.)

- (Another note: when you're doing production research runs, turning flags on and off like this is probably not the best thing to do. Instead, you can have different project inlists and reference them from your main inlist.)