

Stars

Student Page

Purpose

To investigate stellar classification by studying the H-R Diagram

Before you Begin

1. Based on your background knowledge, is our Sun considered a hot star, a cool star, or a star with average temperature?
2. If a star were to become larger in volume, what would happen to its surface temperature and the amount of light it radiates?

A.J.J.A.R. Programs Required

H-R Diagram

Black Body Source

Questions

1. Using the diagram, what is the approximate surface temperature of our Sun?
2. What is significant about the Sun's location on the graph?
3. Click somewhere in the upper right corner of the graph. A star in this part of the graph has an extremely high luminosity (wattage), but very low surface temperatures. Explain how this is possible.
4. The long line that extends from the upper left to the lower right portion of the graph is known as the Main Sequence. The majority of stars are found somewhere on this line. Develop a hypothesis as to which of the stars along the Main Sequence will stay in that stage of their life the longest, based on the information you have using this program.
5. At what wavelength does the Sun radiate at its peak intensity?

Advanced Questions

1. Human vision is extremely sensitive at the same wavelength of light as the Sun's peak energy output. If humans were to travel to a planet orbiting a star with a surface temperature four times higher than our Sun's, what kind of visual modifications, if any, would they need to make?
2. The star Betelgeuse in the constellation of Orion has a peak wavelength of about 9500 angstroms. What is Betelgeuse's approximate surface temperature?

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Teacher Page

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Possible Answers to Before you Begin

The Sun is considered to be average in temperature.

If a star were to become larger in volume, its surface temperature would decrease (because its energy would be spread over a larger surface area) and the amount of light it radiates would increase (because it would have a larger surface area that is radiating that energy).

A.J.J.A.R. Programs Required

H-R Diagram

Black Body Source

Answers to Questions

1. By clicking on the diagram, it is possible to locate the position on the graph where a star will have one solar luminosity and one solar radii. This will yield a surface temperature of approximately 5700 K.
2. The Sun's location is significant because it lies on the long path that runs from the upper left to the lower right portion of the diagram. This is on the Main Sequence portion of the diagram.
3. Even though stars in this portion of the diagram have relatively low surface temperatures, they have high luminosities because of their tremendous size. The stars in this portion of the graph are now as supergiants.
4. Stars in the lower right portion of the graph will remain on the Main Sequence the longest. This is because they will burn their fuel very slowly compared with larger stars on other parts of the Main Sequence.
5. The Sun radiates at a peak wavelength of approximately 5000 angstroms.

Answers to Advanced Questions

1. A star with a surface temperature four times higher than our Sun's will have a peak output of approximately 1300 angstroms, which is a far shorter wavelength than the human eye can detect (4000-7000 angstroms). Although a star of this temperature will still radiate light in the visible portion of the spectrum, humans would no doubt have to utilize some sort of visual aid in order to see satisfactorily while exploring a planet orbiting such a star.
2. Betelgeuse has a surface temperature of approximately 3100 K.

Additional Internet References

Virtual Trips to Black Holes and Neutron Stars

http://antwarp.gsfc.nasa.gov/htmltest/rjn_bht.html

The Natures of the Stars

http://www.astro.uiuc.edu/~kaler/sow/star_intro.html