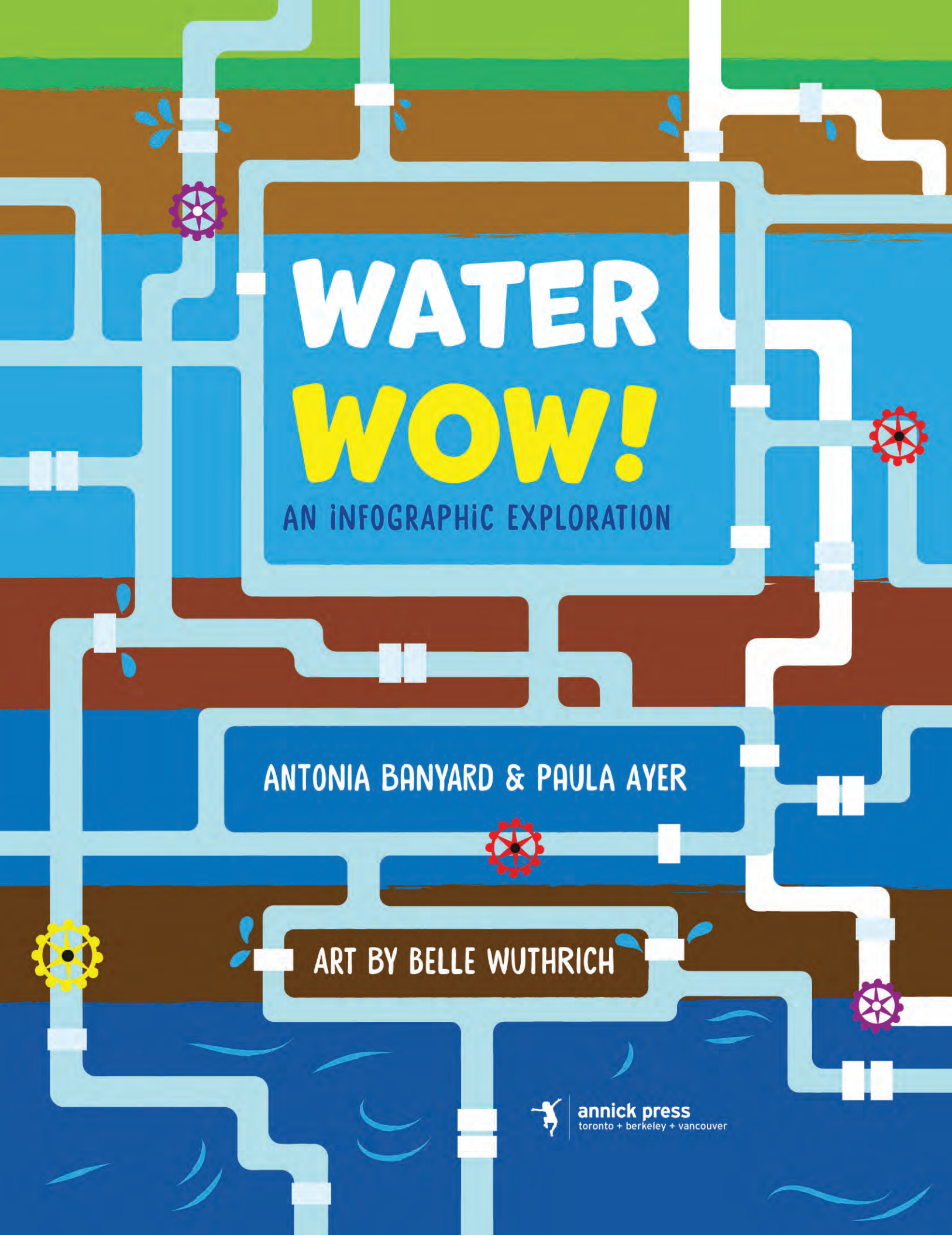

WATER
WOW!
AN INFOGRAPHIC EXPLORATION
ANTONIA BANYARD & PAULA AYER
ART BY BELLE WUTHRICH
annick press
toronto + berkeley + vancouver

Proofread by Linda Pruessen
Designed by Belle Wuthrich

Annick Press Ltd.

We acknowledge the support of the Canada Council for the Arts, the Ontario Arts Council, and the Government of Canada through the Canada Book Fund (CBF) for our publishing activities.

ONTARIO ARTS COUNCIL
CONSEIL DES ARTS DE L'ONTARIO
an Ontario government agency
un organisme du gouvernement de l'Ontario

Cataloging in Publication

Banyard, Antonia, author
Water wow! : a visual exploration / Antonia Banyard and Paula Ayer ; illustrated by Belle Wuthrich.

Includes bibliographical references and index.
Issued in print and electronic formats.
ISBN 978-1-55451-821-0 (paperback).—ISBN 978-1-55451-822-7 (bound).—ISBN 978-1-55451-823-4 (html).—ISBN 978-1-55451-824-1 (pdf)

1. Water—Pictorial works—Juvenile literature. 2. Water—Juvenile literature. I. Ayer, Paula, author II. Wuthrich, Belle, 1989-, illustrator III. Title.

GB662.3.B35 2016 j553.7 C2015-904559-2
C2015-904560-6

Distributed in Canada by University of Toronto Press.
Published in the U.S.A. by Annick Press (U.S.) Ltd.

Distributed in the U.S.A. by Publishers Group West.

Printed in China

Visit us at: www.annickpress.com
Visit Belle Wuthrich at: bellewuthrich.com

Also available in e-book format.
Please visit www.annickpress.com/ebooks.html for more details. Or scan

CONTENTS

HOW TO READ THE WATER MEASUREMENTS IN THIS BOOK

IN THIS BOOK, we've used both metric and imperial measurements. But "20 liters of water" or "3 gallons" can be hard to picture. So sometimes, we've used everyday measurements like water bottles, milk jugs, or swimming pools to give a better idea of how much water we're talking about. Here's what we mean when we say ...

1 cup = 250 milliliters (8 ounces), or the amount that would fit in a small glass

1 milk jug = 3.79 liters (1 gallon)

1 water cooler bottle = 19 liters (5 gallons), like the big bottles that go on top of water coolers

Bathtubs can hold varying amounts of water depending on their size and how much you fill the tub. When we say "a bathtub full," it means an average tub filled to the brim, or about 150 liters (40 gallons).

Showers can also vary depending on the water pressure of the showerhead. When we say "a five-minute shower," that means around 60 liters (15 gallons) of water.

An Olympic-sized swimming pool holds about 2.5 million liters (660,000 gallons) of water.

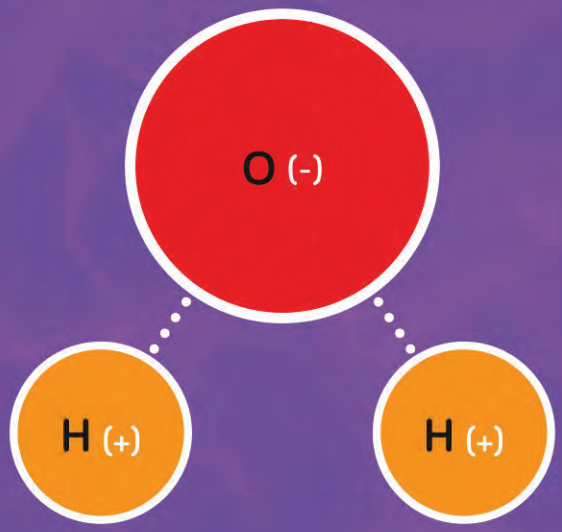
Sometimes, we need to measure really, really big quantities of water. How much? A LOT! For this, scientists and researchers use units called **cubic kilometers** and **cubic gigameters.** A cubic kilometer is an imaginary cube 1 kilometer (0.6 miles) on each side. That cube would hold over 984 billion liters (260 billion gallons), enough to cover the entire island of Manhattan in water 11.5 meters (37 feet) deep! But a cubic gigameter is *100,000 times bigger!* So one cubic gigameter would hold 98,400 trillion liters (26,000 trillion gallons)!

INTRODUCING THE AMAZING ... WATER!

IT FLOWS! IT FREEZES! It powers houses and buildings! It's in the air and in the ground. And even though you need it, you probably think of it only when there isn't any around. It's ... water!

Care for a Glass of Dihydrogen Monoxide?

Relax—it's just water! That funny chemical name tells you what water's made of: two hydrogen atoms and one oxygen atom. (*Di* at the start of a word means "two" and *mono* means "one.") When those three atoms crash into each other hard enough, they stick together to make a water molecule.



Cool Things About Water Molecules

THEY'RE CHARGED!

Think of a water molecule like a triangle with magnets at each point. The top point of the triangle (oxygen) has a negative charge, pulling it one way. The bottom two points (hydrogen) have a positive charge, pulling them in the opposite direction.

THEY LIKE TO STICK TOGETHER.

Water molecules are attracted to other water molecules because of that magnet-like charge. One molecule can pull as many as four other molecules around itself. Try dripping some water on a table. See how it forms rounded drops rather than flattening out? Now you know why!

THEY MOVE APART WHEN THEY COOL OFF.

Most things get smaller—or contract—when they get colder. Not water! Its molecules actually expand as they freeze, making frozen water less dense than the liquid form. That's why ice floats on top of water. This is a good thing for the fish that live at the bottom of lakes; otherwise they would become fishsicles.

Also Known As ...

You may have encountered H_2O in one of these forms:

ICE. Water's chilled-out solid form. Found in summer drinks, skating rinks, and hanging off the end of your nose in winter.

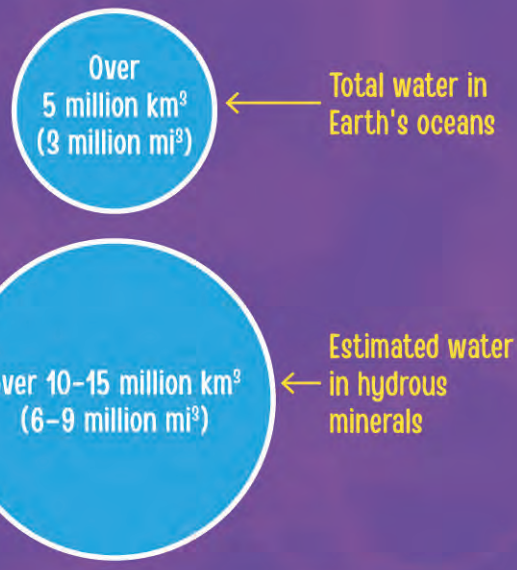
WATER. The good old liquid stuff, essential for drinking, bathing, and backyard water fights.

VAPOR. When water droplets get too hot, they like to dance around in the air and let off some steam. You'll encounter this gas form of water puffing out of kettles or rising over a hot bath.

Are There More Than Three States of Water?

Scientists say, yes! Water also exists under a mysterious alias called *supercritical fluid*, which acts a little bit like a gas and a little bit like a liquid. It tends to hang around in places you wouldn't exactly like to visit, such as vents at the bottom of the ocean or the inside of volcanoes.

Then there's another form so secret we can't even see it. *Hydrous minerals*—a fancy name for "watery rocks"—look like an average rock, but fused into the rock are molecules of water. This type of water is only found deep under the Earth's surface, where the intense pressure squishes the water molecules into the rock molecules. Amazingly, hydrous minerals are the most abundant source of water on Earth!



It's Clear! No, it's Blue!

A glass of water is clear, right? So why do oceans, lakes, and swimming pools look blue? Sunlight or other white light contains all the colors of the rainbow. When light shines on water, the vibrating water molecules absorb all the colors of the rainbow except those at the blue end, which are reflected back to our eyes. Algae or other particles in the water and the reflection of the sky also make large bodies of water look blue. Even the pure water in your glass is a very light blue, but our eyes can only see it when light travels through deeper water.

WET PLANET

EARTH ISN'T CALLED THE BLUE PLANET for nothing. There's much more water on Earth than on any other planet in our solar system, and on most planets we know of in the universe. Without that water, Earth would be a boring rock with no plants, animals, or humans.

You probably already know about the water cycle: water falls as rain and evaporates back into the sky, over and over and over again. But have you ever thought about where all that water came from in the first place?

Cosmic Juice

Scientists believe that all water was formed in space, one molecule at a time, over billions of years, probably from hydrogen and oxygen that spewed out of exploding stars. Eventually, enough of these molecules found one another. First they formed a fine mist, then a droplet, and on and on.

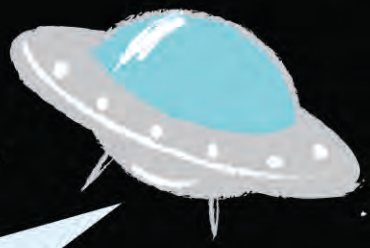
How Old Is It?

Half of the Earth's water could have been formed in space even before the Sun existed—that's over *4.54 billion years ago!*

IN 1998, a team of scientists discovered a huge water factory in an interstellar gas cloud in the middle of Orion, a constellation in our solar system. This cloud of gas creates enough water to fill all of the Earth's oceans in less than half an hour. Every day, around the clock.

The Mystery of Water on Earth

Water from your tap might seem fresh and new. In fact, it's one of the oldest things on Earth! So how did it get here? Surprisingly, scientists aren't sure.



THEORY 1: IT CAME FROM OUTER SPACE!

The young Earth was a hot and atmosphere-less place, some scientists think, so it couldn't have held much water—it would have just boiled off or flown back into space. They say the water we have now was delivered by ice-carrying meteoroids or comets long after Earth was formed.

THEORY 2: IT WAS HERE ALL ALONG!

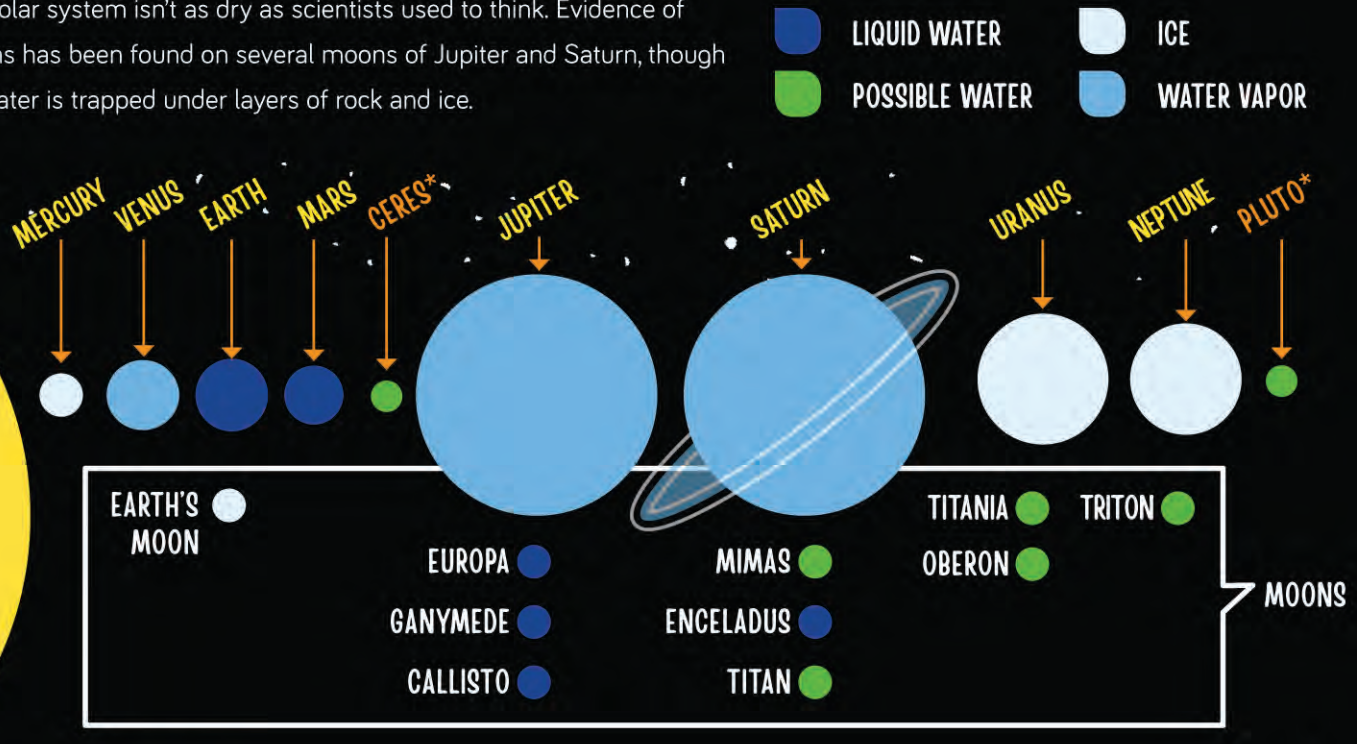
Other scientists say there's increasing evidence most of Earth's water was on the surface from the beginning. They believe that water was one of the raw space materials that crashed together to form the planet around 4.5 billion years ago.

THEORY 3: IT WAS JUST HIDING!

Still other theories suggest that water existed *in* the Earth, but didn't make its way to the surface until much later. It might have leaked out from hydrous minerals, or erupted out of volcanoes.

Where Else in the Solar System Is Water?

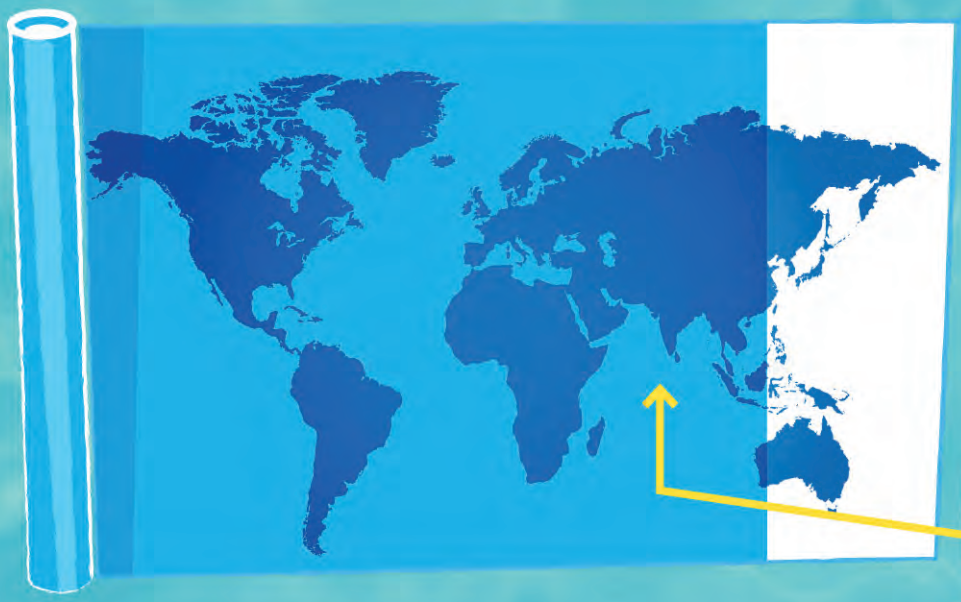
Our solar system isn't as dry as scientists used to think. Evidence of oceans has been found on several moons of Jupiter and Saturn, though the water is trapped under layers of rock and ice.



*Dwarf planet

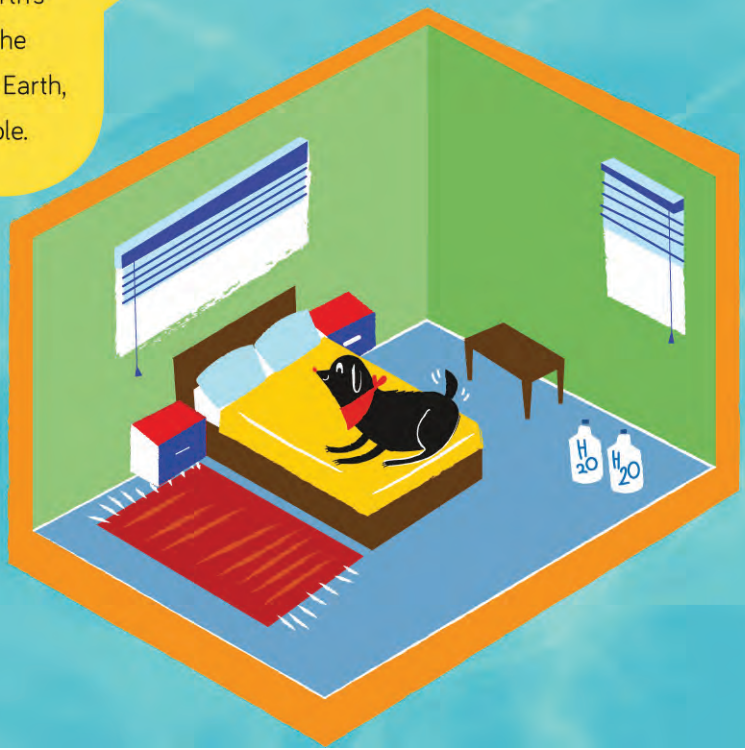
WHERE ON EARTH IS THE WATER?

WHEN YOU LOOK AT A MAP, the world seems to be mostly water. But surprisingly, most of the planet is not water, and just a tiny part of the water that is here is fresh enough for us to use. So where *is* all the water? It might not be where you think!



If you were to roll out the surface of the Earth like a map, water would cover nearly three-quarters of it.

But if you could gather all of that water together into a ball, it would actually be only a tiny fraction of the Earth's mass—about 0.025%! That's because even though the oceans seem very deep, compared to the size of the Earth, they're spread in a thin layer—like the skin on an apple.



If the entire Earth were the size of your bedroom, all the water would fit in two milk jugs in the corner.

Where Can You Get a Drink around Here?

While the Earth may not have as much water as we're used to thinking it does, even that tiny blue dot on the globe still represents a lot of H_2O. But nearly all of that is salt water. Good for fish, but not for drinking!

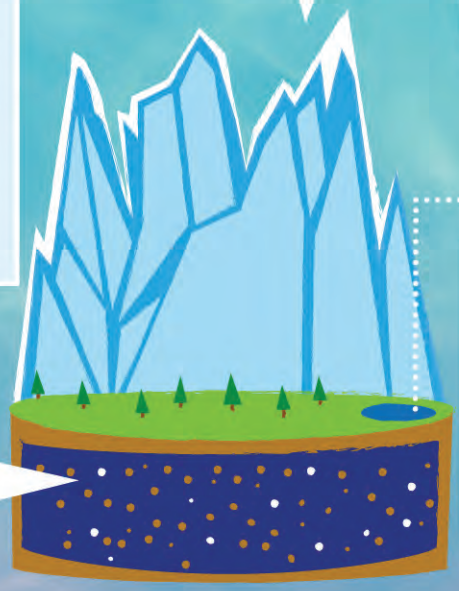
3%
is freshwater

97%
of water on Earth is in the oceans

Only 3%? Well, there's more bad news: most of that small amount is frozen in glaciers and ice caps. Another big chunk is stored underground or in cracks in rock as groundwater.

68.7%
is in ice caps and glaciers

31%
is groundwater
(water stored in the soil or in tiny holes in rock)



0.3%
is surface water
(freshwater that's above ground, like lakes and rivers)

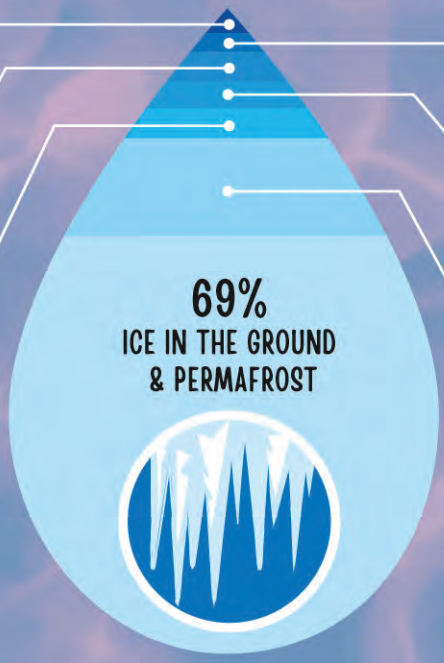
This tiny amount is the water we're most familiar with—what we use for drinking, watering our lawn, bathing, and everything else.

Where Can You Find Surface Water?

0.26%
IN LIVING THINGS

2.6%
SWAMPS & MARSHES

3.8%
SOIL MOISTURE



69%
ICE IN THE GROUND & PERMAFROST

0.49%
RIVERS

3.0%
ATMOSPHERE

20.9%
LAKES

Imagine if someone gave you $100, then took it all back except for three pennies. That's the difference between all the water on Earth and the surface water we can use!