

Earth and Space

If we define an astronaut as someone who travels through space, everyone on Earth is an astronaut. Even though we may be standing still on Earth's surface, we are actually traveling through space at speeds of thousands of kilometers per hour. Indeed, our planet may be thought of as a spaceship on a never-ending voyage. As "astronauts" traveling through space on the surface of Earth, we take for granted the complex environment that sustains life. Earth's gravitational attraction holds a dense atmosphere of nitrogen, oxygen, carbon dioxide, and water vapor in a thick envelope surrounding Earth's entire surface. The weight of this atmosphere exerts pressure, and its movements distribute heat from the Sun to balance global temperatures. Its gases filter out harmful radiation and disintegrate all but the largest meteoroids. Earth's atmosphere is a shell that protects and sustains the life forms that have evolved on its surface. Without the atmosphere's protection, life as presently known would not be possible.

When Earth astronauts leave the surface of their planet and travel into space, they must carry some of their environment with them. It must be contained in a physical shell because their body masses are too small to hold it in place by gravitational attraction alone. The shell that is used is called a spacecraft—a rigid collection of metal,



Earth as seen by the crew of the Apollo 17 Moon mission.

glass, plastic, and composites. Though far simpler in function than Earth's environment, a spacecraft's environment serves well for short missions lasting a few days or weeks. On some flights, the shell is deliberately opened and the astronauts pass through an airlock to venture outside. When doing so, they must be protected by a still smaller and very specialized version of their spacecraft called the Extravehicular Mobility Unit (EMU). This smaller spacecraft is composed of a spacesuit with a life-support system. It differs from the first spacecraft, or mother ship, in its anthropomorphic (human) shape and its flexibility. Astronauts wearing EMUs



need to be able to move arms, hands, and legs to perform an array of tasks in space. They must be able to operate many types of scientific apparatus, collect samples, take pictures, assemble equipment and structures, pilot themselves about, and repair

and service defective or worn-out satellites and other space hardware. The tasks of astronauts outside their mother ship are called extravehicular activities, or EVAs.

