ASTRONOMY 122
STARS and STELLAR EVOLUTION

Fall Term 2003

Prof. Greg Bothun
Office: 417 Willamette
Office Hours: 10:00-12:00 MWF
(But check this first)

email: nuts@blgmoo.uoregon.edu

TA: Rachel Drummond (rdrummon@darkwing.uoregon.edu)

Textbook: None Required

The home page for this course is:

http://zebu.uoregon.edu/2003/str122.html

Course Content and Philosophy:

This course will deal with the structure and evolution of stars. But this course will not be a lecture based course but instead will be a series of explorations, aided by the use of computer software, into the kinds of measurements which are necessary to make so that we can learn about the nature of stars. Hence, much emphasis will be placed on what we can deduce merely from observations of the light emitted from stars as well as how detectors actually work. While we hope to teach you some astronomy this term, the primary goal of this class is for you to become scientifically literate, to understand the role of uncertainty in the scientific process and to learn the vital role of detectors, measurement error, signal-to-noise and bias.

We will use these observations and their related uncertainties to present a model for the manner in which stars evolve and provide a common basis that links together all life forms. Overall, I hope to make this course fun and entertaining and I also plan to stimulate your brains to think about things that may not have occurred to you. I would like to replace the usual minimum energy learning environment with something a little more challenging and meaningful! At the very least, the course should provide you with a framework for understanding how elements in the Universe came to be and for how scientific inference is made from observations.

If you are looking to learn and interact with material in a way that is different than the standard spoon fed knowledge/memorization mode of teaching, this class is definitely for you.
However, if you really don't want to take ownership of the learning process your self and have come to rely strictly on spoon fed knowledge 1) this will paralyze your ability to learn and 2) this class may not be best for you.

Course Organization:

This course will not make heavy use of any textbook.

We will start out this course with exercises designed to further your understanding of measurement errors and how detectors work. This will basically involve the use of a digital camera simulator and measuring the properties of images recorded on that detector. We will then move to understanding the basic processes of photon emission and absorption and the overall nature of light. From that we will move to a series of measurements that emphasize what spectra lines are and the chemical information that is encoded by them. Then we will shift to activities that emphasize the relation between the observed color of a star and its temperature. We will then begin to measure the spectral properties of real stars in order to determine how stellar classification is done from measurements.

Using the above as a baseline, we will then proceed to simulate how astronomers make the HR diagram, the fundamental way in which we learn about stellar evolution. This will be done by the use of our trigonometric parallax simulation tool and different groups of students will use it in different ways. Here is then where we will learn about the energy sources in stars and how each stage of stellar evolution is triggered by a change in energy source.

In short, this class will be centered around the use of real data and real measurements. We will all learn together from that mode, and not from lecturing by the Professor.

Math Required:

This course will not be very technical, although some mathematical descriptions will be absolutely necessary. Grading techniques, however, will be designed so that people with weak math backgrounds or aptitudes will not be penalized.

Collaborative Learning:

No one in this class will work alone. You will be working with other partners on the in class and out of class activites. Such collaboration will facilitate inquiry and different points of view. It will be an essential part of this class.

Grading

- Homework 25%
- In-Class Participation 15%
- Midterm 30%
- Final Exam 30%