# **Everything you wanted to know about stars**

## These luminous balls of gas helped ancient explorers navigate the seas and now help modern-day scientists navigate the universe.

4 MINUTE READ

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Gently singing *Twinkle, twinkle, little star* may lull a baby to sleep, but beyond the confines of Earth’s atmosphere, the words aren’t exactly accurate. A correct, albeit less soothing, rendition might be: *Emit, emit, gigantic ball of gas*.

Stars are huge celestial bodies made mostly of hydrogen and helium that produce light and heat from the churning nuclear forges inside their cores. Aside from our sun, the dots of light we see in the sky are all light-years from Earth. They are the building blocks of galaxies, of which there are billions in the universe. It’s impossible to know how many stars exist, but astronomers estimate that in our Milky Way galaxy alone, there are about 300 billion.

## A star is born

The life cycle of a star spans billions of years. As a general rule, the more massive the star, the shorter its life span.

Birth takes place inside hydrogen-based dust clouds called nebulae. Over the course of thousands of years, gravity causes pockets of dense matter inside the nebula to collapse under their own weight. One of these contracting masses of gas, known as a protostar, represents a star’s nascent phase. Because the dust in the nebulae obscures them, protostars can be difficult for astronomers to detect.

As a protostar gets smaller, it spins faster because of the conservation of angular momentum—the same principle that causes a spinning ice skater to accelerate when she pulls in her arms. Increasing pressure creates rising temperatures, and during this time, a star enters what is known as the relatively brief T Tauri phase.

Millions of years later, when the core temperature climbs to about 27 million degrees Fahrenheit (15 million degrees Celsius), nuclear fusion begins, igniting the core and setting off the next—and longest—stage of a star’s life, known as its main sequence.

Most of the stars in our galaxy, including the sun, are categorized as main sequence stars. They exist in a stable state of nuclear fusion, converting hydrogen to helium and radiating x-rays. This process emits an enormous amount of energy, keeping the star hot and shining brightly.

## All that glitters

Some stars shine more brightly than others. Their brightness is a factor of how much energy they put out–known as luminosity–and how far away from Earth they are. Color can also vary from star to star because their temperatures are not all the same. Hot stars appear white or blue, whereas cooler stars appear to have orange or red hues.

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