



Age of M13

Life of Stars

Claudia Piceno

Jose Guzman

Overview

- Why is this an interesting project?
- What is M13?
- Observations
- Life of a Star
- How we measured the age of our cluster.

M13 Globular Cluster

- We calculated the age to be between 12 to 14 billion years old
- It is 25,000 light years away from Earth

Data

Nickel Telescope 1-meter
located in Mt. Hamilton in
San Jose, CA.

Filters:

B for Blue

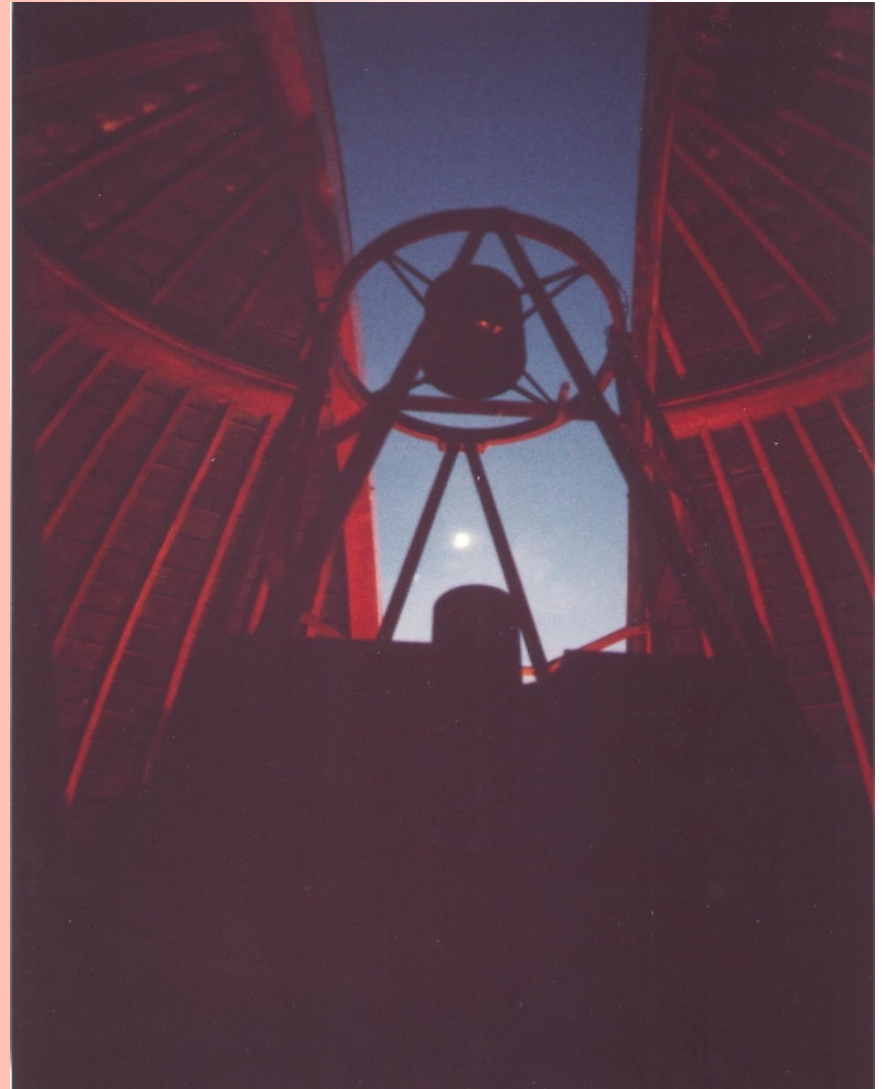
R for Red

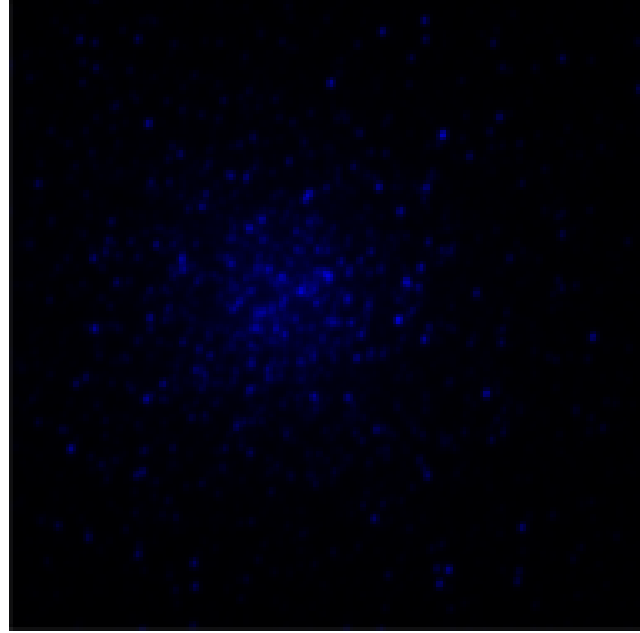
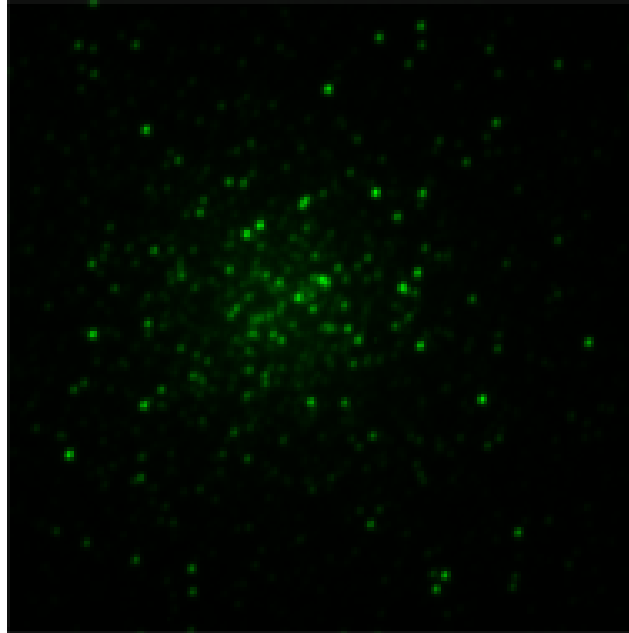
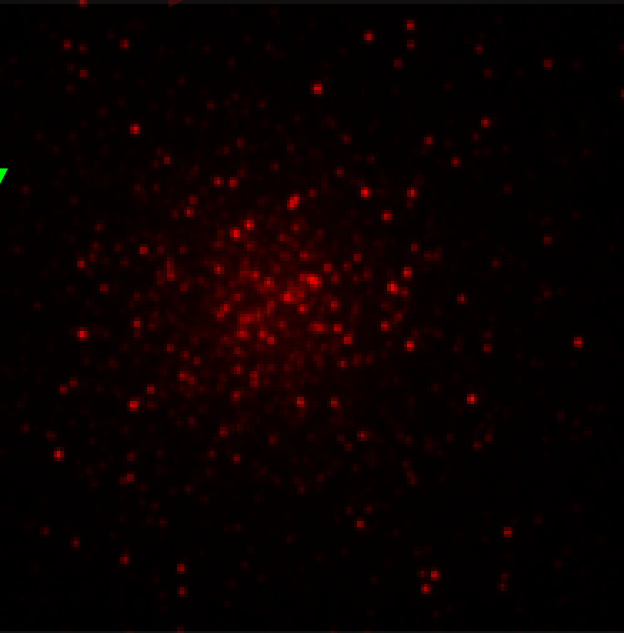
V for Green (visual)

Three images were taken in
each filter:

5 minutes for V and B

3 minutes for R





Red Filter

Visual Filter

Blue Filter



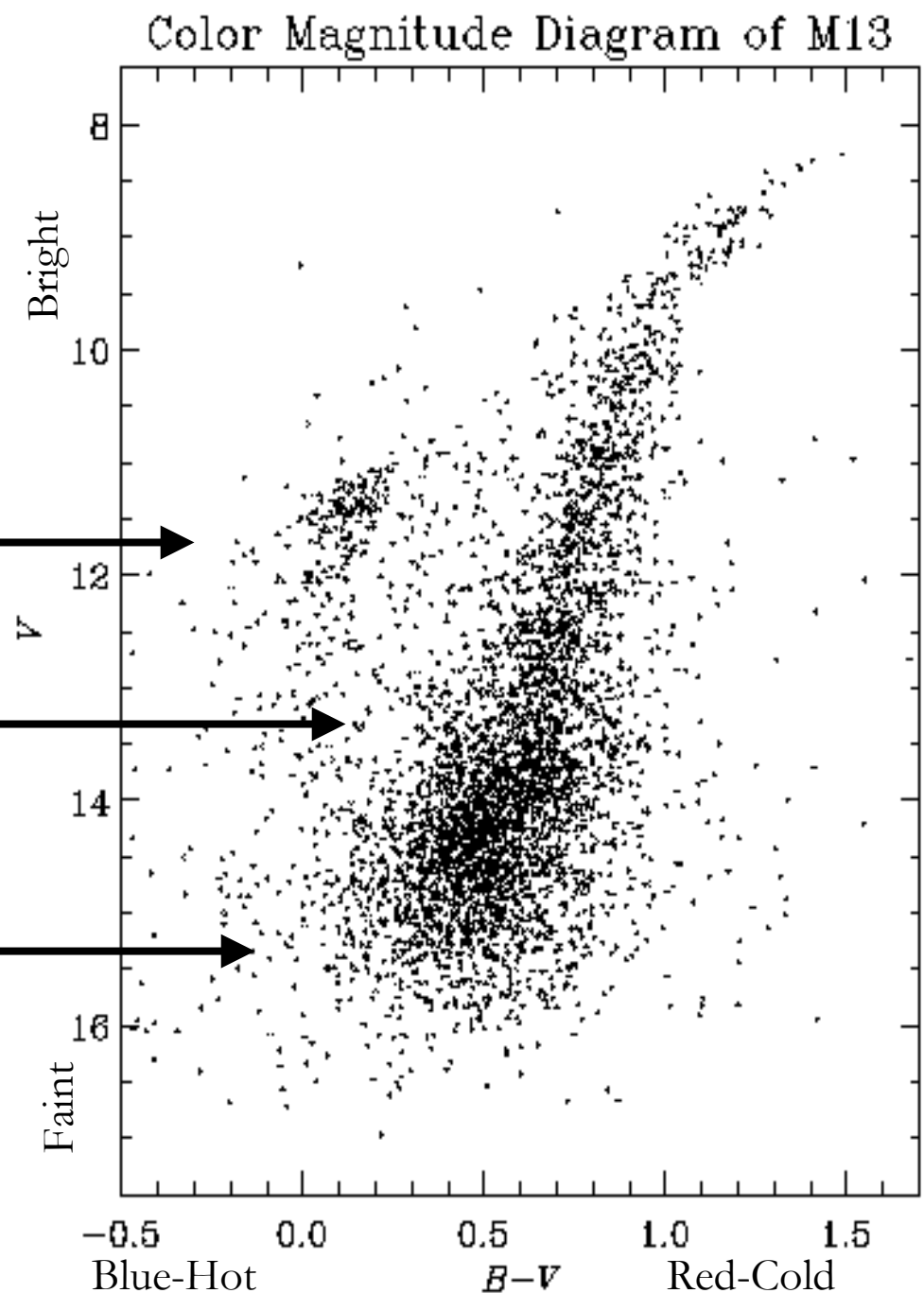
RGB

RBV Combined



The Color Magnitude Diagram of M13 shows:

- There is the HB
- There is a lot of red giants
- That there is a low amount of main sequence stars



Theory

- How do stars form?
- How do stars evolve?
- Main Sequence to Red Giant to HB.
- Using the Star Evolution we figured out the age of our Star Cluster.

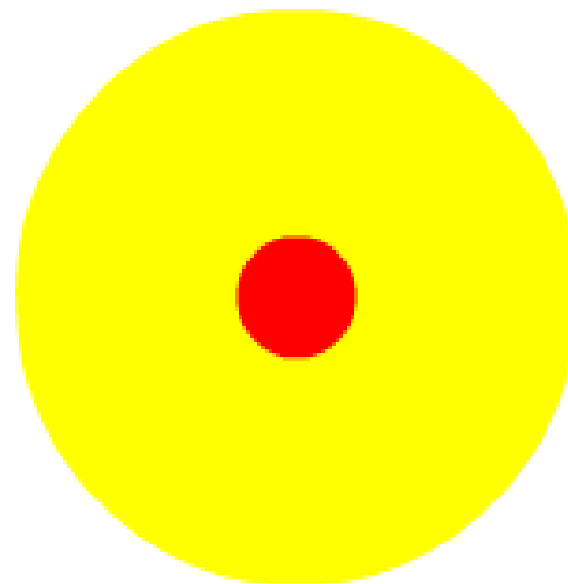
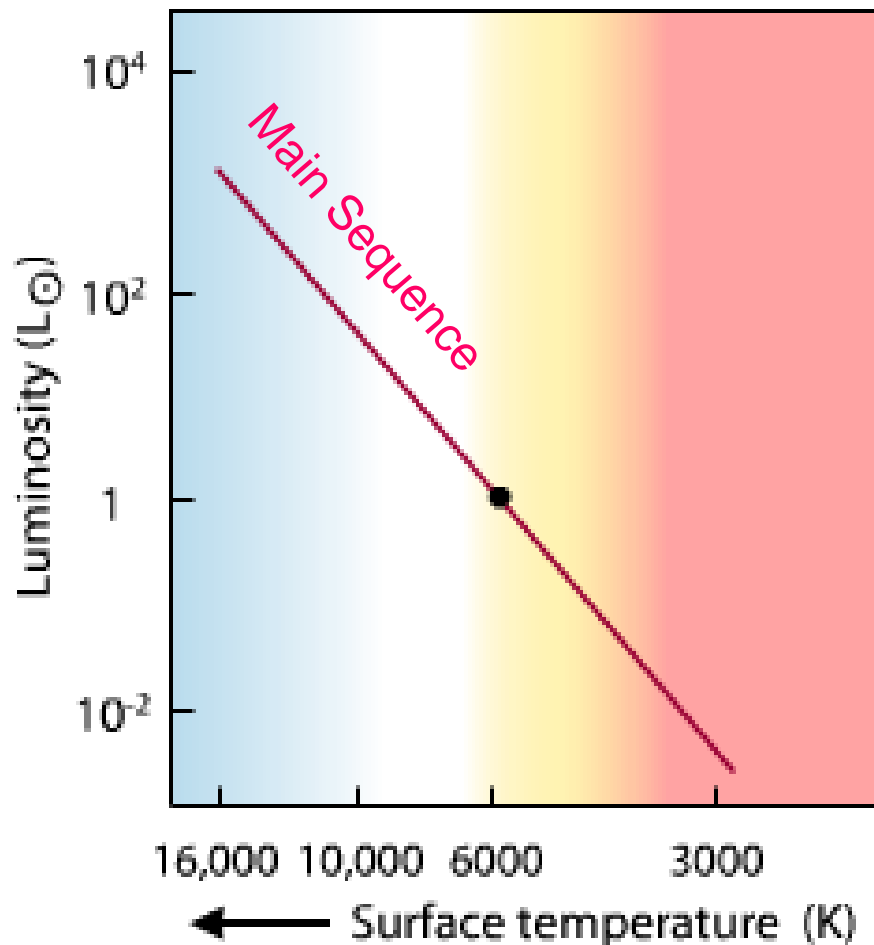
Star Formation

A vibrant nebula of red and orange gas and dust, with a bright yellow and white core at the center. Two black arrows point towards the core from the left and right sides. The background is dark, making the glowing nebula stand out.

This is a dust and gas cloud that gravity is collapsing.

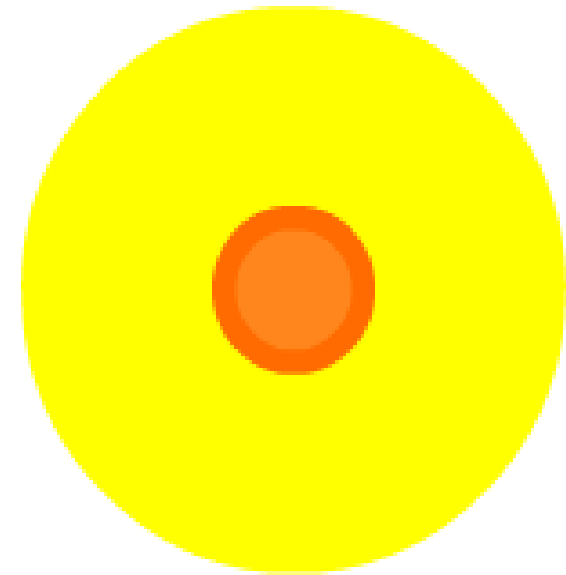
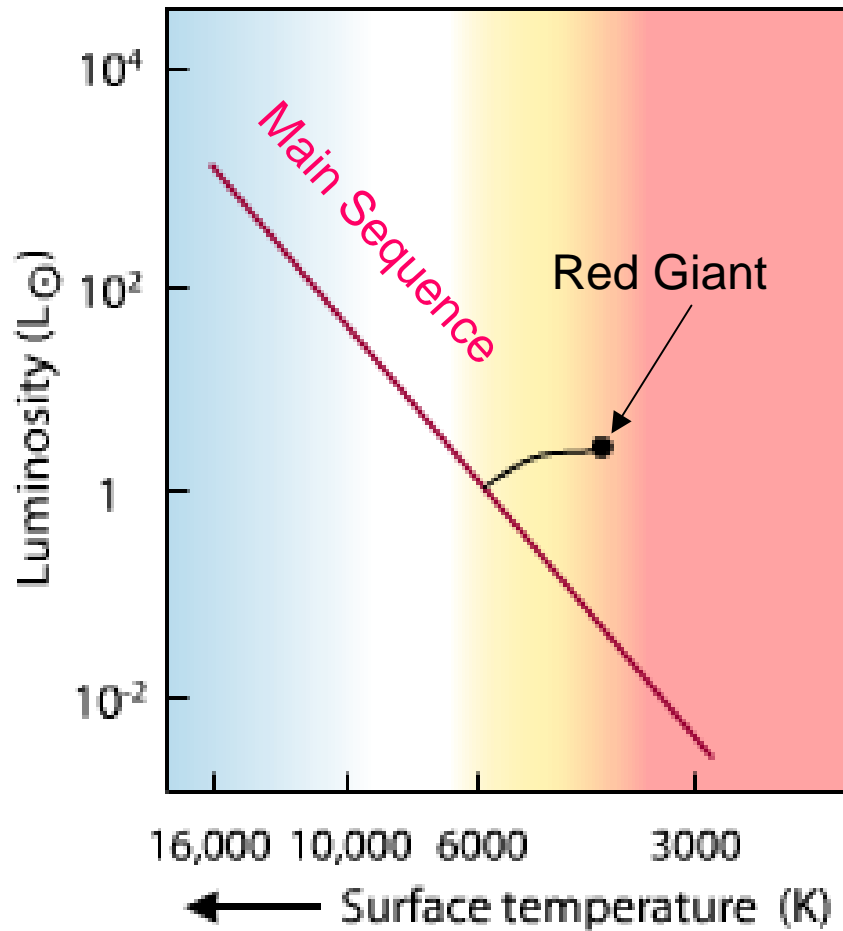
Gets hot enough for fusion to occur.






Main-sequence star with core hydrogen burning



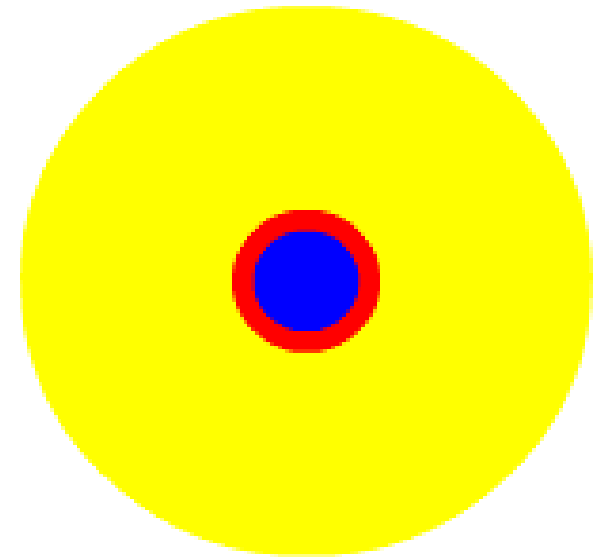
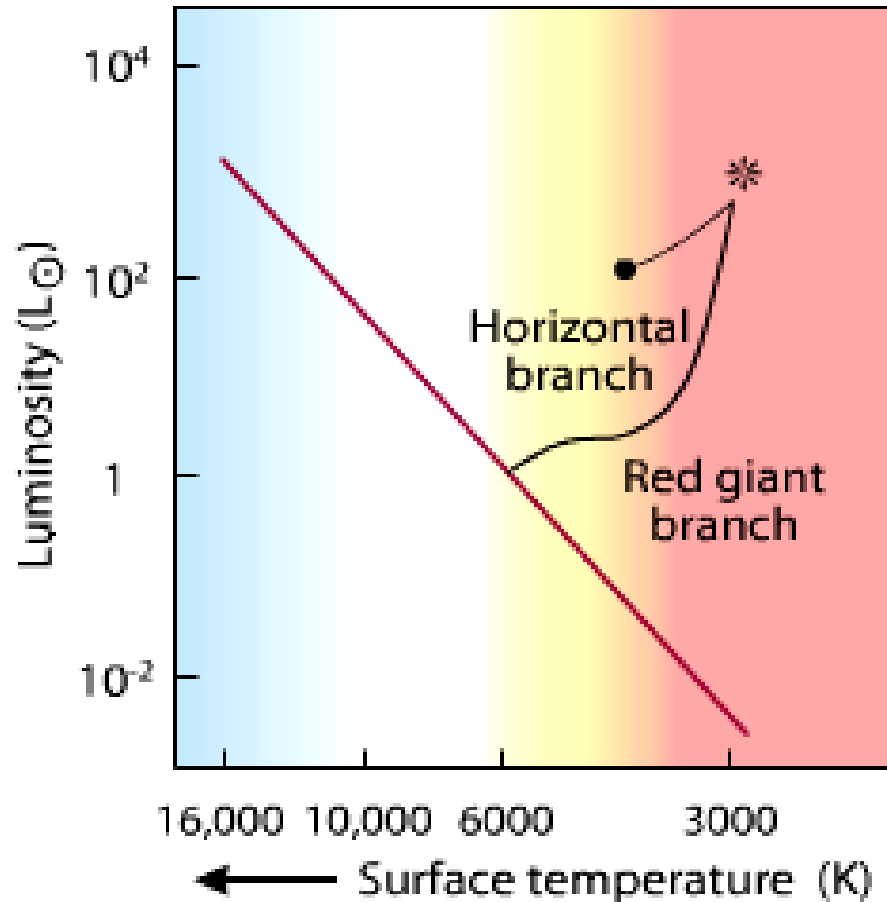
- Mostly hydrogen, no nuclear reactions
- Mostly helium, no nuclear reactions
- Mostly carbon & oxygen, no nuclear reactions
- Hydrogen burning
- Helium burning

Red giant star with inert helium core and hydrogen-burning shell



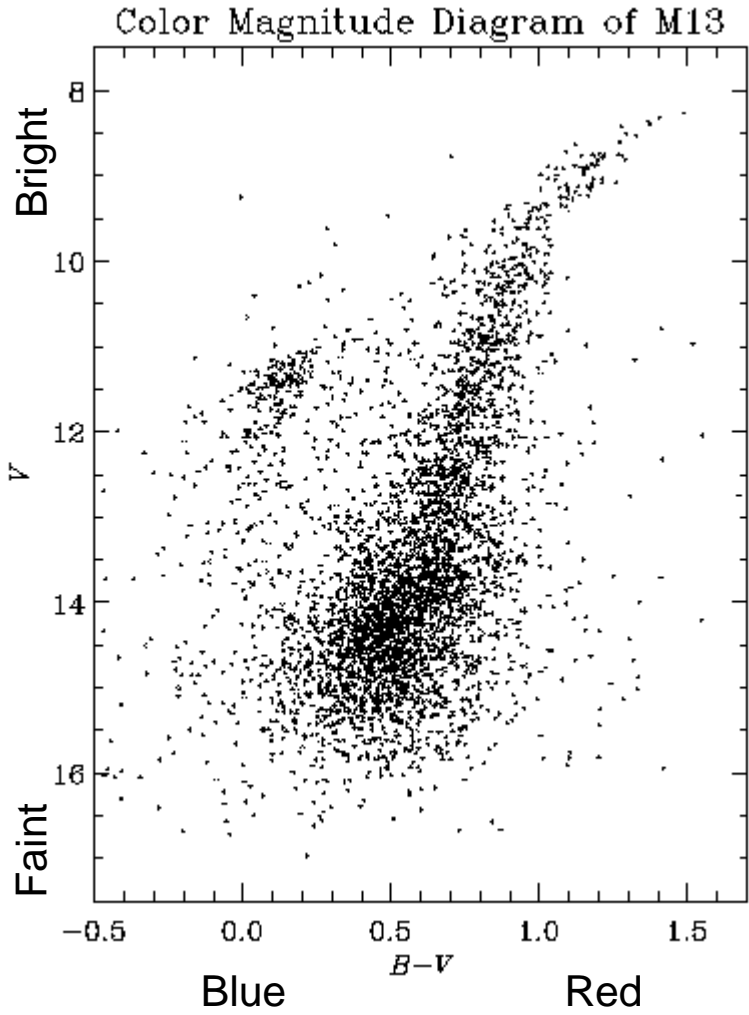
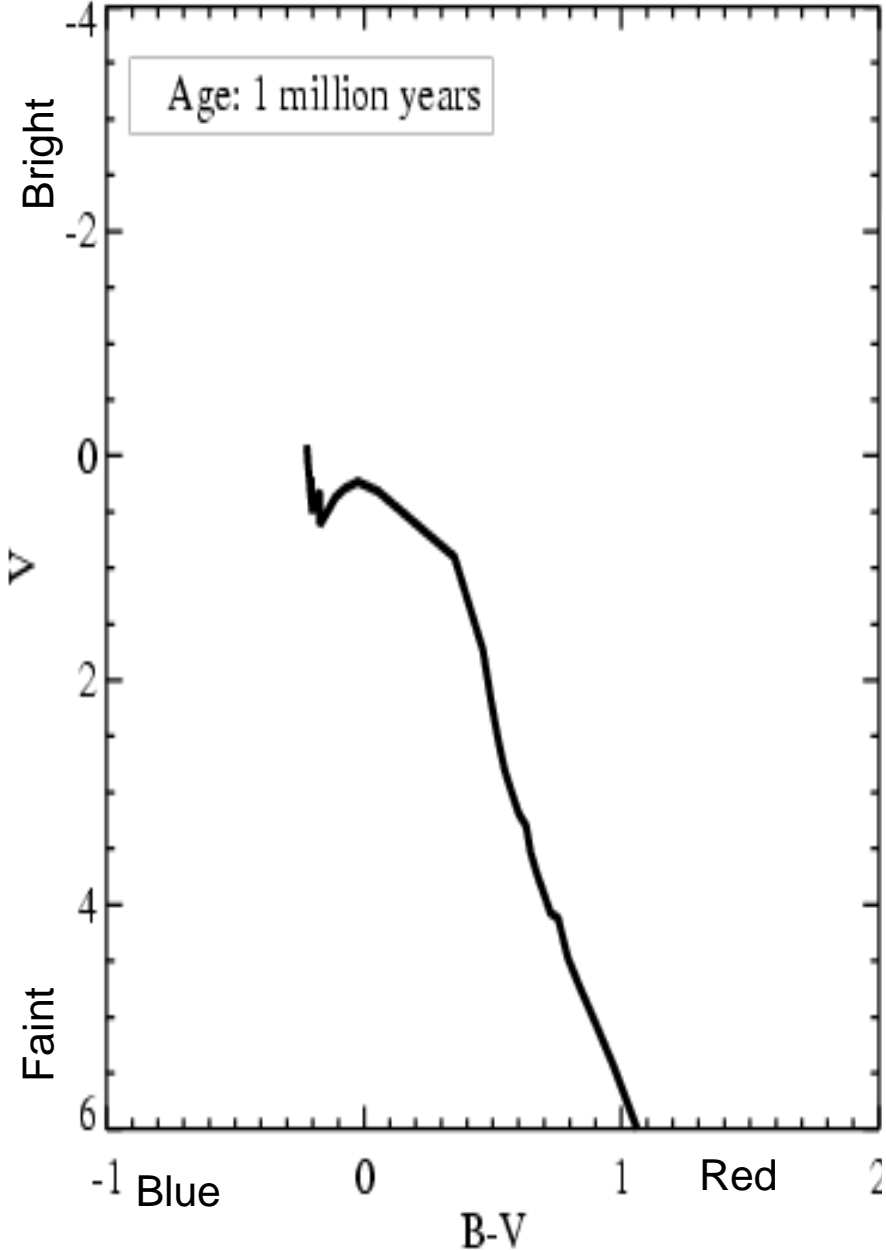
-  Mostly hydrogen, no nuclear reactions
-  Mostly helium, no nuclear reactions
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-  Hydrogen burning
-  Helium burning

Horizontal-branch star with helium-burning core



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- Mostly carbon & oxygen, no nuclear reactions
- Hydrogen burning
- Helium burning

Cluster Evolution



Conclusions

- We used CMD Models to determine the age of M13 Globular Cluster.
- Cluster is 12 to 14 billion years old.
- Stars are formed by collapsing gas and dust.

M13



Acknowledgements

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