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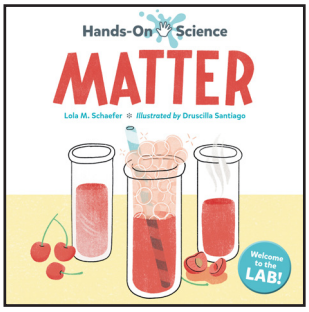
Hands-On Science

ACTIVITY KIT



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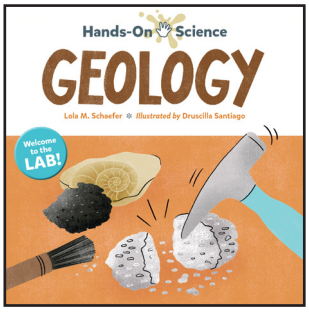

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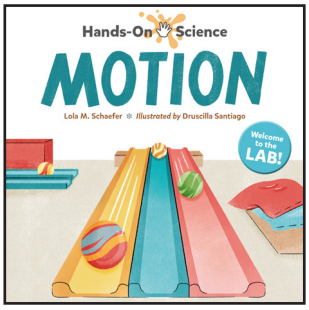

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About the Series

Welcome to the lab! Bill Nye meets Hervé Tullet's *Press Here* in this interactive, kinesthetic series of picture books exploring basic science concepts.

About the Author

Lola M. Schaefer was a classroom teacher in grades K–7 for eighteen years. She began writing books for children because she saw how important a good book was to each of her students. Lola is now a writing consultant and the author of more than 275 children's books. She and her husband live in the mountains of north Georgia. www.lolaschaefer.com

About the Illustrator

Druscilla Santiago is the illustrator of the Hands-On Science series. When not at the drawing board, she can be found enjoying a good laugh and a sweet treat with her family on the island of O'ahu. www.adventurefun.club

Hands-On Science

MATTER

Activity Kit

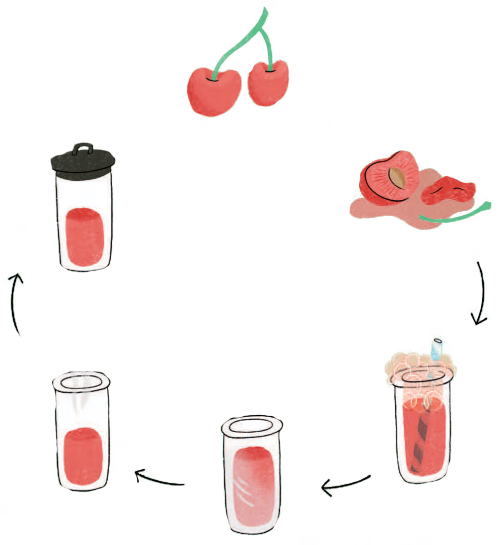
Discussion

Use these questions to kick off classroom discussion, guide pre-thinking and post-reading responses, or inspire a writing or drawing assignment!

Discussion

Before reading the book, show students the cover of *Hands On Science: Matter.* Ask them what they think the book is about. List predictions on the whiteboard.

1. What is matter? How is the word "matter" in a scientific context different from how students may have heard it in conversation, such as "Your feelings matter"?
2. If you pour water from a saucepan into a water glass, does its mass change?
3. Water is often used as an example of the three states of matter (solid, liquid, and gas). Can students think of other examples of matter changing states?
4. Does the mass of the cherry juice change when it freezes into ice? How about when it thaws and evaporates in the sun?
5. Is all matter visible? What are some things that have mass that the human eye can't see?
6. Look at the illustration of the scientist in the back matter. What are some kinds of matter that can be found in the human body? Where does that matter come from? As students grow, are they making new matter out of nothing or getting it from the food they eat?
7. Think of some plants or animals that appear to change size and shape very suddenly, like pufferfish. How do they do that? What kind(s) of matter are involved in this transformation?
8. What are some things that cause matter to change states? Think of examples from the book, like temperature (putting the juice in the freezer) or pressure (squeezing the cherries). Are there things that cause matter to change states that the author didn't include?



Hands-On Science

MATTER

Activity Kit

Activity: Total Meltdown

Explore the phases of matter with an ice-melting activity.

Materials

- 3 to 5 plain ice cubes
- 3 to 5 ice cubes with small solid materials frozen inside, like Legos or other toys
- 3 to 5 ice cubes with large air bubbles inside
- A sunny windowsill, electric blanket, microwaved hot pad, or other safe device for melting ice
- A clear glass container for holding ice while it melts
- 3 clear beakers or glasses

Procedure

1. Begin by talking about the cherry-juice experiment in *Hands-On Science: Matter*. What happened when the cherry juice was put in the freezer? What happened next, when the frozen cherry juice was left in the hot sun? What do students think would happen to ice that had something frozen inside it?
2. Introduce students to the ice cubes. Ask if what they see inside is a solid, liquid, or gas. Invite students to make predictions about what will happen when the ice melts.
3. Using your sunny windowsill, electric blanket, hot pad, or other heating device, melt the plain ice cubes while students watch. Ask them to share their observations aloud or write them down. When the ice is all melted, what do you have left? Pour the liquid into a clear beaker and pass it around or invite students to come up and examine it. How did their predictions compare with the results?
4. Repeat step 3 with the solid-bearing ice cubes. Set the beakers side by side and ask students to compare the results. Why did the objects inside the ice not melt?
5. Repeat step 3 with the air-bubble ice cubes. Set all three beakers together and ask students: Where did the trapped gas go?
6. Break the class into small groups and ask them to discuss: What would happen if the liquid in the beakers was refrozen?

Hands-On Science

MATTER

Activity Kit

Word Search

Name: _____

Date: _____

E D H R K T F M D
T L B H L H R V L
A B U B B L E S I
O U L W Z H E S Q
I G E S G S Z A U
N Z U T T L E M I
S N G A S C I L D
H M A T T E R H N
R S P E S O L I D

SOLID
LIQUID
GAS
MATTER
STATE
MELT
FREEZE
MASS
BUBBLES

Hands-On Science
GEOLOGY
Activity Kit

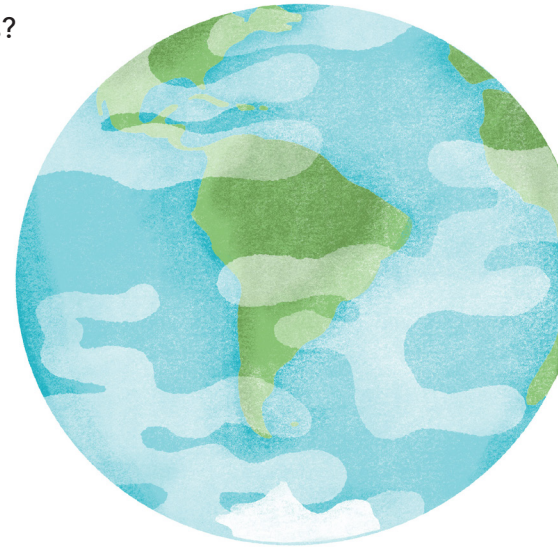
Discussion

Use these questions to kick off classroom discussion, guide pre-thinking and post-reading responses, or inspire a writing or drawing assignment!

Discussion

Before reading the book, show students the cover of *Hands-On Science: Geology.* Ask them what they think the book is about. List predictions on the whiteboard.

1. What kinds of rocks can students find in their area? Is there a prominent geological formation nearby, such as a mountain, canyon, or cliff?
2. How do scientists identify types of rock? What are some qualities that make rocks distinct from each other (such as shape, color, hardness, etc.)?
3. What are some careers where knowing about geology is useful? (For example: surveyors, architects, jewelers, search-and-rescue workers, etc.)
4. Do you live in an area prone to earthquakes, tsunami, or volcanic eruptions? What do your students do to prepare for natural disasters? What makes earthquake preparation different from preparing for other natural disasters, like hurricanes?
5. Look at the tectonic plate map on the California Earthquake Authority's website: www.earthquakeauthority.com/Blog/2020/Understanding-Plate-Tectonic-Theory. What tectonic plate do you and your students live on? Are you near a boundary between two plates? Why does being near a boundary increase the likelihood of earthquakes?
6. What is a fossil? What kinds of fossils are your students familiar with? What can scientists learn by studying fossils?
7. What is the difference between igneous, metamorphic, and sedimentary rock? Why do students think rocks are classified based on how they were made?
8. How do students use rocks, metals, and minerals in their daily lives?



Hands-On Science
GEOLOGY
Activity Kit

Activity: Hard Rock

Explore some real-life rocks, and conduct an experiment to determine how hard each rock is.

Materials

- A variety of rocks, including some very soft and some very hard
- Writing and drawing materials
- Magnifying glasses
- Pennies
- Steel nails

Procedure

1. Begin by talking about the section in *Hands-On Science: Geology* when the limestone became marble. Which do students think is harder: the limestone or the marble? Can students think of examples of very soft rocks (chalk is a good one) or very hard rocks (such as obsidian)?
2. Show students the Mohs Hardness Scale on the National Parks Service website: www.nps.gov/articles/mohs-hardness-scale.htm. Point out the tools shown on the far right, and explain that students will use tools like these to test the hardness of some rocks.
3. Invite students to draw a hardness scale, using the Mohs Hardness Scale as a guide. Ask them to leave the far left column blank. Draw your own scale on the whiteboard along with the students and use it in the step below.
4. Demonstrate the hardness test with one rock. First, attempt to scratch the rock with a fingernail. If that doesn't leave a mark, scratch with a penny. If that doesn't work, scratch the rock with a steel nail. In the far left column of your scale, write down where your rock falls on the scale.
5. Divide the class into small groups and distribute three or four rocks to each group. Invite each group to test their rocks and rank them on the scale.
6. Once the groups have ranked their rocks, bring the whole class back together and assemble a mega-scale, organizing the rocks from softest to hardest.

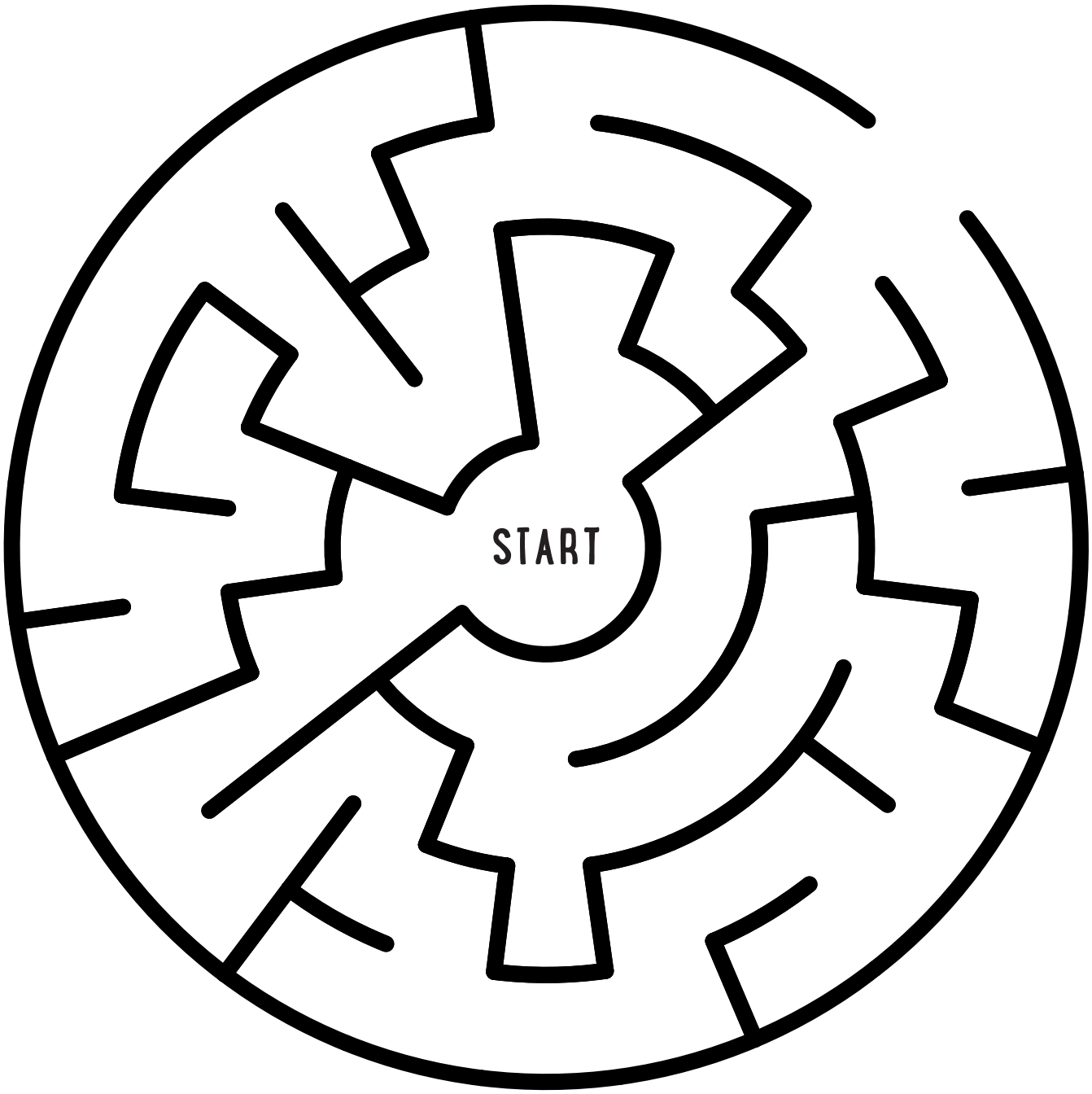
Hands-On Science
GEOLOGY
Activity Kit

Mantle Maze

Help the magma find its way from inside Earth to the surface!

Name: _____

Date: _____



Hands-On Science
MOTION
Activity Kit

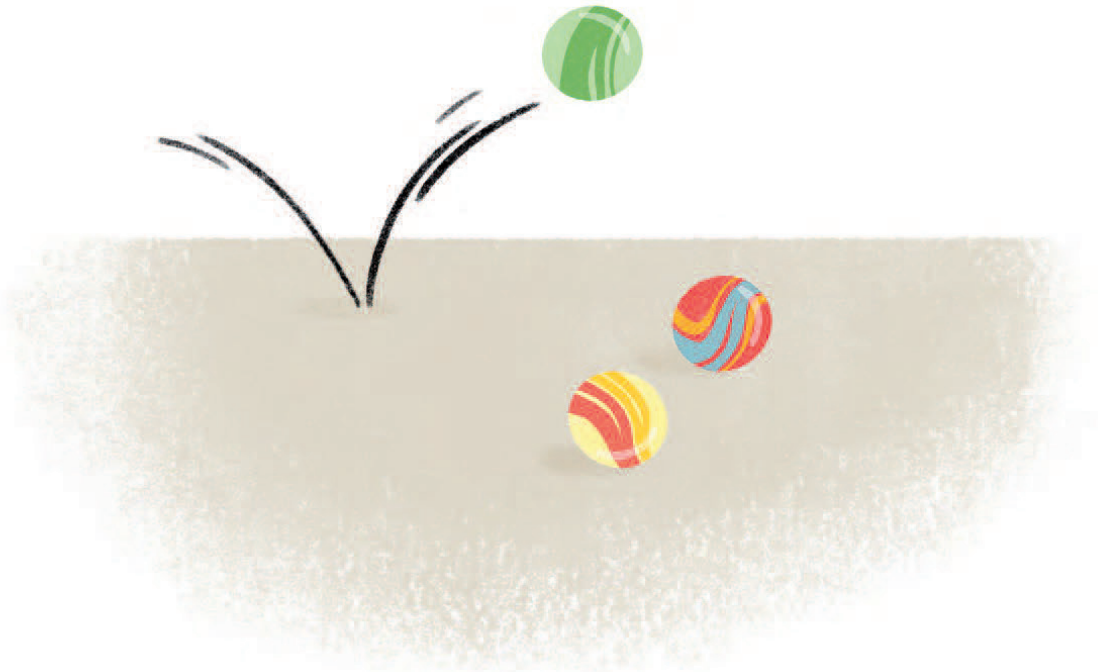
Discussion

Use these questions to kick off classroom discussion, guide pre-thinking and post-reading responses, or inspire a writing or drawing assignment!

Discussion

Before reading the book, show students the cover of *Hands-On Science: Motion.* Ask them what they think the book is about. List predictions on the whiteboard.

1. What is physics? Can students think of how they use physics in their lives? (For example: Winding up to pitch at a Little League game, pirouetting during ballet class, stirring together ingredients to make cookies, or launching a basketball at the hoop during recess.)
2. What are some careers where knowing about physics is useful? (For example: engineers, truck drivers, chemists, airplane pilots.)
3. What is friction? Can students think of examples of high friction (brakes on a bike, eraser on paper) and low friction (air hockey, sledding)?
4. Forces are invisible pushes and pulls. We can't see them, but we can see what they do. Ask students to look around the classroom. What forces are at work? How can they tell?
5. What do students know about gravity? Have they seen movies or TV shows where characters are in zero gravity? How do characters move differently in zero gravity as opposed to gravity on Earth?
6. What's the difference between a force and the thing that exerts the force?
7. How does the Lab-Vac work? Can students describe how other cleaning tools work in physics terms?



Hands-On Science
MOTION
Activity Kit

Activity: Playground Science

Explore a playground together and think about how physics comes into play when kids play!

Procedure

1. Take students to a nearby playground and ask them: What do you see when the playground is at rest? Can you predict how the equipment will move when it's not being used? How do you know?
2. Closely investigate one piece of playground equipment, such as a swing or a slide. Ask students to identify the forces that they use when playing on this equipment. Do they push or pull? Do they act on the equipment, or does the equipment act on them? What roles do gravity and friction play in using this equipment?
3. Ask students to imagine that this playground is now in a space station with zero gravity. Would they still be able to play on the equipment? Why or why not?
4. Ask students to imagine that this playground is back on Earth, but everything is now made of ice, with very little friction. Would they still be able to play on the equipment? Why or why not?
5. Release students to play for fifteen minutes on the playground, then call them back inside and have them share observations in small groups: What kinds of force did they use to play?
6. **Optional homework extension:** Ask students to invent a piece of playground equipment. Each student should draw their equipment and write three sentences explaining how it is used.
7. **Optional class project extension:** After the homework project above, invite students to use a variety of craft materials to construct a model of their playground equipment. Assemble the finished models in a "playground of the imagination" and ask each student to explain to the class how their invention works.

Hands-On Science

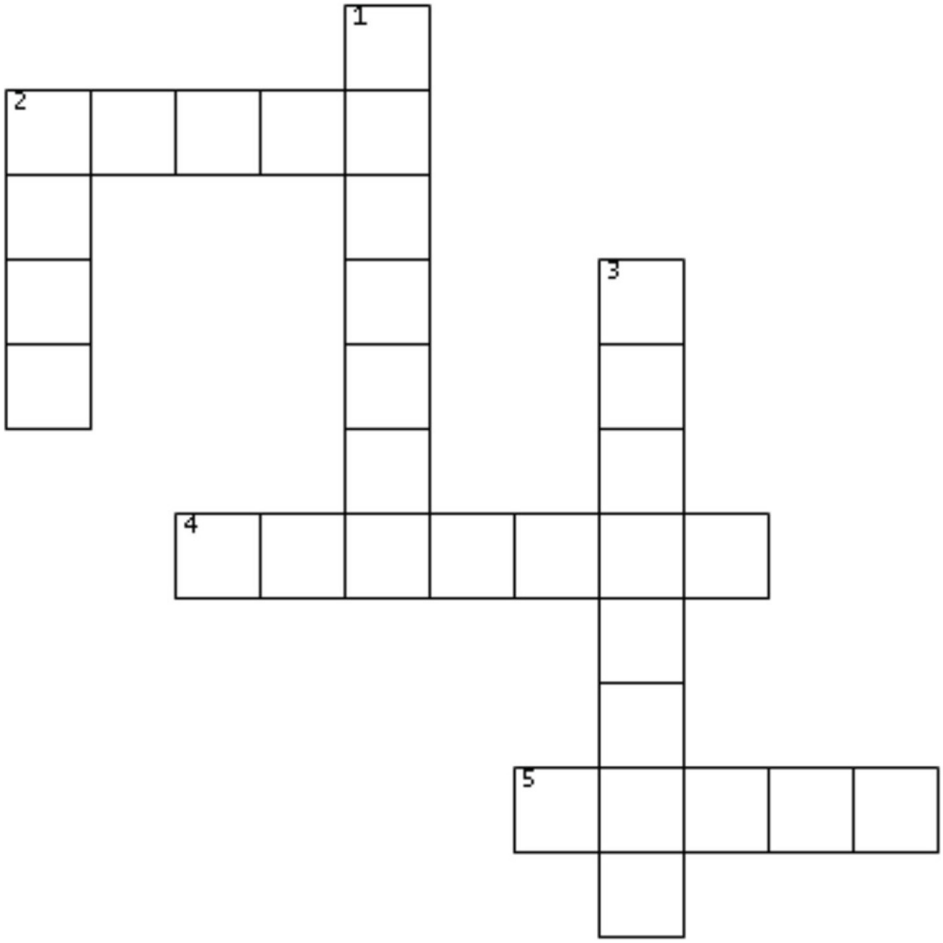
MOTION

Activity Kit

Crossword

Name: _____

Date: _____



Across

2. A common liquid which, when moving, can exert force on an object
4. The study of motion and forces
5. A push or pull that can change the motion or shape of an object

Down

1. A force that pulls objects toward Earth
2. Moving air that can exert force on an object
3. A force that happens when objects rub against each other