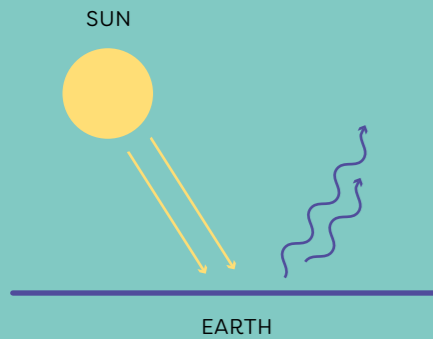


What Is the Universe?

When we look up at the dark night sky, space seems to be endless. Yet we can actually only see a tiny fragment of the universe.

It is impossible to imagine just how huge the universe is—it stretches way beyond our planet and includes all the stars, moons, planetary systems, galaxies, gigantic clouds of gas and dust, and even black holes!

Why is the universe so dark and cold when the sun gives off so much heat?



Light in space comes from stars such as our sun and from other shining celestial bodies. There are often huge distances between the stars, so wherever starlight fails to reach it is dark and cold. The atmospheres of many celestial bodies, including the planets Earth, Venus, and Saturn, reflect and scatter light from our sun, spreading it further around the universe. Their atmospheres consist of gases that scatter the sunlight. Celestial bodies without an atmosphere (like our moon), or with a very thin atmosphere (like the planet Mercury), reflect light but do not scatter it.

The universe contains everything that exists—matter, energy, space, and time. There are trillions of stars. A trillion has 12 zeros—that's 1,000,000,000,000. There are also big chunks of rock that fly through the universe. They're called asteroids.

Humans, plants, and animals all need oxygen to keep them alive. We can't see, smell, or taste this gas, though it's part of the air we breathe. Air consists of different particles, all of which have been drawn in by the Earth's gravity.

As the universe is unimaginably huge, scientists have introduced a special unit of measurement—the **light-year**. One light-year is 5.88 trillion miles (9.46 trillion kilometers). If a star is 10 light-years away from us, then the light we see is what was shining 10 years ago.

Scientists are constantly trying to find out all they can about the universe. For example, they want to know if other planets contain water and have oxygen in their atmosphere.

What is gravity?

As our spacecraft moves farther and farther away, the Earth's force of gravity becomes weaker and weaker. Think of gravity as an invisible power that pulls everything toward the center of the Earth—like a magnet attracting metal, except that the Earth's center pulls in all objects with mass. That's why we're able to stand firmly on the ground and don't hover the way that astronauts do when they fly out of reach of our planet's gravitational pull. It's also why things fall when we drop them. In our solar system, the Earth is not the only celestial body with gravity. The sun's gravity pulls the planets toward it, but as they orbit (travel around) the sun, their movement creates another force, called centrifugal force, which pushes them away. These two forces work together, stopping the planets from falling into the sun.

