Lec #12: 19 SEP 11   The HR Diagram

- **LAST TIME: Spectral Classification**
  - effective temperature
  - historical development of spectral classification
  - the MK system
- **TODAY: HR Diagram**
  - what is it? how is it used?
  - luminosity class
  - spectroscopic parallax
  - mass on the HR diagram
- **WEDNESDAY: Measuring Stellar Mass**
  - binary stars
  - mass-luminosity relation
  - mass and the HR diagram

"HR" Diagram of the **nearest** stars *(w/ measured distances)*

• Most stars "cooler" than the Sun

• Stars confined to the lower right end of a narrow strip ("main sequence")

• or below and to the left of the main sequence ("white dwarfs")

"HR" Diagram of the **brightest** stars (w/ measured distances)

• Most bright stars "hotter" than the Sun

• Stars confined to narrow strip (upper left of "main sequence")

• or above and to the right of the main sequence ("red giants")

$L = 4\pi R^2 \sigma T^4$

giants have narrow lines
dwarfs have broad lines

caution: rotation rate also affects line width

2-dimensional MK Spectral Classification

Class	Type of Star
Ia-O	Extreme, luminous supergiants
Ia	Luminous supergiants
Ib	Less luminous supergiants
II	Bright giants
III	Normal giants
IV	Subgiants
V	Main-sequence (dwarf) stars
VI, sd	Subdwarfs
D	White dwarfs

H-R diagram for nearest stars.

Ib

III

Arcturus
KI III
M_v = 0
d = ?

Altair
A7V
M_v = 0.8
d = ?

V

Spectroscopic Parallax

• stars are confined to narrow strips defined by spectral type and luminosity class

• given MK classification, we know approximately what absolute magnitude (luminosity) should be

• with apparent magnitude, we can determine distance (from the distance modulus)