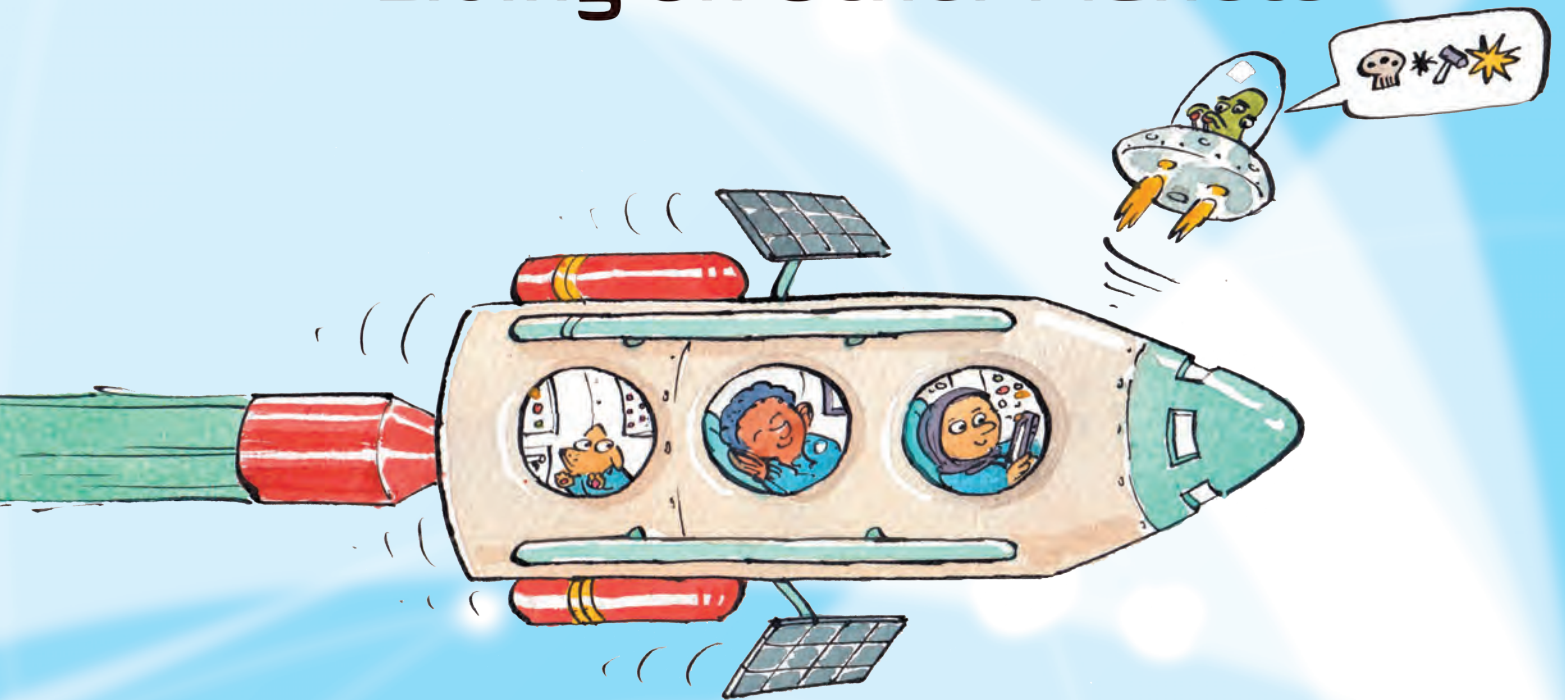




Destination: Space

Living on Other Planets



Dr. Dave Williams and Loredana Cunti
art by Theo Krynauw



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Welcome from Dr. Dave

There are so many great reasons to explore, but the most natural is curiosity. Throughout history, explorers have sought new opportunities, new things to buy and trade, and new lands to discover. The stories of their travels captured the imaginations of other explorers, encouraging them to look even farther for their own adventures.



Dr. Dave Williams

Astronaut David R. Scott places a drill on the surface of the Moon during the Apollo 15 mission.



In the 1960s and '70s, humans started to explore space—in person! We've even walked on the Moon. It's certainly been a great adventure, but space exploration has taught us a lot, too. It's helped us to appreciate our own planet and to understand why Earth is a perfect home for so many different species.

Exploring our solar system has also made us even more curious. Today, we're wondering where else we can go. Could we actually live in outer space? And if so, how would it work?

Let's find out!

Astronauts Neil A. Armstrong, Michael Collins, and Edwin E. (Buzz) Aldrin Jr. (left to right) were the first crew to go to the Moon.



Dare to Dream

Long before spacecraft were developed, the dream of exploring our solar system was alive. Our brains came up with ways to get us there, and science fiction became science fact when humans first set foot on the Moon in 1969. Since then, spacecraft have visited Mars, Venus, Saturn's moon Titan, and other comets and asteroids. We've even created a spacecraft that has traveled *beyond* our solar system.

So how long until we're living on another planet?

Not So Crazy

That's actually a trick question! Although the idea of humans living in outer space seemed crazy not so long ago, that dream became a reality in 2000 when astronauts started living and working full-time on the International Space Station (ISS). Is your birthday after 2000? If it is, humans have been living in space for your entire life!

So what's next? Can we go farther? Can we stay longer? In the years to come, humans will explore these questions and others. Can we live aboard new space stations orbiting other planets, or can we actually touch down and live on the surface of a planet like Mars? And what can space exploration teach those of us who are comfy and cozy right here on Earth?



Russian, European, and American crew members celebrate astronaut Samantha Cristoforetti's birthday aboard the International Space Station.



The A Team

Dreaming of making space exploration your job? One of these careers might be right for you:

- ✱ **astrobiologist:** studies the possibility of life beyond Earth
- ✱ **astronaut:** lives and works in space
- ✱ **astronomer:** studies the universe and all objects in it
- ✱ **astrophysicist:** studies life cycles of objects in the universe

Astrophysicist Jedidah Isler studies blazars (extremely large black holes) in distant galaxies.

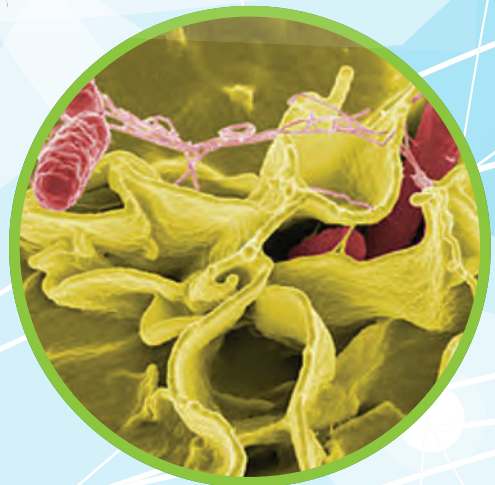


First Things First

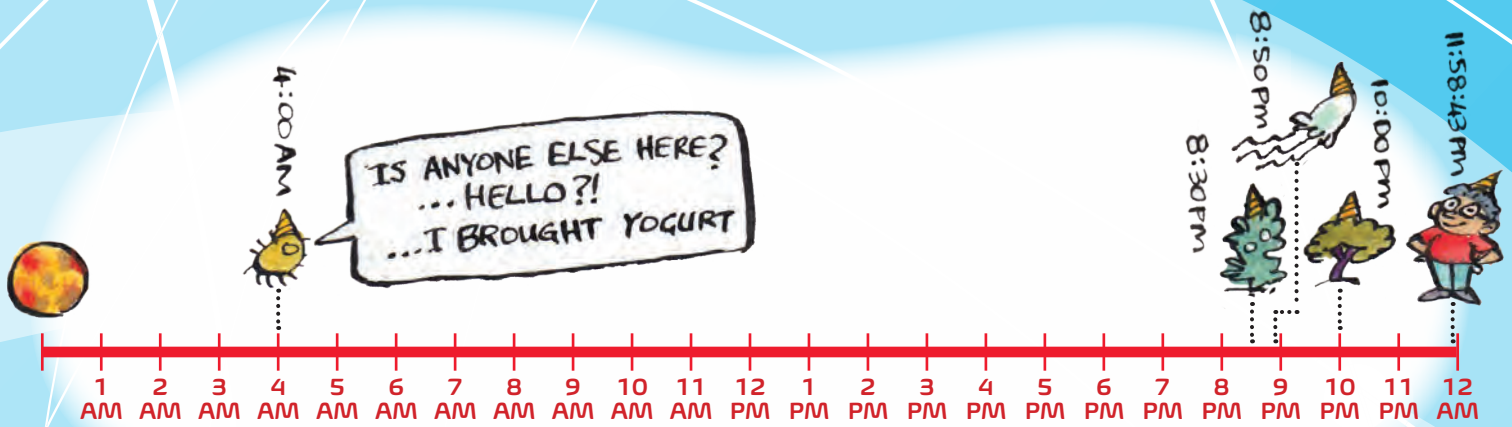
The idea of finding a home somewhere else in our solar system is pretty amazing, but we can't just pick up and leave. Turns out that living creatures are complicated . . . and have some pretty big needs.

It's Alive!

What do we mean when we say something is "alive"? A whale, a carrot, a flea, and the bacteria that make you sick are alive, just like you. Why? Big, small, or microscopic, living things are all made up of tiny building blocks called cells, use a fuel (like food) to make energy, can grow, multiply in some way (such as having babies), and can change themselves.



A whale, a carrot, a flea, and bacteria don't look like they have anything in common, but they do—they're all living things.



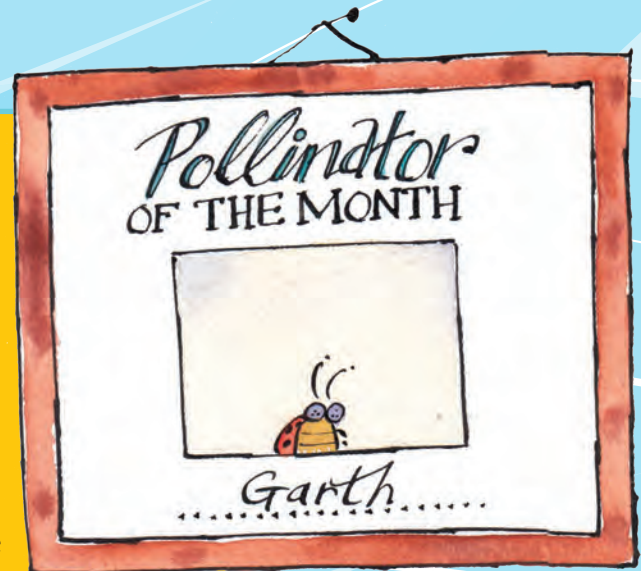
Meet the New Kid

If Earth were only one day old, then the first forms of life appeared at about 4:00 a.m. These microscopic one-celled bacteria got a little bigger and more complicated, but it took all the way until 8:30 p.m. before sea plants developed. Twenty minutes later, sea animals like jellyfish joined them. And just before 10:00 p.m. (past your bedtime!), land plants arrived. Finally, at 1 minute and 17 seconds before midnight, humans showed up. Let's party!

Lots of Living Things

There are more living things on Earth than we can count, but we do know that the planet is home to about 8 million different species. In terms of numbers, the springtail beats all. These insect-like critters are smaller than a pinhead, but they're literally everywhere. Ants come a close second, acting like tiny-but-mighty managers of Earth's surface. And there are more different kinds of beetles than any other living thing. Their jobs, including pollination, are so important that most plants couldn't survive without them. Who knew?

This tiny springtail is almost too small to see, but huge numbers of them live everywhere in soil and other natural ground.



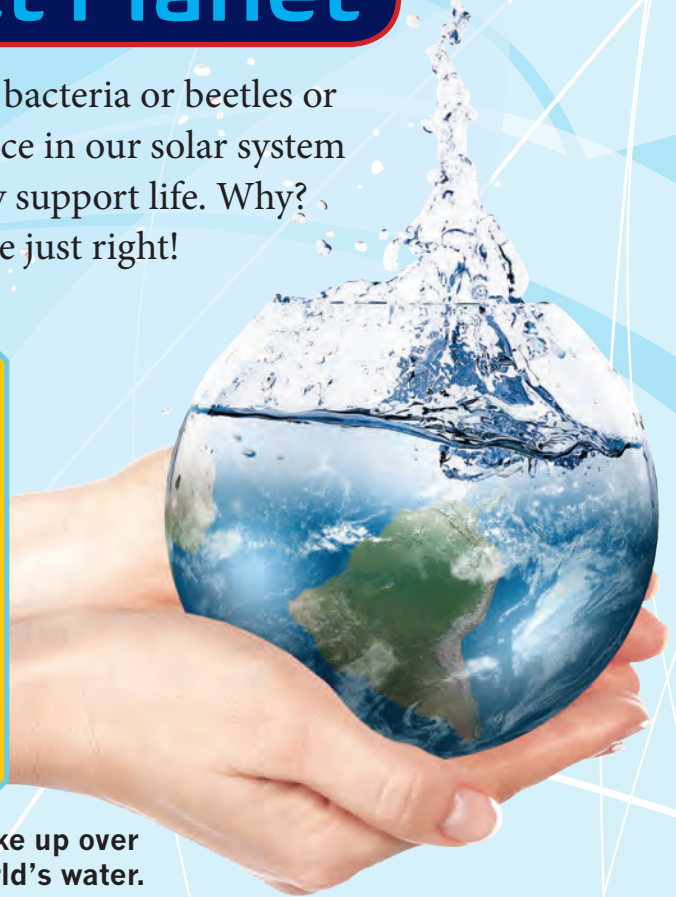
The Perfect Planet

Whether we're talking about bacteria or beetles or humans, Earth is the only place in our solar system that we know can currently support life. Why? Conditions here are just right!

The Soup of Life

When astronomers want to know if another planet can support life, the first thing they look for is liquid water. Liquid is needed for the kinds of chemical reactions that living things depend on, like digestion. And water is the perfect liquid because it *stays* liquid under many conditions and it dissolves things. Earth's surface is about 71 percent water. No shortage of the stuff here!

Oceans and seas make up over 95 percent of the world's water.



Goldilocks and the Sun

Life also needs energy. Our biggest energy source is the sun. The sun's light and heat reach all planets in our solar system, but some get too much and others don't get enough. Earth is just the right distance from the sun. Enough light reaches us for plants to grow, and the temperature is not too hot or too cold—just like the baby bear's porridge in the Goldilocks story!





Scientists exploring the possibility of life in our solar system search for planets or moons in what we call the “Goldilocks Zone”—where the temperature is just right for liquid water to exist.

Sun

Earth's ozone layer absorbs all ultraviolet C and most ultraviolet B rays.

UVC
UVB
UVA

Ozone layer

Earth's Sunscreen

Along with light and heat, the sun also gives us something we can't see or feel: ultraviolet radiation, or UV rays. These rays are good in small doses, but if we get too much of them, we'd burn to a crisp. Luckily, a layer of gases surrounds Earth to protect us from these damaging rays. It's the ozone layer, and it traps most of the sun's UV rays before they reach us.

Sunscreen or sunblock stops the ultraviolet A and B rays from burning our skin.



When we breathe out on cold days, it's like we can "see" the air, though what we're really seeing is water molecules.



A Is for Atmosphere

Underneath the ozone layer is a blanket made up of . . . air. Even though we can't see it, smell it, or taste it, we definitely need it. The three main gases in Earth's air—oxygen, nitrogen, and a little bit of carbon dioxide—are just perfect for life. Too much carbon dioxide would poison us, but a small amount helps to keep Earth at the right temperature.

We need the oxygen to breathe. Our bodies use that oxygen and turn some of it into carbon dioxide, which plants then take in to produce and release oxygen. And around and around we go.

Earth's Velcro

Holding that airy blanket of atmosphere in place is one more thing that makes Earth such a great place to live: gravity. Gravity pulls in everything that comes close enough. And that's what keeps us from floating away!





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This book is dedicated to all young readers who are curious about living in space and are unafraid to go farther and stay longer. Join in the future of space exploration and go for it!—D.W.

This is for my friends and family and all fellow Earth beings. As cool as it is thinking about life on other planets, only here do I have all of you to share a laugh with. —L.C.

