

# FYI

## Our Star – The Sun

The sun is the only star in our solar system. It is the central gravitational body that governs the orbits of nearly all of the planets in our solar system. The sun is a yellow star that has medium temperature and medium size compared to other stars. It is made of mostly hydrogen and helium with traces of other elements.

By observing star-forming regions in our galaxy and using computer models to recreate similar features and processes, scientists have learned that about 4.5 billion years ago, the sun formed from a large cloud of molecular gas. A small clump of gas within the cloud collapsed under its own gravitational force until it became hot and dense enough to start fusion in its core, and at that point it became a star. **Nuclear fusion** in the core of the sun combines lighter elements, such as hydrogen and helium, into heavier ones, such as carbon, nitrogen, and oxygen. These elements, made inside most stars, are the basis for life on Earth, including what makes up our bodies and most of the food we eat. Every second, 700 million tons of hydrogen are converted into helium in the core of the sun—releasing of an enormous amount of energy (about  $4 \times 10^{26}$  megawatts!) that radiates in all directions into space.

The nuclear fusion in the core of the sun also provides all the energy we receive from the sun as light and heat. Earth is the perfect distance away from the sun to receive the exact amount of energy necessary for life. If Earth were 5% closer to the sun, the oceans would evaporate; 5% farther and all the oceans would freeze!

As energy leaves the core of the sun and makes its way to the sun's surface, eruptions of hot gas can occur. These are called **solar flares**. High-energy particles emitted during flare events create the shimmering **Northern Lights (aurora borealis)** and also can disrupt communication systems on Earth. During an eclipse, when the disk of the moon covers the disk of the sun, we can observe **prominences**, large jets of glowing gas that erupt from the surface of the sun, extending into the sun's outer layer, the **corona**.

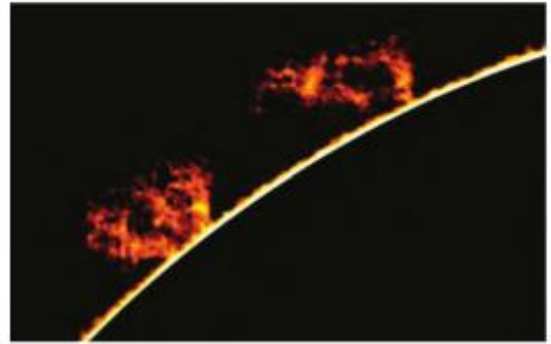


Figure 1-4: Image of prominences erupting in the corona of the sun during a solar eclipse

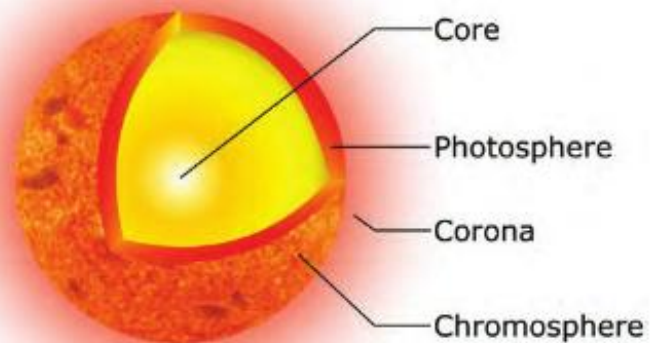


Figure 1-5: Diagram of the structure of the sun

### Checking In

1. In what ways is the sun important in our solar system?
2. Explain how nuclear fusion is responsible for life on Earth.

