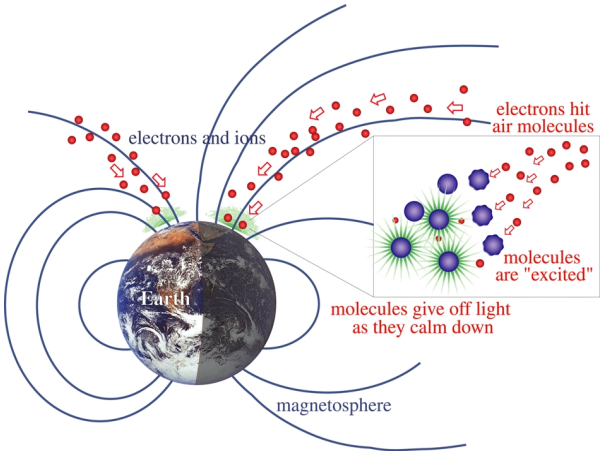
What causes the aurora?

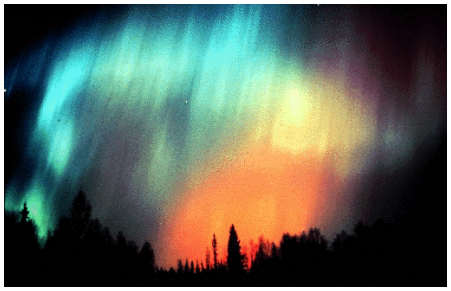
The "northern lights" are caused by collisions between fast-moving particles (electrons) from space and the oxygen and nitrogen gas in our atmosphere. These electrons originate in the magnetosphere, the region of space controlled by Earth's magnetic field. As they rain into the atmosphere, the electrons impart energy to oxygen and nitrogen molecules, making them excited. When the molecules return to their normal state, they release photons, small bursts of energy in the form of light.

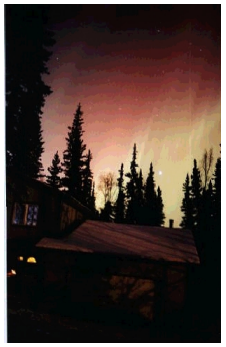


When billions of these collisions occur and enough photons are released, the oxygen and nitrogen in the atmosphere emit enough light for the eye to detect them. This ghostly glow can light up the night sky in a dance of colors. But since the aurora is much dimmer than sunlight, it cannot be seen from the ground in the daytime.

Why the different colors?

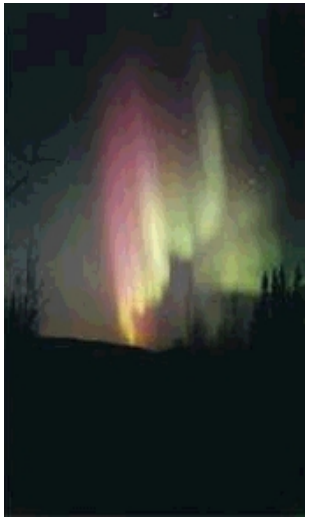
The color of the aurora depends on which gas is being excited by the electrons and on how much energy is being exchanged. Oxygen emits either a greenish-yellow light (the most familiar color of the aurora) or a red light; nitrogen generally gives off a blue light. The oxygen and nitrogen molecules also emit ultraviolet light, which can only be detected by special cameras on satellites.





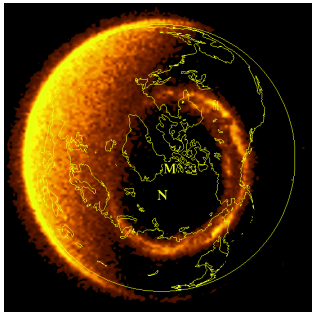
Why does it take different shapes?

Scientists are still trying to answer this question. The shape of the aurora depends on where in the magnetosphere the electrons came from and on what caused them to precipitate into the atmosphere. Dramatically different auroral shapes can be seen in a single night.



Where can I see the aurora?

Auroras usually occur in ring-shaped areas centered around the magnetic poles of Earth. The complete rings, called the auroral ovals, can only be seen from space.



False color picture of the auroral oval in ultraviolet light. The brighter the color, the more intense the aurora. The crescent of color on the left is from sunlight scattered over the upper atmosphere.

The best places to see the aurora are in Alaska, Canada, and Scandinavia, during the late evening hours. Resident of the northernmost United States – near the Canadian border – typically see auroras several times a year. On rare occasions – perhaps once per decade – auroras are visible as far south as Florida or Japan.

Do auroras occur in the southern hemisphere?

An auroral oval also exists around the southern magnetic pole. This picture from space shows the simultaneous "crowns" of the auroral ovals.