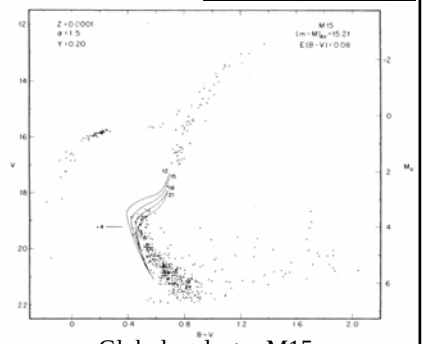
Lifetime of Stars—3 Oct

- How are giants and dwarfs related?
- Does the sun have a finite life or does it last forever?
- Clues
  - H-R diagram
  - Mass is related to luminosity
  - Fuel consumption rate

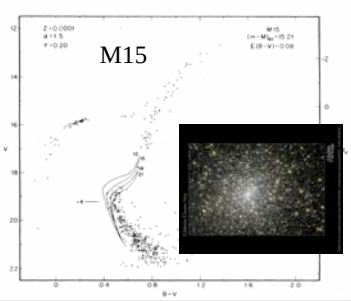


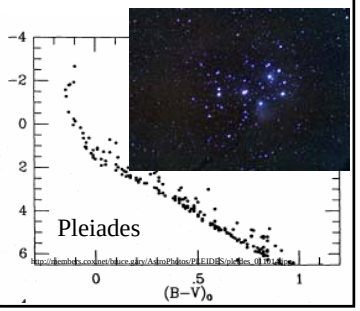
Globular cluster M15

- Homework 4 and 5 are due on Wed, Oct 8. No late papers.
- Test 2 is on Mon, Oct 13 (new date).
  - Covers material through class on Fri, Oct 3.
  - It will be mostly on material not covered on Test 1.
  - Practice test (with answers) is on the web.
  - Last 15min of class of Fri, Oct 10 will be Missouri club.
- Observing session next week is cancelled. Go to public observing on 10th & 11th (link on syllabus) if you are interested.
- I will be in Chile to set up the Spartan Infrared Camera during the week of 13-17.
  - Jack Baldwin will teach for me.

Pleiades & M15

- Stars in a cluster were born at the same time. They are at the same distance.
  - Study a cohort of thousand-tuplets. How are they different? What is their lifetime?
- What are differences between the Hertzsprung-Russell diagrams of M15 and the Pleiades? (For M15, plot is apparent magnitude.)





Differences between M15 & Pleiades

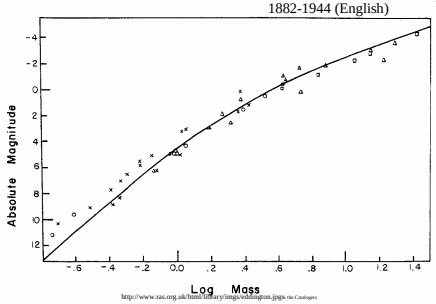
- All stars in Pleiades are on the main sequence. Some in M15 are not.
- Main sequence ends at color -0.2 for Pleides and +0.4 for M15.
- M15 has more stars.

Mass-Luminosity Relation

Arthur Stanley Eddington
1882-1944 (English)

- Reading the plot
  - Absolute magnitude of the sun is about 5.
  - Mass of the sun is 1.
  - mass = $10^{\log \text{ mass}}$
- What is the mass of a star with 1000 times the luminosity of the sun?

1. What is the absolute magnitude of such a star?
   A. -2.5
   B. 0
   C. 2.5
   D. 5
   E. 7.5
2. What is the mass?
   A. 1.2
   B. 16



Lifetime of Stars

- Lifetime = Amount of fuel/Rate of consumption
  - Lifetime of a tank of gas for a car
  - For a star
    - Amount of fuel = mass
    - Rate of consumption = luminosity
- Lifetime = mass / luminosity
- Stars have a finite life. The sun will not live forever!

Spectral Class	Abs Mag	Luminosity [Lsun]	Mass [Msun]	Lifetime [Tsun]
O3	-6	25000	40	1/600
G2 (sun)	5	1	1	1
M0	10	1/100	0.3	30

Lifetime of Stars

- Lifetime = mass / luminosity
- Stars have a finite life.
- The sun will not live forever!
  - Life of sun is 10Byr
- O3 stars
  - Lifetime is 1/600 of sun's
  - O stars have a lot more mass than the sun. Why is their life so short?
- M0 stars have a long life.

Spectral Class	Abs Mag	Luminosity [Lsun]	Mass [Msun]	Lifetime [Tsun]
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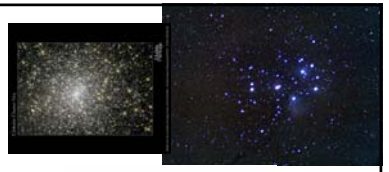
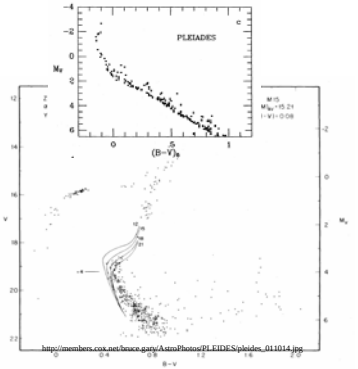
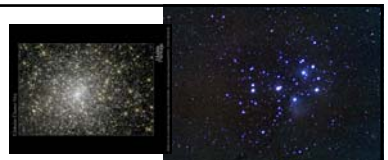
Pleiades & M15



3. Why does M15 not have any main sequence stars with B-V=0.2?
   A. They were not born in M15.
   B. They died already.
   C. They became redder main-sequence stars.



Pleiades & M15



3. Why does M15 not have any main sequence stars with B-V=0.2?
   A. They were not born in M15.
   B. They died already.
   C. They became redder main-sequence stars.
4. Why are there so few giants in the Pleiades?
5. How are giants related to main sequence stars?