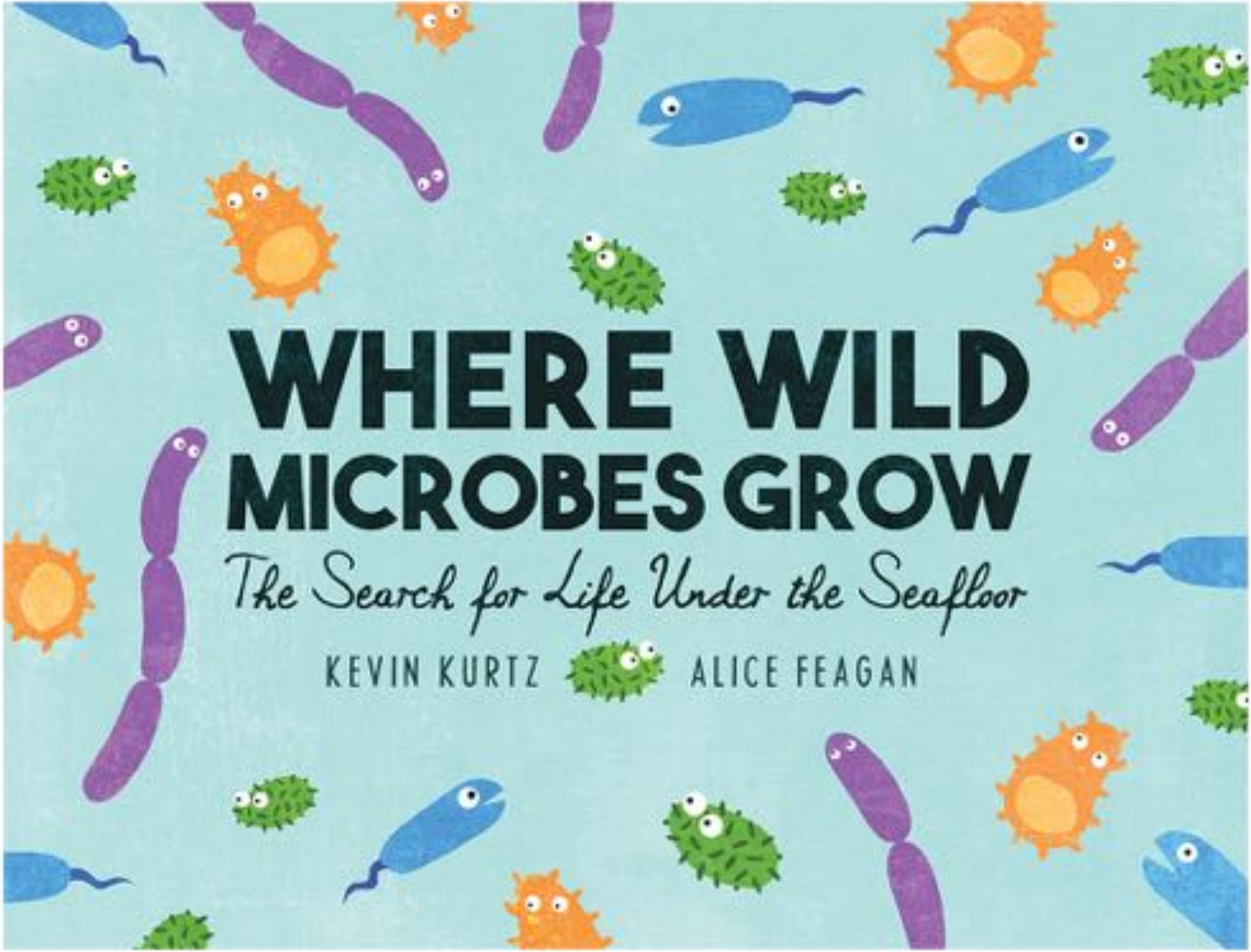
WHERE WILD MICROBES GROW

The Search for Life Under the Seafloor

KEVIN KURTZ ALICE FEAGAN

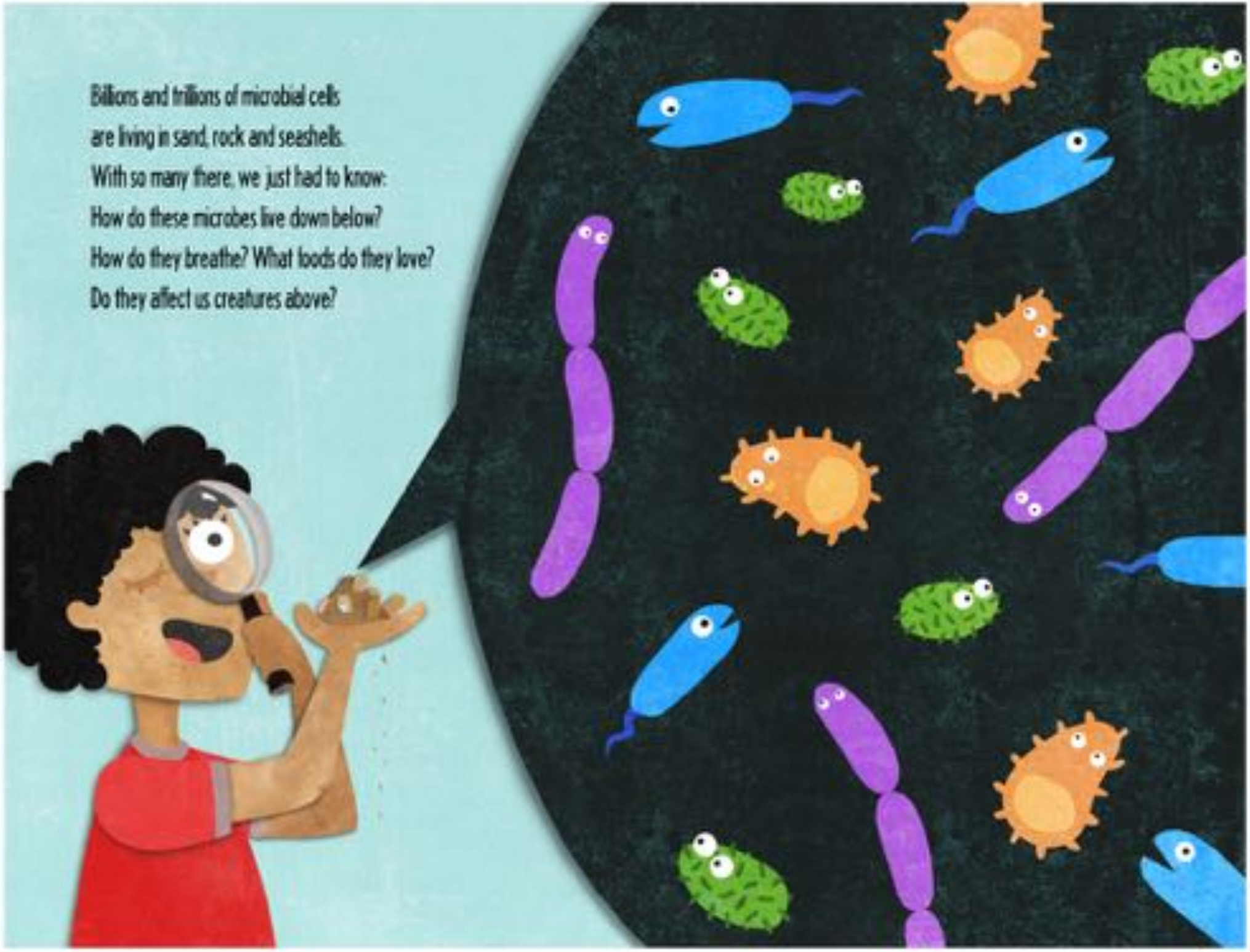

WHERE WILD MICROBES GROW
The Search for Life Under the Seafloor
KEVIN KURTZ
ALICE FEAGAN


Our planet Earth is special indeed.
It has all the stuff that living things need.
Its water, food, and breathable air
create habitats that living things share.

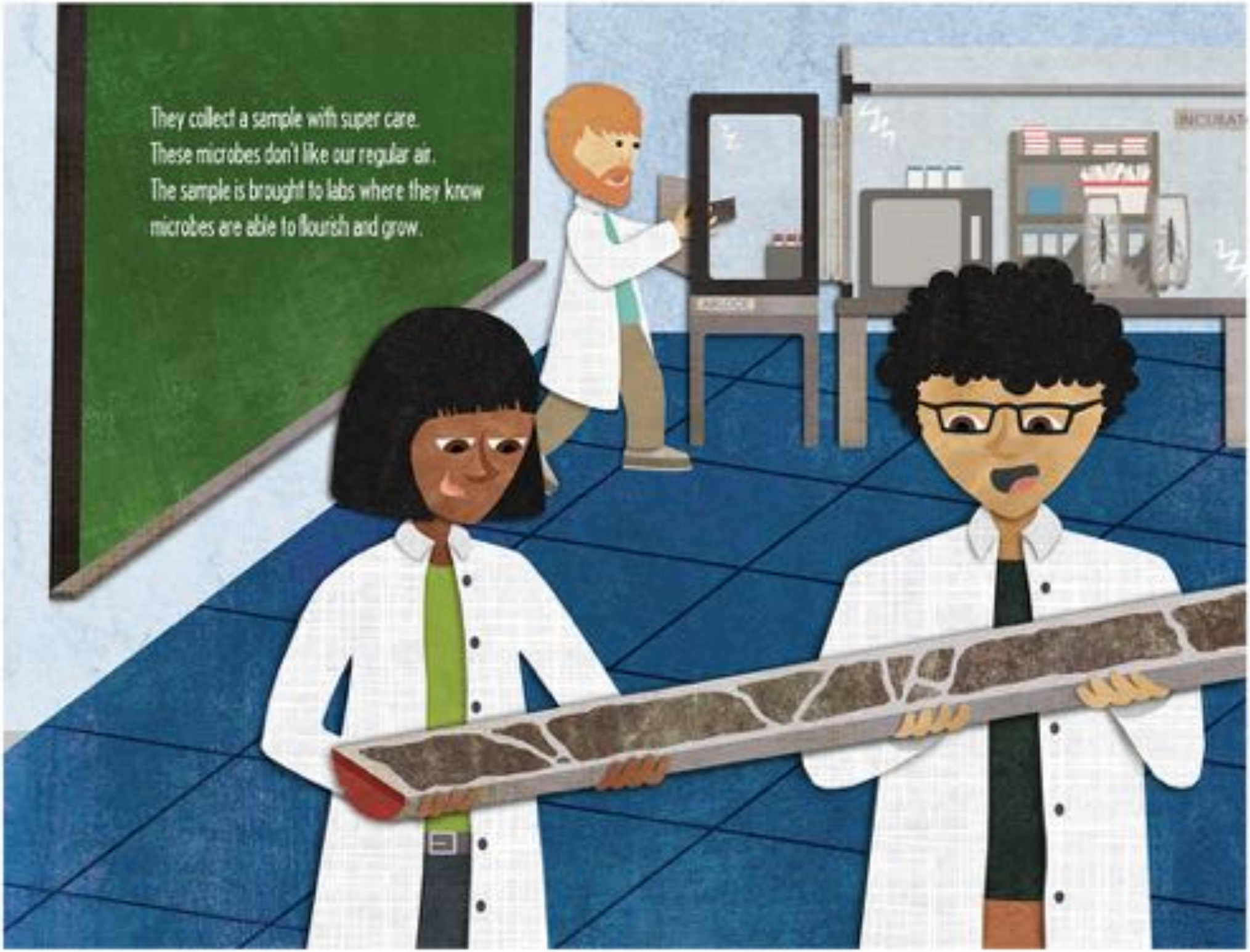

Habitats exist all the world round,
like forests, grasslands, and inside the ground.
We've found living things where water will boil,
deep under ice, and feeding on oil.


The world is so full of critters galore,
scientists wondered, "What's in the seafloor?"
They drilled down, collected some mud and some rock
and what they discovered came as a shock.

Billions and trillions of microbial cells
are living in sand, rock and seashells.
With so many there, we just had to know:
How do these microbes live down below?
How do they breathe? What foods do they love?
Do they affect us creatures above?



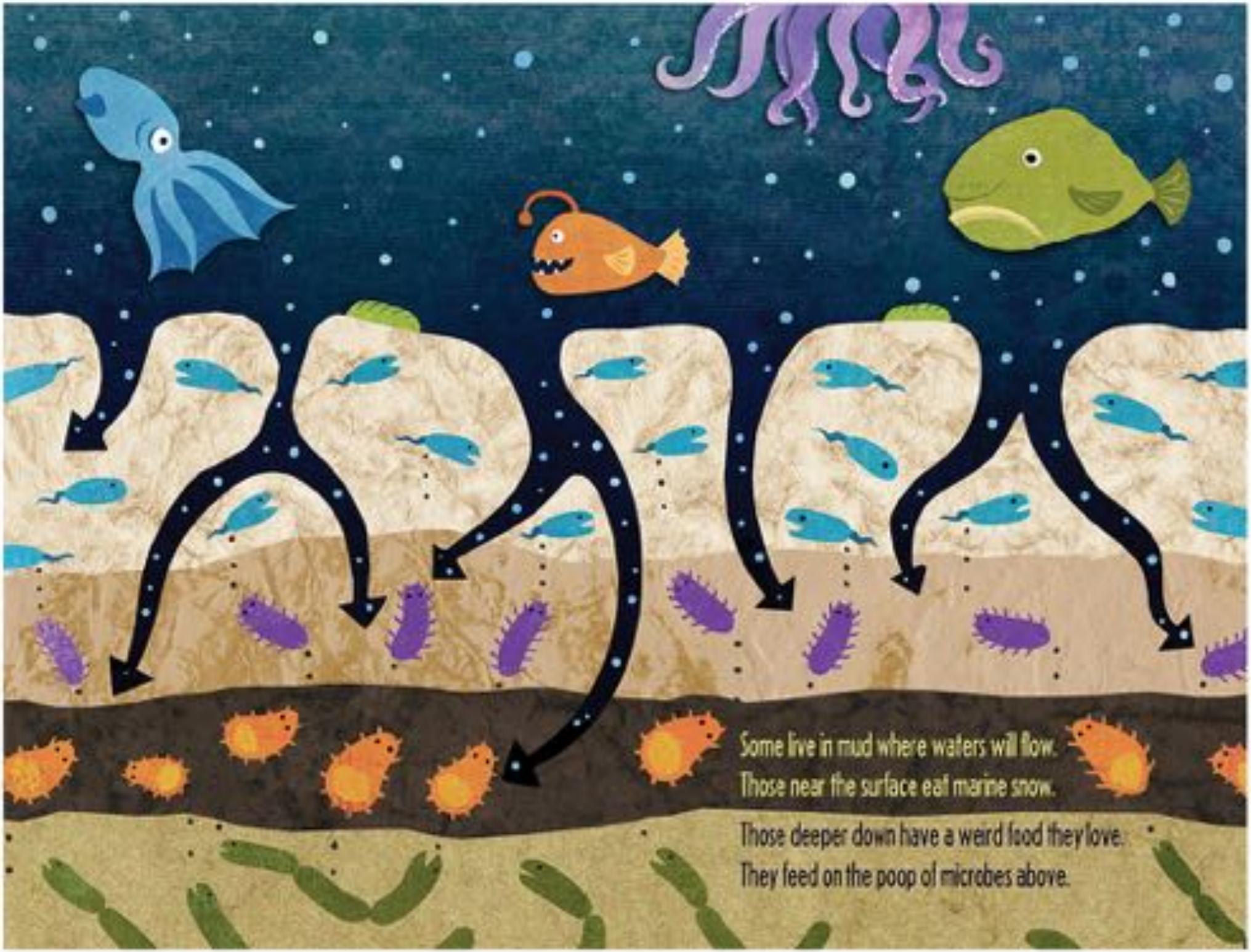

Microbes are tiny, too small to see.
Billions could fit inside of a flea.
Though you won't spot one, even if you stare,
scientists know how to tell that they're there.

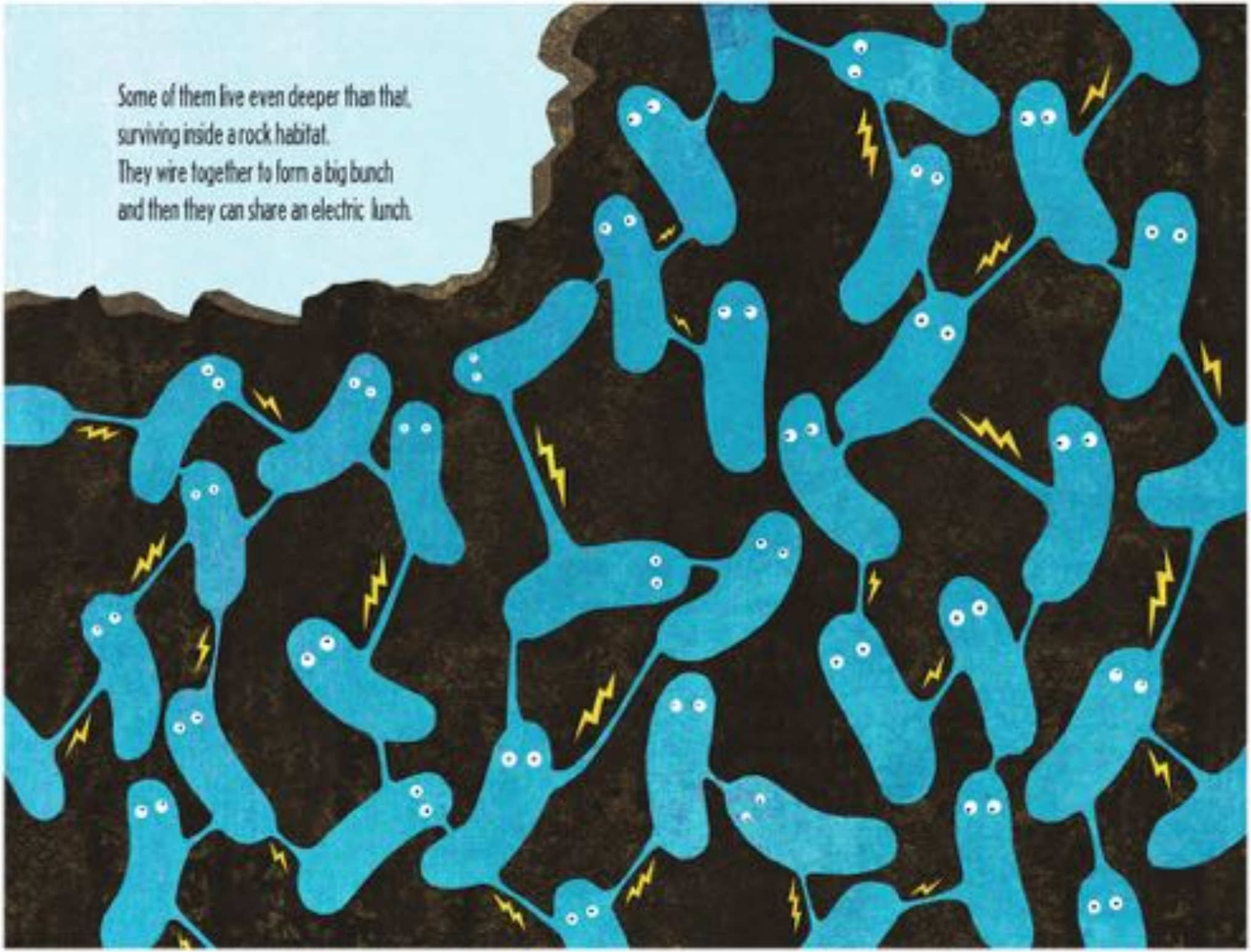

They collect a sample with super care.
These microbes don't like our regular air.
The sample is brought to labs where they know
microbes are able to flourish and grow.


Inside the labs, the scientists work
to find the microbes wherever they lurk.
They ID each species they find alive
and try to determine how they survive.

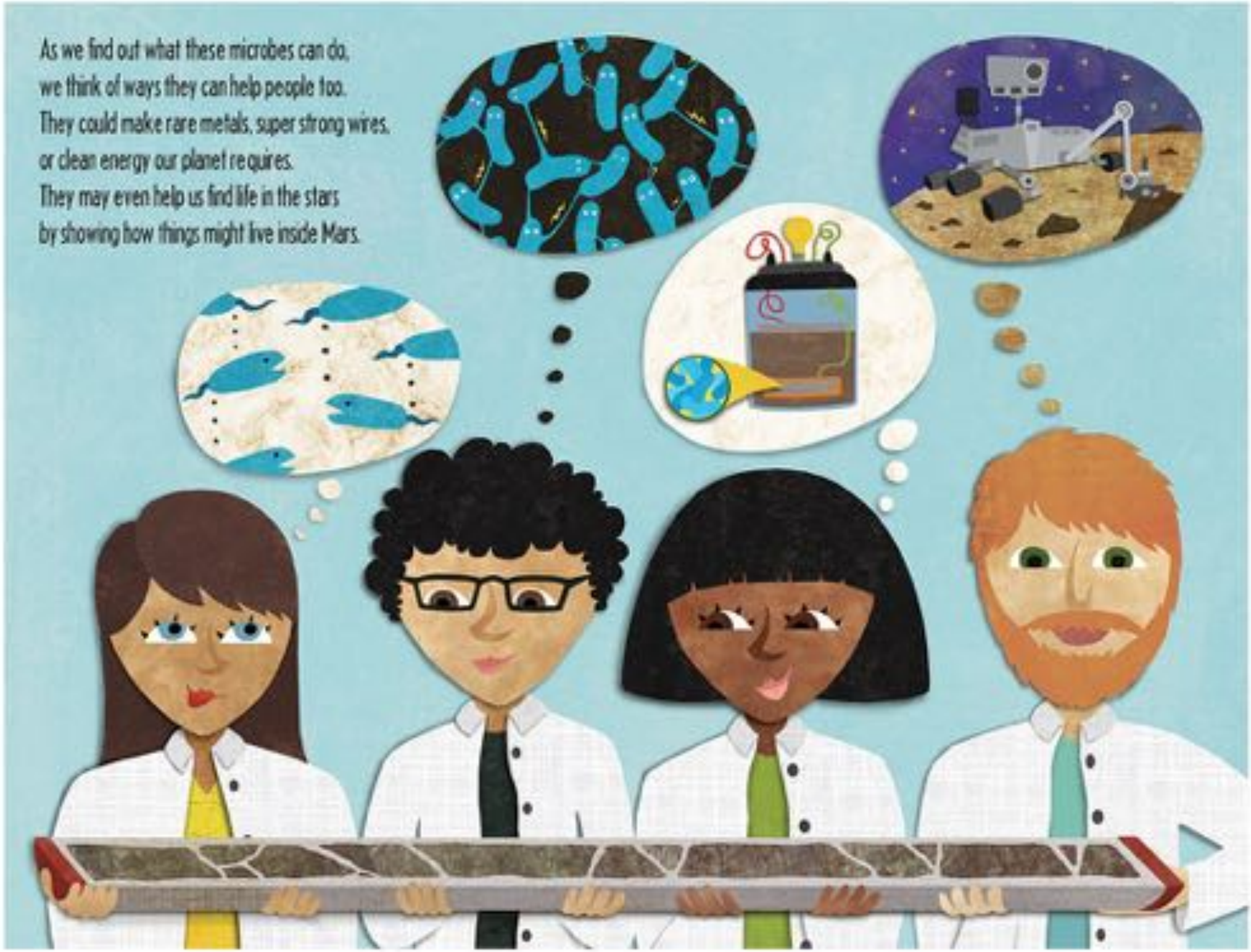

AIR
FOOD
WATER
In some ways microbes are kind of like you.
They all need to eat, and breathe and drink too.
The seafloor is not a place we could stay
but microbes live there in so many ways.


FOOD
WATER
AIR


Some live in mud where waters will flow.
Those near the surface eat marine snow.
Those deeper down have a weird food they love.
They feed on the poop of microbes above.


Some of them live even deeper than that,
surviving inside a rock habitat.
They wire together to form a big bunch
and then they can share an electric lunch.

As we find out what these microbes can do,
we think of ways they can help people too.
They could make rare metals, super strong wires,
or clean energy our planet requires.
They may even help us find life in the stars
by showing how things might live inside Mars.




We've just started learning about life in the seafloor.
Each expedition unearths something more.
The more we discover what the seafloor conceals,
the more possibilities our planet reveals.

THANK YOU!

We would like to thank the following for their tremendous help with answering our questions, reviewing this book and developing and sharing media:

Jason Sylvan
Rosalynn Sylvan
Stephanie Schroeder
Sharon Katz Cooper
Lisa Strong
Nicole Kurtz
Bill Crawford
Karen Graber
Andy Fisher
Kiana Frank
Katie Inderbitzen
Roman Barco
Carly Buchwald
Adrienne Hoarfrost
Ben Tully
Donato Giovannelli
Jan Amend
Rick Colwell
Julie Meyer

ABOUT THE AUTHOR

Kevin Kurtz is the author of the nonfiction children's books *A Day in the Deep*, *A Day on the Mountain*, and *A Day in the Salt Marsh*, as well as *Uncovering Earth's Secrets*, which was also illustrated by Alice Feagan. He was onboard the JOIDES Resolution during a research expedition in which microbiologist Jason Sylvan looked for microbes living in extinct, underwater volcanoes. To learn more about Kevin's books and school visit programs, visit http://kevinkurtz.homestead.com.

ABOUT THE ILLUSTRATOR

Alice Feagan specializes in traditionaland digital cut paper illustration. She has illustrated picture books, chapter books, children's wall art, and products for clients such as National Geographic Kids Magazine, Kids Can Press, and World Book Encyclopedia. She was onboard the JR for a School of Rock educator workshop as the ship traveled from Curacao to Bermuda. To view Alice's portfolio visit http://alicefeagan.com.

GLOSSARY

Atmosphere: The atmosphere is the layer of the Earth that stretches from the ground to about seven miles above us. It contains the air, which is made of gases like oxygen, carbon dioxide and nitrogen.

Cell: Cells are like tiny building blocks that make up living things. Some living things, called microbes, have only one cell in their bodies. Other living things have multiple cells that link together to make-up their bodies. You, for example, have over 37 trillion human cells in your body, plus 100 trillion microbe cells (from the 100 trillion microbes living in your body).

Cell membrane: A cell membrane is basically the outer skin of a cell. The cell membrane holds the cell together and protects the insides. The cell membrane has openings in it that allow food, water and gases (like oxygen) to pass into the cell.

Chemosynthesis: Chemosynthesis is the process some microbes use to turn carbon, nutrients and other chemicals into energy that the microbe can use to live. Chemosynthesis is different from photosynthesis, where living things get the food energy they need from sunlight. Microbes that do chemosynthesis have been found in hydrothermal vents, hot springs, cold seeps, lakes underneath glaciers and inside the seafloor.

Core: Cores are samples that are drilled out of the ground or out of ice. The JOIDES Resolution drills the seafloor to collect cores. Its drill fills up a long tube with rocks and sediment. The tube is brought up to the ship and cut into 1.5 meter length pieces (about 5 feet) to make the cores. The science team onboard carefully records the order and location of each core so scientists all over the world can study and learn from them.

Decomposers: Decomposers are microbes (like bacteria) and multi-cellular fungi (like mushrooms) that feed on poop and dead stuff. Decomposers breakdown the cells found in poop and dead stuff to release the cells' energy and nutrients. Other living things can then use those energy and nutrients.

Food chain: A food chain is a diagram that shows which living things eat which other living things in a habitat. It is a quick way to show how energy travels from one living thing to another. Food chains always start with photosynthesizers getting energy from the sun or chemosynthesizers getting energy from carbon, nutrients or other chemicals. One example of a food chain is: (1) grass gets energy from the sun, then (2) a cow gets energy by eating the grass, and then (3) you get energy by eating the cow as a hamburger.

Genes: Genes are like the computer programs inside of the cells of living things. Genes tell the cell what to do. The type of genes a living thing has determines what type of species it is. When living things have babies, their genes are automatically passed onto their babies.

GLOSSARY

Habitat: A habitat is a place where a living thing is able to find the food, water, space and other things it needs to survive. A habitat can be a place like a forest, a desert, a coral reef or a pond. A habitat can also be on or inside another living thing's body. Some of the things habitats provide living things with are:
Water - Energy - Nutrients - Stuff to breathe - Enough space to live - Shelter - The right temperatures

Magma: Magma is what we call hot, molten rock inside the Earth. If magma comes out of the ground, then it is called lava.

Marine snow: Marine snow is the stuff that falls down through the ocean from all the animals and other living things that make the ocean their habitat. Marine snow gets its name because it falls in such large amounts deep in the ocean, marine snow looks like falling snow. Marine snow flakes are made mainly of poop and the remains of dead fish, algae, plankton, bacteria and other ocean creatures.

Microbe: A microbe is a living thing that only has one cell in its entire body. They are so tiny that we can only see them with a powerful microscope. Bacteria, viruses, amoeba, archaea and yeast are all types of microbes.

Microbiology: Microbiology is the scientific study of microbes.

Microbiologist: A microbiologist is a scientist who studies microbes. They specialize in studying living things that cannot be seen with the naked eye, like bacteria, viruses and fungi. They try to understand how microbes live, grow, and survive in their habitats, and how they affect the world around them.

Photosynthesis: Photosynthesis is the process plants, algae and some microbes use to turn water, carbon dioxide and sunlight into sugar and oxygen. The sugar stores energy the plant can use later to live and grow. Animals also get energy from these sugars when they eat plants. Most of the oxygen made during photosynthesis is released in the atmosphere. Humans actually could not survive if it were not for plants and microbes doing photosynthesis. There would not be enough food energy to eat or oxygen to breathe without them.

Sediment: Sediment is made of tiny bits of rock and microscopic fossils. The tiny bits of rock are sand, silt and clay. Sediment covers the seafloor, but can also be found in rivers, lakes and the sides of mountains.

Species: Species are types of living things that have bodies, behaviors and/or habitats that are different from other living things. There are about 1.5 million named species on Earth and there are probably millions more we have not discovered yet. Just to give a few examples, around the world there are over 3000 known species of snakes (like eastern diamondback rattlesnakes, western diamondback rattlesnakes and red diamond rattlesnakes), over 500 known species of sharks (like tiger sharks, sand tiger sharks and sandbar sharks) and over 240 known species of woodpeckers (like red-headed woodpeckers, red-bellied woodpeckers and red-cockaded woodpeckers).