18-7 What is the surface of the Sun like?

Objective

Describe sunspots, solar flares, and prominences.

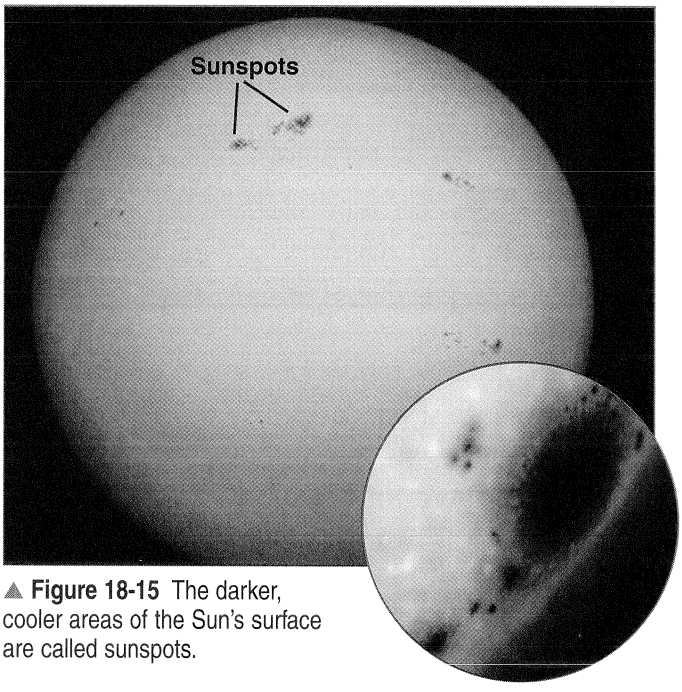
Key Terms

sunspot: dark, cool area on the Sun's surface

prominence (PRAHM-uh-nuhns)**:** stream of gas that shoots high above the Sun's surface

solar flare: eruption of electrically charged particles from the surface of the Sun

Sunspots Some areas on the surface of the Sun are cooler than the areas around them. The gases in these cooler areas do not shine as brightly as the areas around them. As a result, these areas appear dark. The dark, cooler areas on the Sun's surface are called **sunspots.** Sunspots usually appear to move in groups across the Sun in the same direction. The appearance of movement is caused by the spinning of the Sun on its axis. Sunspots may last for days or even months.

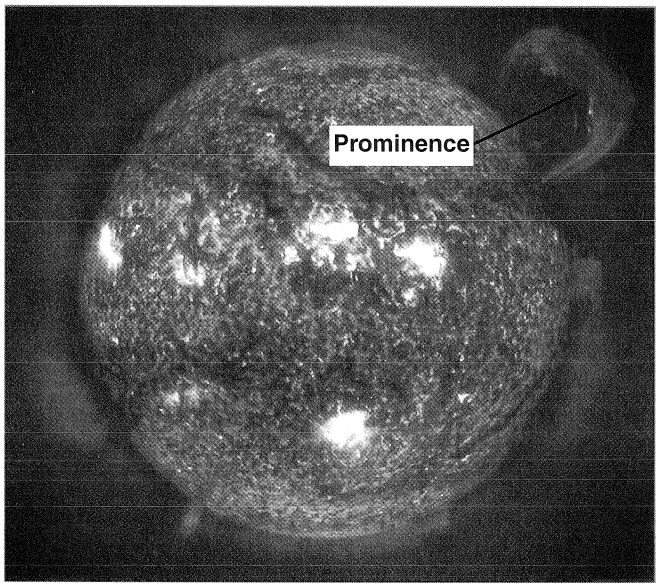


▲ **Figure 18-15** The darker, cooler areas of the Sun's surface are called sunspots.

1 EXPLAIN: Why do sunspots all appear to move in the same direction?

Prominences Streams of flaming gas shoot out from the surface of the Sun. These streams of gas are called **prominences.**

Prominences most often form in the chromosphere or photosphere. They can reach many thousands of kilometers above the Sun's surface. Then, they fall back into the Sun, forming huge arches. Prominences are best seen during a solar eclipse. They can last for weeks or months.



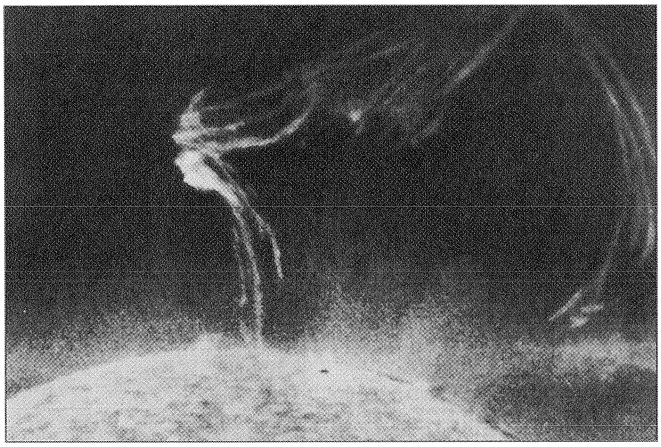
▲ **Figure 18-16** Prominences form in the chromosphere or photosphere.

2 DEFINE: What are prominences?

Solar Flares Energy sometimes builds up in the Sun's atmosphere. This buildup of energy usually happens near a group of sunspots. If the energy is given off suddenly, a **solar flare** is formed.

Solar flares usually do not last for more than an hour. Some may last for only a few minutes. In that time, though, they release enormous amounts of energy.

Solar flares send streams of electrically charged particles out into space. When these particles reach Earth's surface, they can cause electrical outages and disrupt communications. Solar flares are also the cause of the auroras, also called the northern and southern lights, on Earth.



▲ **Figure 18-17** Solar flares send streams of charged particles out into space.

3 **DESCRIBE:** How do solar flares affect Earth?

CHECKING CONCEPTS

1. Sunspots appear dark because they are _____ than surrounding areas.
2. Streams of gas from the surface of the Sun are _____.
3. Solar flares release streams of _____ particles.

THINKING CRITICALLY

4. **MODEL:** Draw and label a picture of the Sun. Show all of the features of the Sun that were discussed.

Web InfoSearch

Sunspots and Ice Ages Astronomers have found that sunspot activity seems to build up and decrease in an 11-year cycle. This cycle has been linked to climate changes on Earth. For example, the Little Ice Age of the 1600s has been associated with a long period of low sunspot activity.

SEARCH: Use the Internet to find out more about sunspots. Why do they move across the Sun in an 11-year cycle? Could magnetic activity be a part of it? If so, how? Start your search for information at www.conceptsandchallenges.com. Some key search words are **sunspots, sunspots magnetic,** and **sunspot ice ages.**

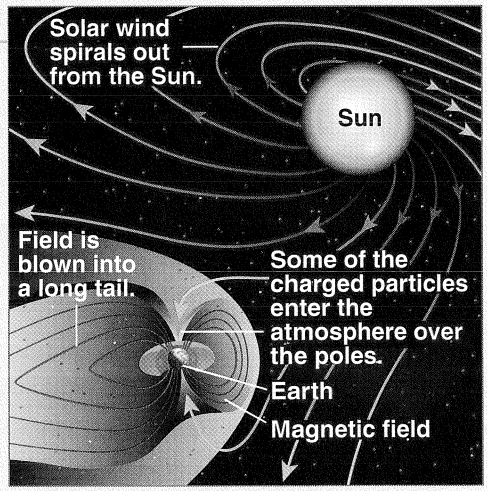
Integrating Physical Science

TOPICS: magnetism, solar energy, ions

THE SOLAR WIND

Electrons and charged particles called ions move off the surface of the Sun. They slip through gaps in the magnetic fields of the Sun's corona and travel through space in all directions. This movement of charged particles through space is called the solar wind. It is not related to the air that blows across Earth's surface.

The ions heading toward Earth are drawn to Earth's magnetic poles. As the solar wind passes Earth, the charged particles that are moving at very high speeds may interact with the magnetic field of Earth. Once in Earth's atmosphere, they react with the oxygen and nitrogen atoms there. This reaction causes the light shows in the sky known as the auroras, or the northern and southern lights.



▲ **Figure 18-18** The solar wind spirals out from the Sun and enters the atmosphere over the poles.

The tail of a comet also shows evidence of the solar wind. The solar wind sweeps the gases evaporating from the comet nucleus into a tail. Because of the solar wind, a comet's tail always points away from the Sun.

Thinking Critically Why do you think ions are drawn toward the magnetic poles of Earth?