Lesson of the Week!

LET'S MAKE THINGS GO!

ALL ABOUT ENGINES
for Young Scientists

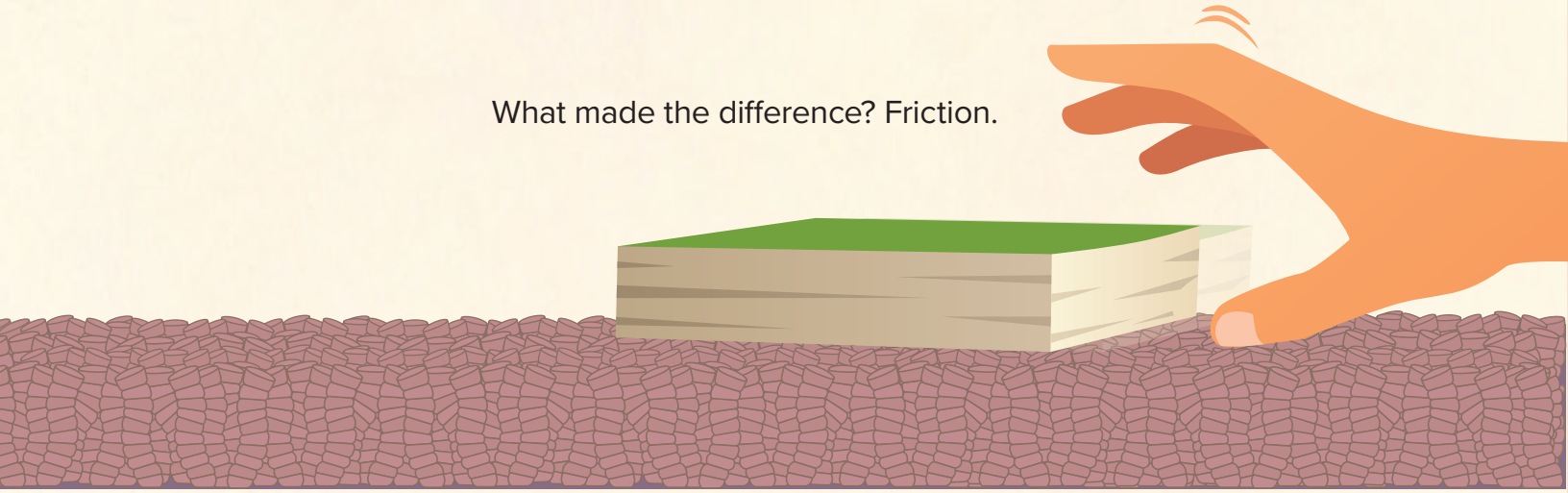
HERON BOOKS

3 CHAPTER FRICTION

Imagine you have a book sitting in front of you and you want to give it to a friend on the other side of the table. You give it a quick push and it slides across.

Now imagine you're sitting on a carpeted floor with the book in front of you. Again, you want to slide it over to someone so you give it the same quick push. You use the same amount of force as before, but the book hardly moves.

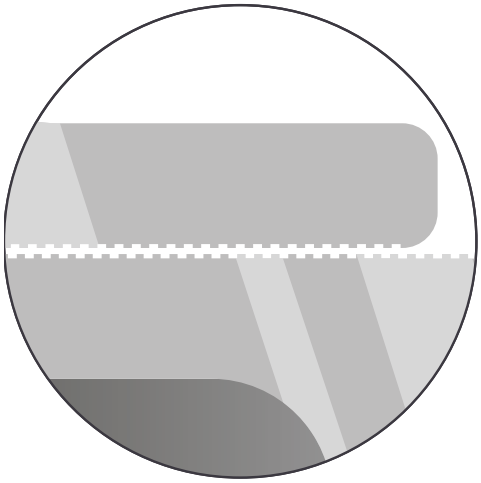
What made the difference? Friction.



Friction is a force that happens when one surface rubs against another. Friction slows down or stops things. A tabletop is fairly smooth. There is little friction, so the book slides easily. But the carpet is not so smooth, so the book doesn't slide as easily. There was more friction.

WHAT CAUSES FRICTION?

In the examples of the carpet and the table, it's easy to see that a rough surface has more friction than a smooth surface. But let's look at this more closely.

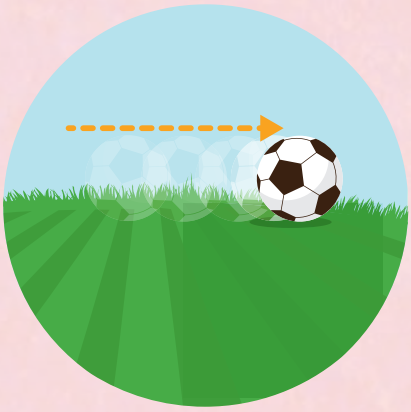


The surfaces of objects are not perfectly smooth, even when they appear to be.

They have tiny ridges and bumps. When two objects rub against each other, the tiny ridges and bumps on one object push against the ridges and bumps on the other object.

That rubbing force is friction. It's a force that slows or stops motion.

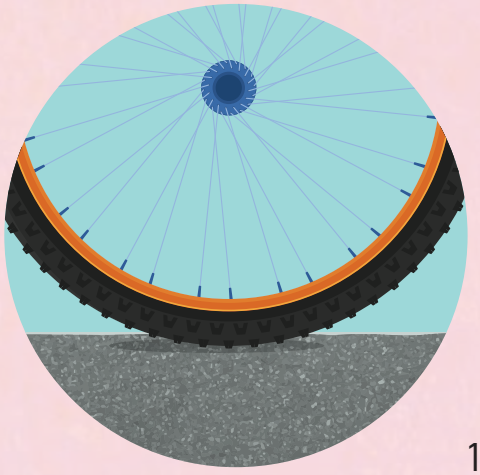
When you roll a ball across a lawn, there is friction between the ball and the grass. The ball rolls for a bit, then slows and stops.



A racing bike with thin tires will roll for a long distance on a very smooth road. But it too will eventually stop.

There is friction between the wheels of a moving bicycle and the road. Even on a good, strong bike with tires full of air, if you stop pedaling on a flat road, the friction caused by the tires rubbing against the road will slow your bike down and eventually stop it.

Friction between your shoes and the sidewalk keeps your shoes from slipping and sliding.



When you walk down a sidewalk, there's usually enough friction for you to walk easily without slipping. When you take a step, the bottom of your shoe rubs against the sidewalk. This friction keeps your shoe from sliding, and you move forward.

MORE AND LESS FRICTION

But what if there is too much friction?

Too much friction slows motion, or might even stop it. Imagine you're riding a bike on a smooth road and you get up some speed. Suddenly the road turns to rough dirt and gravel. Your bike slows down. It's harder to pedal.

Why? Now there is more friction between your tires and the rough road, too much to keep up your speed. Your bike is slowed down, and moving it along takes a lot more work.

What if there is too little friction?

Suppose you go out to take a walk on a very cold day, and the sidewalk is covered in ice. When you take a step, you find yourself slipping and sliding.

Why? You have no grip because there's so little friction between your shoes and the surface you're walking on!

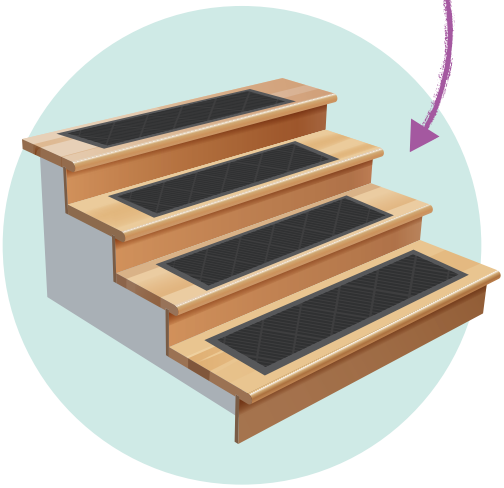
Imagine if all floors were so slippery you kept falling down!

Friction is all around us, yet we don't think much about it. But without friction, it would be hard to do almost anything!

Imagine if doorknobs were so slippery you couldn't turn them or the handlebars of your bike were so slippery you couldn't hold on!

You need the right amount of friction for whatever you are doing.

If you want something to slow down or not slip, you want more friction.



If you want something to move fast, you don't want much friction.

Can you think of activities where more friction is good? Can you think of ones where less friction is good? It all depends on what you're trying to do.

FRICTION

For this activity you will need

- a book
- 15 plastic straws
- a small amount of modeling clay

Steps

1. Lay a book on a table. With one finger, give the book a push hard enough to move it.

2. Stick a few tiny balls of clay to the back of the book. Then, using about the same force as you did before, give the book a push. Observe what happens.

3. Now, take the clay balls off the back of the book. Line up 15 plastic straws side-by-side on the table, about 1 inch apart. Put the book on the straws. Using about the same force you used on the earlier pushes, give the book a push. Notice how far the book moves.

4. (Optional) If you want, think of a different experiment with pushing the book and friction, and try it out.

5. Tell (or write up for) someone what you observed about friction and motion.