EVERYDAY STEM

Illustrated by Xiana Teimoy

OUR Camping trip

PHYSICS, CHEMISTRY & FUN

Written by Helena Haraštová & Lenka Chytilová

Albatros

PHYSICS, CHEMISTRY & FUN | OUR CAMPING TRIP | Helena Haraštová & Lenka Chytilová & Xiana Teimoy

ON VACATION WITH THE BRIGHT FAMILY

It was the beginning of summer and for the Bright family, that meant one thing: a vacation adventure!

I've got the flashlights!

I hope we haven't forgotten anything . . .

Hurry up, Teresa!

I can't wait to hit the road!

Once the Brights were sitting in the car, which was jam-packed with all their things, Mom said, "Let's have a wonderful vacation, everyone," smiling at Dad. And as the landscape opened up before them, full of forests, hills, mountains, and lakes, all kinds of questions ran through the children's minds. They knew they would learn many new things during their vacation in the countryside . . .

WHY CAN'T WE GO STRAIGHT UPHILL?

The Brights were driving up a steep hill along a winding road and Teresa was wondering why the road couldn't be straight. "We'd get to the top faster, at least!" she said in annoyance. "But we'd be more likely to wreck the engine," laughed Dad. "It'd be way too steep."

Because of this ramp, Teresa doesn't have to carry her stoller up the stairs.

COMPARE

With a baby stroller, you can discover for yourself the advantage of an inclined plane. First, try to lift it from the ground up to the top step. Next, try pushing it up the sloped ramp that leads to the building's entrance. Which do you think is easier?
Additionally, bricklayers often use an inclined plane to transport heavy loads in wheelbarrows. Just imagine how hard it would be to lift such a load straight up!

EXPLANATION

Inclined plane
A road that climbs a hill slowly and is longer than the direct route to the top is an example of an inclined plane. An inclined plane is a sloped surface that allows us to carry heavy loads to higher places – although the distance is longer, we don't need as much effort. If a road went straight up a steep hill, no car would ever get up it.

Pulley
That's all well and good, but what if we wanted to lift something heavy to a higher place, for example, into a treehouse? Would we have to build a gigantic inclined plane? No. What we would need is a pulley. A pulley is a wheel that rotates around its axis. It has a groove around its circumference that holds in place a rope or a chain. All you have to do is pull the rope downwards, which is much easier than lifting the load upwards!

Lever
Isn't it great that we have simple machines that make our work easier? And let's not forget the lever. An ordinary seesaw is an example of a lever. A lever has two arms supported by a fixed point, such as the middle part of a seesaw. The longer one arm is, the less force we need to lift the weight that is placed on the opposite arm.

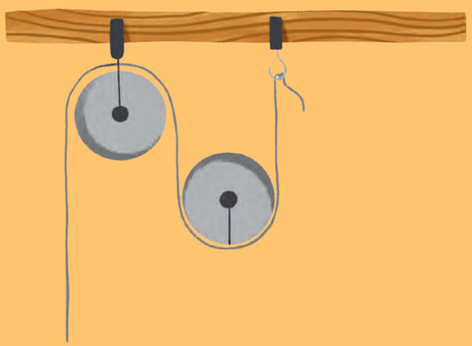
Just one more pull, and our bags will be here!

Heave-ho!

The Brights used a lever on their journey, when they came across a large boulder blocking the road. It would've been a back-breaking task to pick it up and carry it to the side of the road, even for Dad, but thanks to the long arm of the board, shifting the rock was a piece of cake.

ONE MORE THING

The more pulleys we connect together, the more weight we can lift. Each pulley takes a certain amount of the weight off the load. If you were to pull on a rope attached to six pulleys, for example, you could easily lift an elephant . . .



07 NAVIGATION

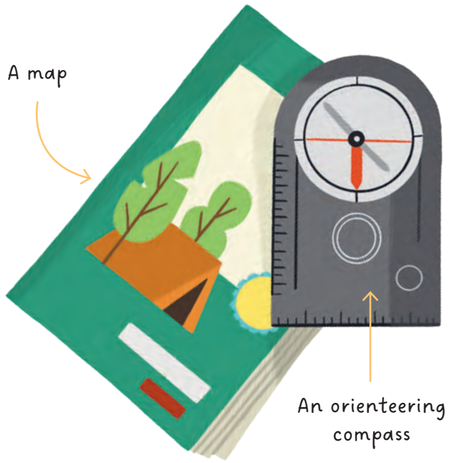
HOW DO WE READ A MAP?

The next day, the Brights didn't want to waste a single minute, so they set off on a hike early in the morning. Cooper and Teresa walked up ahead and tried to find their route on the hiking map. "Oh, for goodness sake. Why does it go uphill so much?" puffed Cooper, and soon they were both out of breath.

EXPLANATION

Contour lines

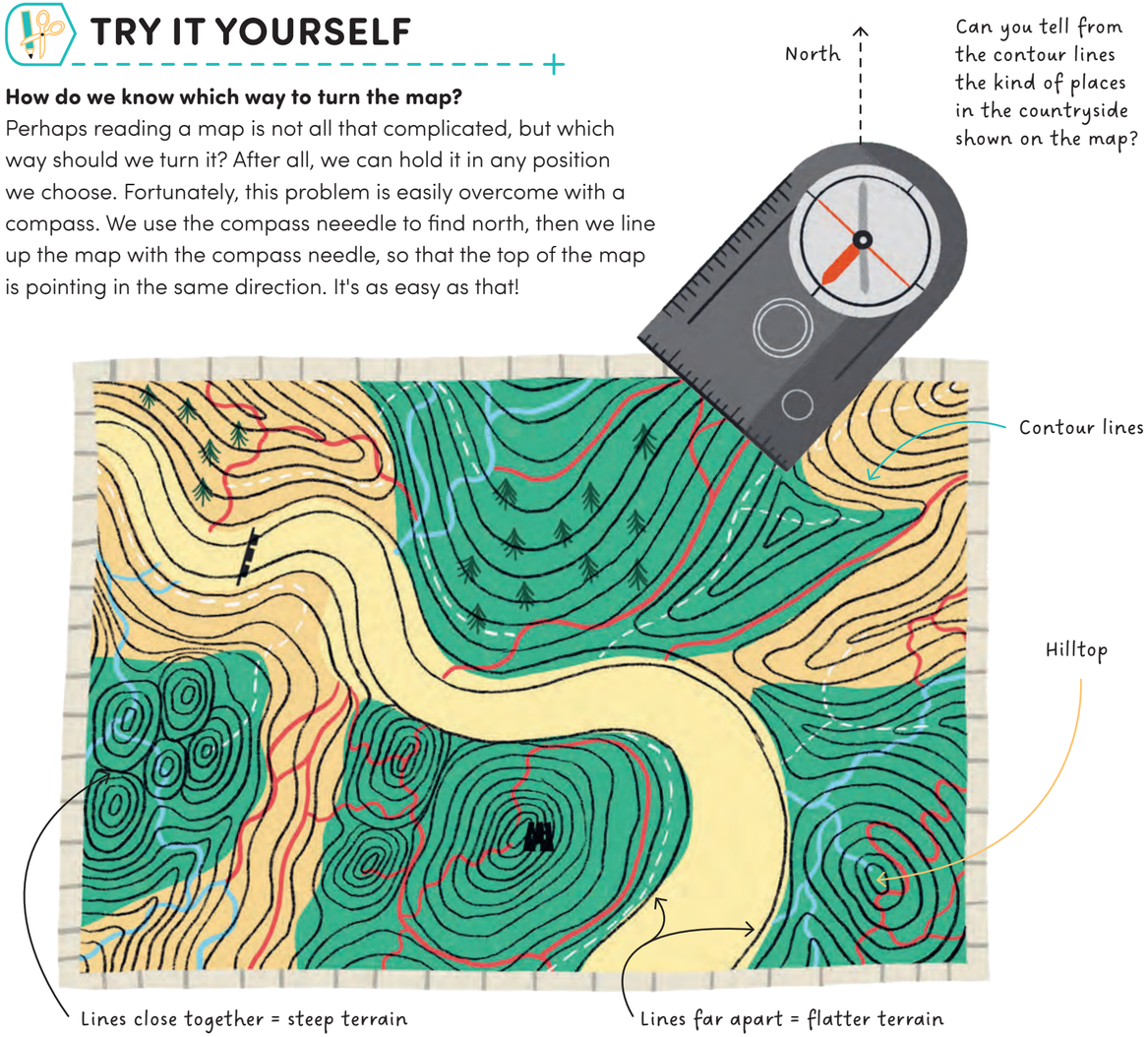
Even though a map is flat, it can still show us how rugged and hilly the landscape is. All we need to do is look at the contour lines. These are lines that connect the terrain with the height. The closer the contour lines are together on the map, the steeper the hill will be in that place. On the other hand, the farther away the lines are from each other, the flatter the landscape will be. Contour lines in circles show us clearly where the top of a hill is.



TRY IT YOURSELF

How do we know which way to turn the map?

Perhaps reading a map is not all that complicated, but which way should we turn it? After all, we can hold it in any position we choose. Fortunately, this problem is easily overcome with a compass. We use the compass neeedle to find north, then we line up the map with the compass needle, so that the top of the map is pointing in the same direction. It's as easy as that!



OBSERVING


A mansion on top of a hill

Dominant features of the landscape

If we don't have a compass with us, we need to scan the landscape for interesting places that may be marked on our map. These features may be:


A railway line


A crossroads

Find at least two distinctive objects in the surrounding countryside, and then find them on the map. Turn the map so that the left and the right correspond to reality. Hurray, now you're oriented.


The edge of a forest

10 SPEED OF SOUND AND LIGHT

WHAT HAPPENS DURING A STORM?

The sky turned dark and suddenly a silent flash of lightning pierced through the gloomy clouds. A few seconds later, as Teresa lifted her finger to point at it, there came a loud clap of thunder. What an incredible noise! Cooper placed his hands over his ears. But how is it that we don't hear the thunder until after we see the lightning?

EXPLANATION

Lightning is a discharge of electricity between a cloud and the ground (and often between two clouds) during a thunderstorm. We see its bright light immediately, but we hear the sound with a delay. Why is this? It's because light travels faster than sound – much, much faster!

Light from the Sun travels the 93-million-mile distance to Earth in just 8 minutes!

Speed of light – around 185,000 miles per second

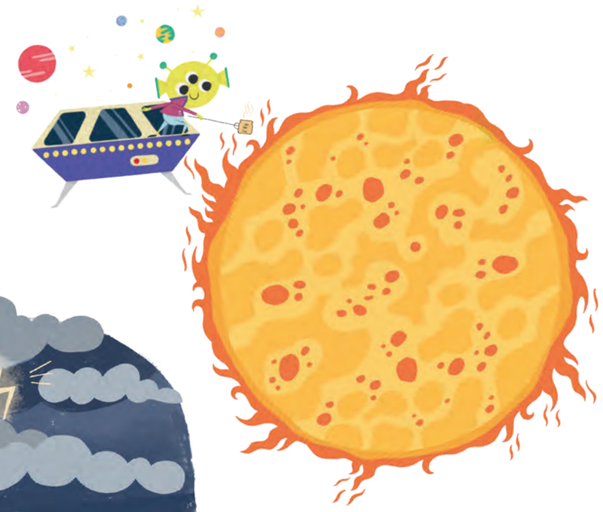
Speed of sound during a storm – less than a quarter of a mile per second

TRY IT YOURSELF

The closer you are standing to a storm, the faster the sound of thunder travels to you. If you count the seconds between the flash of lightning and the sound of thunder, and then divide the result by four, you'll get your approximate distance from the storm in miles.

For example, if a storm is raging one mile from your location, you'll hear the thunder four seconds after the lightning.

Why does thunder accompany lightning?
Lightning has a temperature of around 27,000 °F, which is five times hotter than the surface of the Sun. Any tree it strikes can literally explode, because its sap burns up in an instant. Also, it can melt sand into glass beads.



And it is this scorching temperature that also makes the surrounding air extremely hot, so it expands. The air expands rapidly and cools immediately afterwards, which creates sound – and that is the sound of thunder.

ONE MORE THING

Sound travels through the air in the form of **sound waves**. When Cooper calls out to Teresa, his voice is sent in all directions and Teresa's ear catches it.

This is possible due to the fact that there are tiny particles in the air that send out vibrations. In a vacuum – meaning empty space, like outer space – you wouldn't hear a peep out of Cooper.

THE VACATION IS STILL ON!

Kick the ball here, Teresa!

Dinner's ready!

I've found a great spot for our trip tomorrow!

Teresa and Cooper are going to have plenty more vacation adventures, where they'll learn many more fun new things. In the meantime, let's review what we've learned along the way.

OUR CAMPING TRIP

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EXPLANATION

Chemistry, physics – some say they're boring and complicated sciences . . . nothing for kids, who long for fun and adventure. But what if it's just the opposite? What if chemistry and physics CREATE the wonderful, fascinating world we love to play in and explore so much? What if these sciences are the CAUSE of all the breathtaking wonders around? Well, that's how it is. Why don't I ever fly into space while jumping on a trampoline? How can I possibly move a giant boulder? And where does salt go when I mix it in water?

Join us as we discover the laws of science in the most natural way – by encountering them every day. Together with Teresa, Cooper, and the whole Bright family, you will go on vacation and see that science is all around us. It's life itself. Let's learn to understand it!

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