

18-1

How are stars formed?

Objectives

Describe how stars form. Name some characteristics of stars.

Key Terms

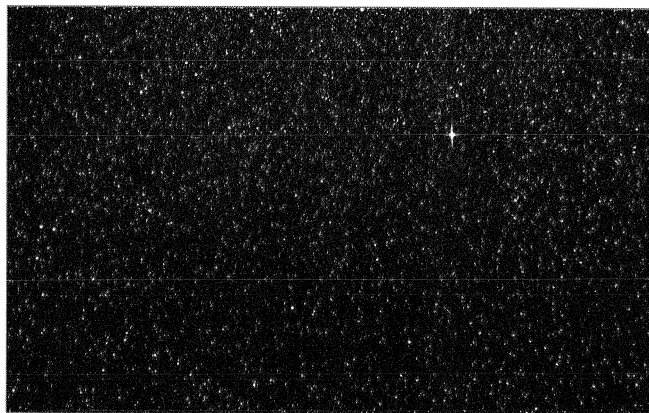
star: ball of gases that gives off light and heat

nebula (NEHB-yuh-luh): cloud of gas and dust in space

protostar: dense material in the center of a nebula that is about to become a star

binary stars: two stars that revolve around each other

star cluster: large group of stars that travel together through space



▲ **Figure 18-2** The Sun is only one of billions of stars. However, the naked eye sees only a few thousand stars.

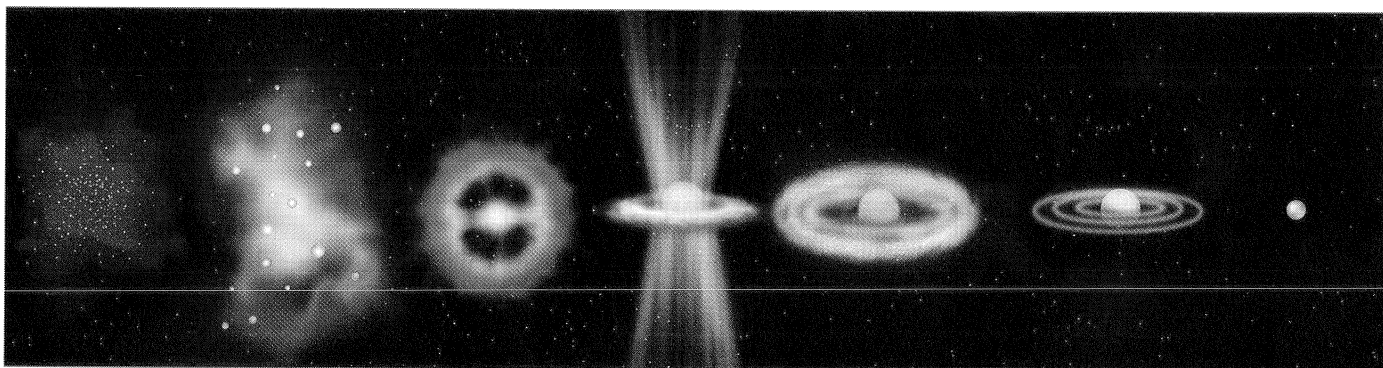
Different stars have different elements. Most stars are made up of the gases hydrogen and helium. Other elements often found in stars include sodium, calcium, and iron. The most common element in stars is hydrogen. All of these elements are found in varying amounts in stars.

1 **NAME:** What is the most common element in stars?

Formation of Stars A star forms from a cloud of gas and dust in space called a **nebula**. Gravity causes the nebula to contract and start spinning. This flattens the nebula into a disk. Material at the center of the disk forms a **protostar**.

As the nebula continues to contract, temperature and pressure build. Eventually, nuclear reactions begin, and the protostar starts to give off light and heat. A new star is born.

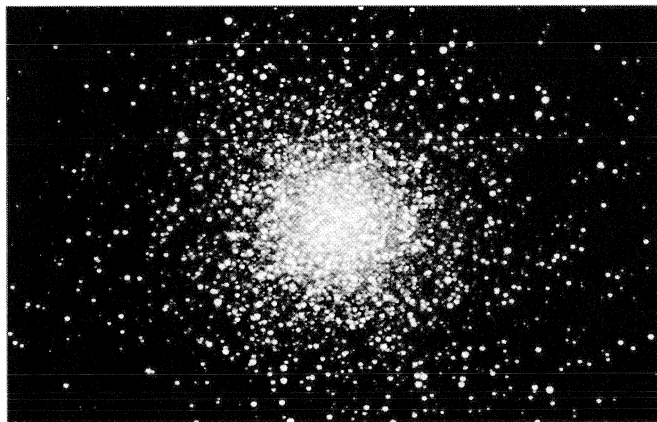
2 **NAME:** What is the first stage in star formation?



▲ **Figure 18-3** A star begins as a cloud of gas and dust that forms into a protostar. When it begins to give off light and heat, the protostar has become a true star.

Double Stars and Star Clusters Unlike the Sun, most stars are double, or binary, stars. **Binary stars** are pairs of stars that travel through space together and revolve around each other.

Some stars are part of multiple-star systems. They contain three or more stars. Many stars move through space in large groups called **star clusters**. Some clusters are globular, or round, in shape. Others are open, or loosely arranged.



▲ **Figure 18-4** A globular cluster can contain millions of stars.

3 **DEFINE:** What are binary stars?

✓ CHECKING CONCEPTS

1. What is the star closest to Earth?
2. What two gases make up most stars?
3. What is a nebula?
4. What causes a spinning nebula to contract?
5. What two shapes do star clusters form?



THINKING CRITICALLY

6. **SEQUENCE:** What are the stages in the formation of a star?
7. **INFER:** Why are rounded clusters called globular clusters?

BUILDING SCIENCE SKILLS

Classifying Stars are grouped according to color, or spectral classes. The letters *O*, *B*, *A*, *F*, *G*, *K*, and *M* each represent spectral classes. Blue stars are in spectral class *O* or *B*. Red stars are *M* stars. Do some research on the following stars: Canopus, Arcturus, Sirius, Rigel, the Sun, Betelgeuse, Altair, and Capella. Then, put them in their correct spectral class.



Science and Technology

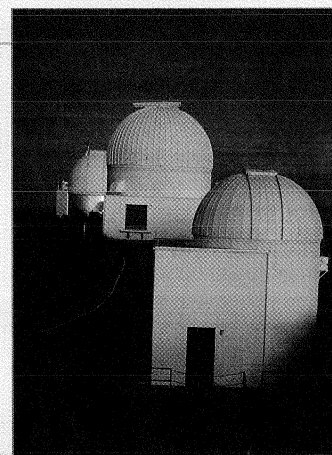
OBSERVATORIES

Most professional astronomers today work at observatories. Instead of using just their eyes to look through telescopes, they use sensitive electronic cameras to build up an exposure over many minutes or hours. Then, computers analyze the data. Astronomers study the pictures and the computer data.

Most observatories use reflecting telescopes with large mirrors. The Special Astrophysical Observatory in Russia has a mirror 6 m in diameter. However, large mirrors often sag under their own weight, blurring the image. This has led scientists to build reflecting telescopes that use many small mirrors acting as one. The Keck Telescope at Mauna Kea, Hawaii, has a mirror made of 36 thin glass segments. Together, these segments make a mirror 10 m in diameter.

Many observatories in the United States, such as Palomar near San Diego, California, are run by cities or nonprofit groups. Kitt Peak National Observatory, near Tucson, Arizona, is the largest U.S. observatory.

Thinking Critically What activities are conducted inside observatories?



▲ **Figure 18-5** Kitt Peak National Observatory