

Astronomy 100, Fall 2006

Name:

Weekly assignment 7: Star classification and evolution

Due: November 28, 2006 at 11 a.m.

Distinguish:

Orbital motion versus **precessional** motion

Nova versus supernova

Neutron star versus black hole

White dwarf versus **brown** dwarf

Type I supernova versus **Type II** supernova

The energy radiated by a “**blackbody**” and its temperature were connected experimentally in 1879 by Jozef Stefan and theoretically in 1884 by Ludwig Boltzmann (in an equation that now bears both of their names). What is a “blackbody” and what is the **mathematical** relationship between energy and temperature?

In 1893, Wilhelm Wien connected two measurable characteristics of a “blackbody” that had not been connected before (the equation that describes the relationship now bears his name). What are the two characteristics and what is the **mathematical** relationship between them?

In 1911, Einar Hertzsprung and Henry Norris Russell simultaneously and independently connected two stellar characteristics that had not been connected before. The graph of these two characteristics is called the Hertzsprung–Russell diagram, or **H–R diagram**, in their honor. What are the two characteristics?

Sketch the H–R diagram on a separate sheet of paper (photocopies of textbook pages is not acceptable). Include labels for the axes, as well as for the “tick” marks along the axes. Also mark where the “**Main Sequence**” area on the diagram is, as well as the “White Dwarf”, “Red Giant” and “Solar Nebula” areas.

What **percentage** of the stars in the Milky Way plot (on the H–R diagram) in the “Main Sequence”?

The H–R diagram not only shows a snapshot of what the Milky Way looks like today, but also it is a diagram of stellar evolution. On your H–R diagram, draw a dotted line that represents the path of the birth, life and death of a one solar mass star, like the Sun.

What **percentage** of a one solar mass star’s life is spent in the “Main Sequence”?

Go out before dawn on a clear morning next week; look to the southeast. Sketch **the Moon (if visible), Saturn and the bright star Regulus in the constellation of Leo**. At 4:30 a.m., Regulus should be about 45° altitude. Give the usual time/date/direction/horizon. As a bonus, you may see some of the Leonid meteor shower.