

# Stars and Constellations

### Overview

The night sky has fascinated stargazers since ancient times. When the ancients looked at stars in the sky, they saw patterns known as constellations. Modern astronomers have defined 88 regions of the sky as **constellations**. In these celestial star groupings are 19 land animals, 13 humans, 10 water creatures, nine birds, two centaurs, one dragon, a unicorn, and a head of hair. Constellations are named after animals, characters in mythology, or familiar objects. Many were named during the ancient Greek era, although many cultures had names and myths for the constellations. Although from Earth the stars in a constellation look relatively close to each other, they often are very far apart.

Stars and constellations can be found on star maps. Maps of the constellations make it possible to navigate your way through the night sky.

Our sun is an average star in size and brightness. Its light is yellow. It is the closest star to Earth and it is about half way through its life span. Like other stars, the sun is a huge ball of gas that produces energy by fusing hydrogen into helium in its core.

Clouds of interstellar gas and dust, **nebulae** are the birthplaces of stars. Clouds of gas and dust begin to collapse under the influence of gravity. As the collapse packs matter tighter and

tighter in the center, the core starts to heat up. When it reaches 10 million kelvins, the fusion of hydrogen into helium begins. Soon after this process starts, a new star is born.

Once they are burning hydrogen, average main sequence stars like the sun have core temperatures of 15 million kelvins and surface temperatures of 6,000 kelvins. Stars the size of the sun use up their core hydrogen fuel in about 10 billion years.

As stars deplete their hydrogen fuel supply, the core starts to cool. A cooling core has less outward radiation pressure so the star begins to collapse on itself. This sudden fall of matter into the core sends the temperature and pressure rising dramatically. The star swells and becomes a **red giant**. Pressures become so high that helium fuses with itself to form carbon.

Although their outer temperatures are relatively low, red giants are so huge they put out thousands of times as much light as our sun. After the star uses up its supply of helium, it contracts even more and the outer layers escape into space. The core collapses to the size of the Earth under the force of gravity and becomes what is known as a **white dwarf**. If the star is large enough, the collapse is much more violent and results in a huge explosion called a **nova**, or **supernova**, with the remnants becoming either a **neutron star** or in some cases, a **black hole**.

Because distances are so great, scientists measure distances in light-years. A **light-year** is the distance that light



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travels in one year, approximately 9.46 trillion kilometers.

Stars exist in different kinds of groupings. **Binary stars** are two stars orbiting a common center of gravity. Most stars are in pairs or groups, although our sun is a **single star**. **Globular clusters** are dense groups of stars numbering from the thousands to the millions. Less densely grouped stars are called **open clusters**.

A **galaxy** is a system containing billions of stars and interstellar material held together by gravitational attraction. Our sun and solar system as well as all of the stars we can see with the naked eye are a part of the spiral-shaped Milky Way galaxy. Galaxies can also be football shaped—**elliptical galaxies**—or without any special shape at all—**irregular galaxies**. Scientists believe there are at least 50 billion galaxies.

