

How do stars form and evolve?

By NASA, adapted by Newsela staff on 03.28.17

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TOP: Thousands of sparkling young stars are nestled within the giant nebula NGC 3603. This stellar "jewel box" is one of the most massive young star clusters in the Milky Way, the galaxy that contains our solar system. NGC 3603 is a prominent star-forming region in the Carina spiral arm of the Milky Way, about 20,000 light-years away. This image shows a young star cluster surrounded by a vast region of dust and gas. The image reveals stages in the life cycle of stars. Photo from: NASA. BOTTOM: Novae typically originate in binary systems containing sun-like stars, as shown in this artist's rendering. Photo from: NASA's Goddard Space Flight Center/S. Wiessinger

A galaxy is a group of millions of stars. Stars are the building blocks of galaxies. Their age and what they are made of tells us about the galaxy's history. That is one reason why studying stars is a very important part of astronomy, the study of space.

Stars are born in huge clouds of dust and gas. These clouds get so big they cave in on themselves. As the cloud caves in, the center, or core, heats up. The hot core will one day become a star.

The core gathers up dust and gas. Some of it adds to the star. The rest may become planets or other space objects.

Stars Burn Brightly

A star burns all through its life. This burning is what makes stars hot and bright. After a very long time, the star will burn itself out. Then the star will collapse, or cave in.

Stars come in many different sizes and colors, and some are brighter than others. The smallest stars are called red dwarfs. Red dwarfs are the most common stars. They have lifespans of tens of billions of years.

The biggest stars are called hypergiants. These stars can be more than 100 times bigger than our sun. They live for only a few million years. Hypergiant stars were common in the early universe. Today, they are rare.

Most Stars Live Billions of Years

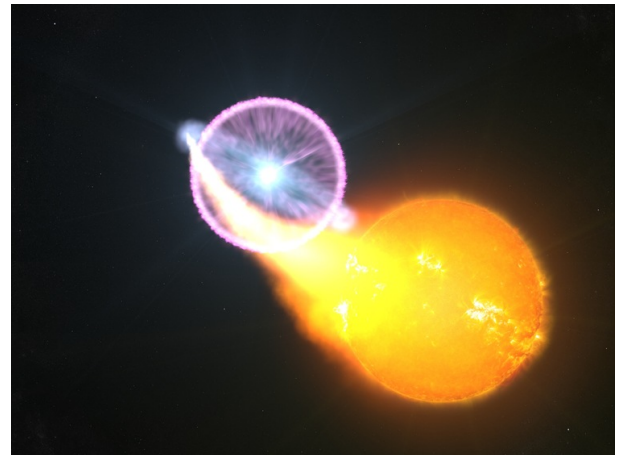
The larger a star, the shorter its life. Still, most stars live for billions of years. Eventually the star runs out of stuff to burn. Then the core caves in on itself. It gets even hotter. The heat pushes the outer layers of the star away from the core.

These layers get bigger and bigger. Finally, they start to cool down. This transforms the star into something called a red giant.

For most stars, the outer parts keep spreading out until only the core is left. At this stage the star is called a white dwarf. The core is dead, but still very hot. The core slowly cools down. Eventually it burns out.

A Nova Is Born

The end will be different if a white dwarf forms near another star. Then, it may end as a nova. The white dwarf will grab material from the nearby star. This will make the white dwarf bigger and bigger, and brighter and brighter. When the white dwarf reaches a certain size, it will shoot off the material it stole. This explosion is called a nova. Within a few days, the white dwarf stops glowing. It begins stealing again. The cycle starts over.



Supernova Explosion And Entering The Black Hole

The biggest stars die in a huge explosion called a supernova. In a nova, only the outside of the star explodes. In a supernova, the entire core explodes. This makes for a much bigger, brighter explosion.

During a supernova, the core collapses. It gets much hotter, up to 100 billion degrees. The outer parts of the star cave in. Then, the core explodes. This throws everything outward into space.

If a supernova is big enough, it will form a black hole. The gravity of a black hole is incredibly strong. It pulls in everything around it. Not even light can escape.

The stuff left behind by dying stars mixes with gas and dust in space. These materials bring new life to the universe. Over time, they will become new stars and planets.