Reminders

1. 2 Online Quizzes this Week
2. Read Chapter 11
3. Mideterm 2 Friday Oct 16: Chaps 3, 5, 10, 11, some of 12
Lecture 18 — How the Sun Works
Eclipsing Binaries: Keys to Finding Stellar Masses and Diameters
Eclipsing Binaries: Get Diameter from Light Curve

An Eclipsing Binary Star System

A small, hot star orbits a large, cool star, and we see their total light.
As the hot star crosses in front of the cool star, we see a decrease in brightness.
As the hot star uncovers the cool star, the brightness returns to normal.
When the hot star is eclipsed behind the cool star, the brightness drops.
The depth of the eclipses depends on the surface temperatures of the stars.
Center of Mass

\[ M_A R_A = M_B R_B \]

\[ \frac{M_A}{M_B} = \frac{R_B}{R_A} \]
Which of the following is FALSE?

(a) The main sequence is a band of stars in the HR diagram

(b) All stars on the main sequence are burning hydrogen to helium in their cores

(c) There is a relationship between mass and luminosity only on the main sequence

(d) Protostars are on the main sequence
Spectroscopic Parallax: Another way to get distance

- Not a parallax measurement at all
- Use spectra to find out Luminosity Class
- Find Position in HR diagram
- Not terribly accurate
- Nowhere near as accurate as trigonometric parallax!
Photometric Bands
Canis Major: Distances and Brightness
Luminosity Function: Volume Limited Survey
Common or Rare: Bright or Dim

In this histogram, bars rise from an H-R diagram to represent the frequency of stars in space.

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Selection Effect

The brightest stars in the sky tend to be highly luminous stars — upper-main-sequence stars, giants, or supergiants. They look bright because they are luminous, not because they are nearby.

The nearest stars in space tend to be very faint stars — lower-main-sequence red dwarfs or white dwarfs. Nearly all of these stars are faint in the sky even though they are nearby. Only a few are visible to the unaided eye.
Hans Bethe and Friends
Proton-Proton Cycle

\[ p + p \rightarrow ^2H + e^+ + \nu \]

\[ ^2H + p \rightarrow ^3He + \gamma \]

\[ ^3He + ^3He \rightarrow p + p + ^4He + \gamma \]
PP Cycle

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Fission versus Fusion