Life in Space

A Reading A–Z Level V Leveled Book
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LEVELED BOOK • V

Life in Space

MULTI Level S•V•Y

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Front cover: Astronaut Scott Kelly floats in front of the windows on the ISS.

Title page: Astronaut Rick Sturckow gives a thumbs-up in front of a wall filled with the badges that represent the different crews who have worked on the ISS.

Table of contents: Astronaut Chris Hadfield poses in front of a floating water bubble.

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Correlation

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Weightless Living

A space shuttle docks with the International Space Station.

You wake up just as the Sun is rising. It takes a moment to untangle from the sleeping bag in the small space. Opening the door, you grab a handle and flip yourself over. With a gentle push, you fly from one end of the room to the other. Another crew member floats by, hands you some coffee, and says, "Good morning," in Russian. You thank him and yawn, tired because you haven't slept much. Your stomach isn't used to the lack of **gravity** yet—and you're incredibly excited.

You're about to begin your first full day working aboard the International **Space Station**. You've trained for years, but even the simplest activities are difficult without gravity. It's almost as if you have to learn how to do them all over again. You won't head back to Earth for another six months, so you may as well get started.

The Race to Space

Humans began racing into space in the 1950s and 1960s. The first person in space was **cosmonaut** Yuri Gagarin, from Russia (then part of the Soviet Union). He **orbited** Earth one time and landed safely after 108 minutes on April 12, 1961. In August of the same year, another Soviet cosmonaut orbited Earth more than 17 times in about 25 hours. **Technology** advanced quickly, and people went farther and stayed longer in space. In 1968, U.S. **astronauts** aboard *Apollo 8* successfully orbited the Moon. On July 20, 1969, the crew of *Apollo 11* stepped onto the Moon's surface.

Space programs continued to create vehicles that let people stay in space for days or weeks. However, scientists had plans for a space station in which people could actually live for months, or even years.

The Soyuz spacecraft, first created in the 1960s, are still being used to take people to and from the International Space Station.

Space Stations

A space shuttle docks with Mir.

The Soviet Union launched the first space station in 1971. It spent 175 days in space before it fell out of orbit and burned up while reentering Earth's atmosphere. In 1973, the United States launched Skylab. It supported three missions before being abandoned in 1974. It fell to Earth in 1979.

The Soviet Union launched the Mir (MEER) space station in 1986. It was the first space station that lasted more than a few years. Mir remained in orbit for fifteen years—three times longer than planned. It hosted scientists from many different countries.

Days in Space

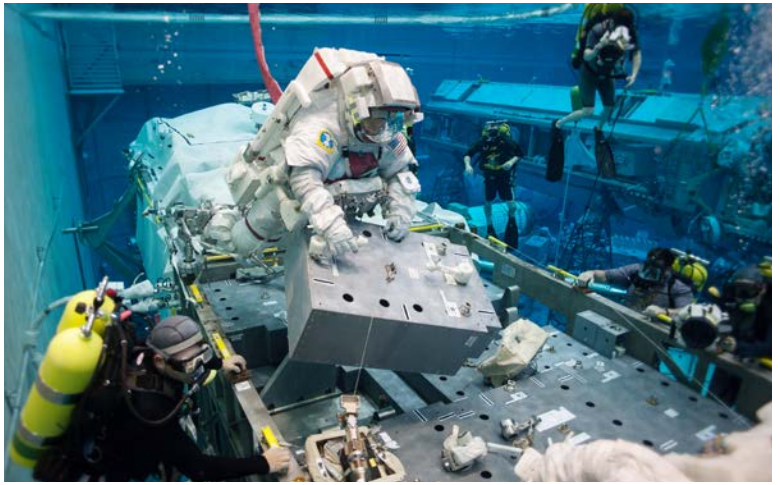
Russian scientist Dr. Valeri Polyakov spent 438 days in space in 1994 and 1995. During his record-setting stay, Dr. Polyakov lived on Mir and orbited Earth 7,075 times. Dr. Polyakov's record still stands.

Before Mir fell to Earth in 2001, work began on a new, larger space station. The United States, Russia, Japan, Canada, and other countries worked together. In 1998, the first section of the International Space Station (ISS) was launched into orbit. More sections have been added over the years, and more are planned for the future. As of 2012, the ISS measured 357 feet (108.8 m) long and weighed almost 1 million pounds (453,592.3 kg). It can even be seen in the night sky without using a telescope.

Over the years, more than two hundred people from fifteen countries have visited the station. It has more living space than the average five-bedroom house. The amount of time an astronaut spends on the ISS varies. Many stay for about three to six months.

That's up to six months of living and working without gravity in a small space with three to six other people. The crew members might be from different countries and speak different languages, but they are a team. It can be very stressful.

The ISS is as long as a football field!



An astronaut practices repairing part of the ISS on an underwater model. Working underwater helps prepare them for space walks.

An Astronaut's Life

Astronauts go to school for many years before they begin **training**. The physical training involves being weightless while flying in an airplane. Astronauts also spend up to seven hours in a space suit while working underwater. They work on life-size models of space vehicles in a huge 6.2 million-gallon (23.5 million liter) pool. Once on the ISS, however, astronauts still have to adjust to the lack of gravity.

Sick in Space

The change to being weightless can make some people ill. Fortunately, the ISS comes with special bags. They have a cloth side that can be used to clean up as well as an extra sealable bag attached for easy disposal.

Sleeping

The ISS has six small "sleep pods" that each hold a sleeping bag with armholes. Each bag is tied to the wall to keep the astronaut from floating away. Because of the space station's orbit, astronauts on board see sixteen sunrises and sunsets every day. Since people are used to sleeping at night and being awake during the day, this can cause serious sleep problems. The space station has a "shades down" period, during which it is dark and quiet to allow the astronauts to get the sleep they need.

Astronaut Alvin Drew prepares to sleep on the ISS.

An astronaut has a breakfast of eggs and sausage on a tortilla with coffee on the ISS.

Eating

Astronauts eat many of the foods most people enjoy, such as chicken, fruits, peanut butter, and brownies. The ISS has no refrigerator, so all food must be packed in such a way that it won't spoil. The station does have an oven, however. Some food can be eaten as is. Other food, such as spaghetti, must have water added. Astronauts use liquid salt and pepper. Regular salt and pepper would float away and damage the space station equipment. Once the food is prepared, however, astronauts still have to get used to swallowing. Astronaut Piers Sellers said it was like "eating while lying on one side."

Using the Toilet

With the way things float around in space, using the bathroom can be tricky. Astronauts need special training to use the toilet. The toilets on the ISS have two parts. For liquid waste, astronauts use a tube with a **nozzle**. For solid waste, astronauts must use foot straps and handles to stay in place. They have to position themselves over a 4-inch (10 cm) opening. The average toilet on Earth has a 12- to 16-inch (30.5–40.6 cm) opening. The toilet uses light suction to take the waste from the opening or tube to where it is stored in another part of the station.

The tube hanging on the wall is for liquid waste. The base on the floor is for solid waste. The ISS has two toilets, which have stopped working more than once. To repair a toilet, astronauts must use parts sent from Earth, which can take months.

Astronaut Karen Nyberg shows how she washes her hair on the ISS.

Bathing and Teeth Cleaning

Astronauts use water and special soap on a cloth to wash their bodies. They wash their hair with shampoo that uses no water. To clean their teeth, they use toothpaste that can be swallowed when they're finished.

Free Time

Astronauts on the ISS might play cards, read, or write, among other things. Keeping in touch with loved ones is also important. Astronauts are able to make calls and have video chats. Sometimes astronauts answer questions from students all over the world or give video tours of the station. Many just look out the windows or take photos. Who can blame them? The view is pretty amazing.

Astronaut Chris Hadfield plays guitar on the ISS. During his last visit to the space station, he even made a music video.

Astronaut Luca Parmitano exercises on a treadmill on the ISS.

Exercising

When people exercise on Earth, their bones and muscles must work against gravity, which makes them stronger. Because of the lack of gravity in space, it takes very little strength or effort to move things that might be extremely heavy on Earth. Because of this ease, astronauts' bones and muscles weaken over time.

Astronauts must work out at least two hours every day. The special exercise equipment in the ISS gym uses **resistance** to help the astronauts stay strong. Even with a daily workout, most astronauts lose 20 to 30 percent of their muscle during their six-month stay.

Astronauts return to Earth from the ISS in 2013.

Back to Earth

When astronauts return to Earth from the ISS, the work isn't over. Recovery from spending months in space takes a long time. For a six-month stay on the ISS, it takes six weeks of working out to regain lost muscle. It can take a whole year for an astronaut's bones to fully recover. Astronauts have to work hard, but the time spent living and working in space is worth it.

Scientists always keep an eye on the astronauts' physical and mental health. The information they gather has already helped astronauts live healthier and happier lives. This information might mean the success or failure of future space exploration.

Glossary

astronauts *(n.)* people trained to travel and work in space (p. 5)

cosmonaut *(n.)* a person trained to travel and work in space; a Russian word for "astronaut" (p. 5)

gravity *(n.)* the natural force that tends to pull objects toward each other, such as objects being pulled toward the center of Earth (p. 4)

nozzle *(n.)* a part at the end of a hose, pipe, or tube that is used to direct and control a stream of liquid or gas (p. 11)

orbited *(v.)* revolved around another object (p. 5)

resistance *(n.)* force that slows motion (p. 14)

space station *(n.)* a spacecraft in which people can live for a long time, used for scientific experiments and research (p. 4)

technology *(n.)* the use of scientific knowledge or tools to make or do something (p. 5)

training *(n.)* the teaching of a specific skill or behavior (p. 8)