

Build Your Own Star

(Virtual Experiment)

http://199.6.131.12/en/scictr/lab/byo_star/index.htm

Directions: Working in groups (3-4 students), go to the above internet site. Once you are at the site, you should read the following sections:

- "Star Primer"
- "Vary Mass and Metal Content to Determine the Fate of Your Star"
- "Stages in the Life of a Star"

When done reading the overview on stars and their life cycle, click on the "Now it's time to Build Your Own Star" link at the bottom of the page. At this point, you should use the information you gathered from the sections you read to build a few stars.

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Virtual Experiment
Build Your Own Star

Use our star simulator to build your own star! You determine the fate of your star by setting initial characteristics. Then watch as its life story unfolds before your eyes. Here's your guide to the Build Your Own Star controls and displays. But first, a little background...

Star Primer

All stars have a beginning and an end. But their life cycles vary. Some are short lived, while others remain bright for a long time. Some end up as white dwarfs, while other become neutron stars or black holes.

Stars generate energy through a process called fusion. Atoms of lighter elements combine to form atoms of heavier elements. In the most common fusion process in the universe hydrogen combines to form helium. This is what is going on in the Sun right now. In some stars, helium fuses into carbon and oxygen. These elements may then fuse into still heavier ones.

There are two main factors that determine how the life of a star unfolds:

- The mass of the star—how much stuff there is in it.
- The proportion of the star that is made of metal.

For astronomers, the term "metal" does not just mean iron, copper and other elements that we normally think of as metals. Any elements other than hydrogen and helium are referred to as metal. (This may sound odd, but it is just the way the term "metal" is defined for astronomers.)

Stars are giant balls of gas in a balance between gravity and heat. Gravity pulls the gas inwards towards collapse, while the pressure due to the internal heat pushes the star towards expansion. It is helpful to think of stars as being in a balancing act, on the brink of a gravitational collapse that is only prevented by the heat generated via nuclear fusion. Stars that are massive must burn fuel much faster than light stars in order to maintain the balance. Despite having more fuel they age much faster—in millions of years instead of billions.

The metallicity of stars is their proportion of elements other than hydrogen and helium. This has an effect on the balance between gravity and heat because it affects how easily the generated heat can push gas out. Higher metallicity means the star is more opaque—less transparent—to photons. So light and heat must work harder before escaping the star.

Science Lab

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