

STELLAR MODEL PROJECT

Physics 3021 – Fall 2009

Due Monday, November 30 at 2:00pm

This project is to make a theoretical stellar model for a given stellar mass with the computer code STATSTAR. You are to calculate a homogenous, main-sequence model having the composition $X = 0.70$, $Y = 0.292$, and $Z = 0.008$. After obtaining a satisfactory model, then do (at least) the following:

- a) Plot P versus r , \mathcal{M}_r versus r , L_r versus r , T versus r , and ρ versus r .
- b) What are the temperatures where L_r has reached approximately 99% and 50% of its surface value?
- c) What are the values of $\mathcal{M}_r / \mathcal{M}_*$ for the two temperatures found in part (b)? (\mathcal{M}_* is the total mass of the stellar model.)
- d) Provide a description of stars of this mass.

**Each team is responsible for the results for the assigned stellar mass.
Each team is responsible for ONE write-up.**

Note that the presentation and appearance of the write-up constitutes a significant fraction of the grade.

To Get StatStar Ready

1. Transfer **statstar.f** and **stargo** to a Unix computer (such as acme, prism, etc.)
2. Compile **statstar.f**

```
$ g77 statstar.f -o statstar.exe
```

3. Make stargo an executable script

```
$ chmod +x stargo
```

To Run The Program

```
$ stargo mass temp luminosity
```

Example: **stargo 1.00 5500.2 0.86071** Try it – the example works!

The only variable you will change is the **luminosity**.
You probably need to use 5 significant digits.

The output file is **starmodl.dat**.

Mass	Temp
0.50	2321.4
0.60	2910.8
0.70	3523.0
0.80	4163.3
0.90	4832.8
1.00	5500.2
1.25	7203.6
1.50	8726.4
1.75	10090.0
2.00	11218.4
2.25	12260.0
2.50	13240.0
2.75	14170.8
3.00	15007.3
3.50	16525.0
4.00	17904.0
4.50	19153.6