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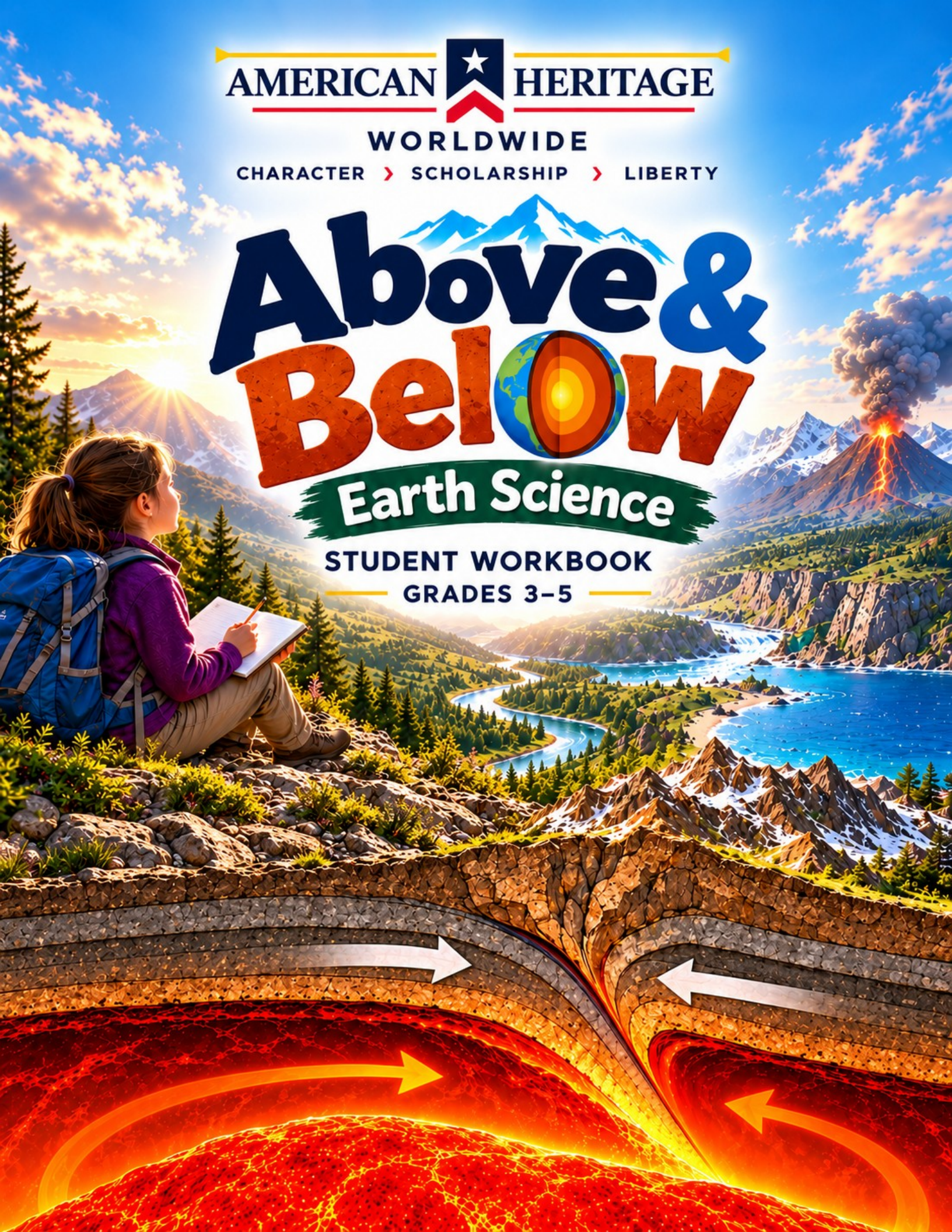
# Above & Below

## Earth Science

STUDENT WORKBOOK

GRADES 3–5



# Above & Below

AHS Worldwide · Earth Science · Unit 1 Project · Upper Elementary

| Name: | | Date: | |
|---|---|---|---|

## Your Challenge

Build the Earth twice. First below the ground: a play dough Earth you cut open. Then above it: two cloth plates crashing together to raise a mountain range.

| Two uploads — that is all | The one big idea |
|---|---|
| • STEP 4 — one photo of your Earth, cut open, all four flags standing.<br>• STEP 8 — one video, 2 to 3 minutes, both models in the shot.<br>*Everything else stays in this packet.* | The mantle inside the Earth moves, and it never stops. The crust on top is cracked into plates that ride on it. That is why the ground can crash together and build mountains. |

**THE ONE BIG TRAP:** Wrap, do not stack. Every layer goes all the way around the one before it, like a coat, instead of sitting on top like a hat. Stack them and your cut in Step 4 will show no rings at all.

## How to Use This Packet

Every page in here goes with one step in your project instructions. Keep both open side by side.

- Do one step a day. Each step uses what you built the day before.
- Write in pencil. You are guessing on purpose in Step 1.

## How the Eight Steps Fit Together

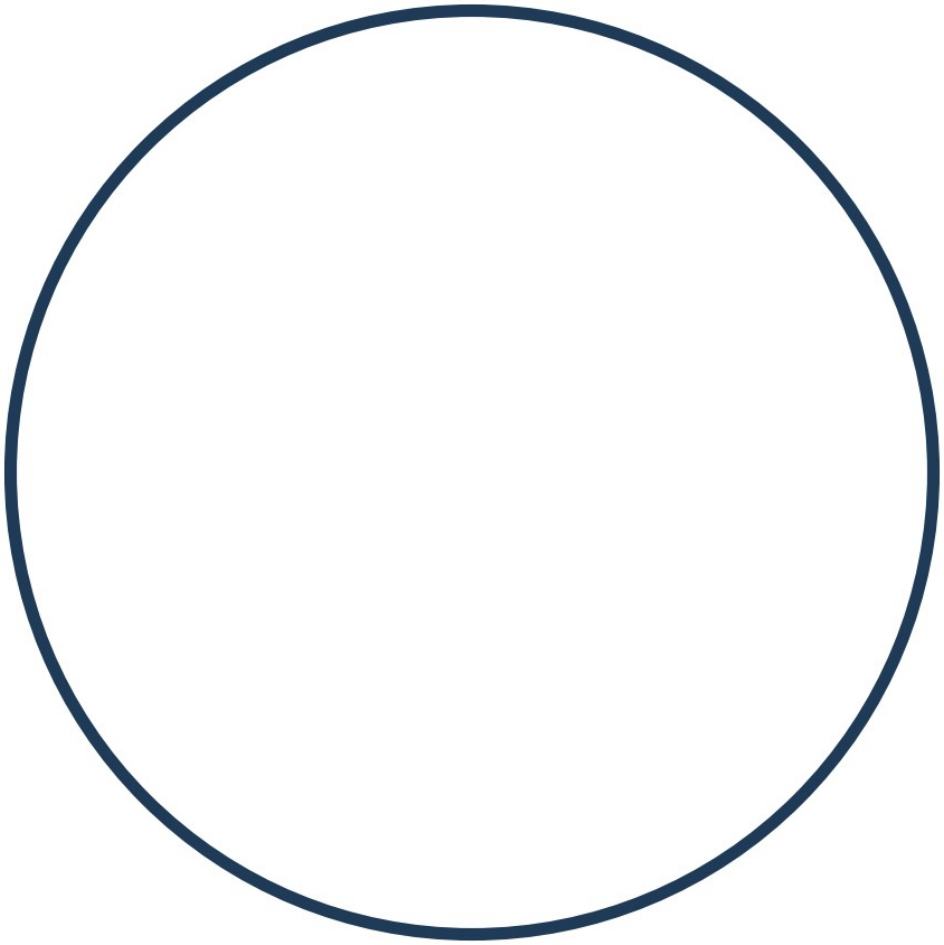
| Part | Steps | What you do |
|---|---|---|
| **Below the crust** | 1–4 | Guess, build the four layers, cut it open. |
| **Above the crust** | 5–7 | Meet your plate, design a model, test it twice. |
| **Explain** | 8 | Explain both models on video. |

BELOW THE CRUST · STEP 1

# Guess What Is Inside

One step a day

**GUESS BEFORE YOU READ:** Do not look anything up, and do not turn this page yet. Draw what you think is inside the Earth. Draw every layer you think is there, and write a label on each one. Being wrong here costs you nothing. Guessing nothing costs you the whole point.



*This is the Earth, cut in half. Draw your layers inside it, and label each one.*

| My Guess, in Words | |
|---|---|
| **How many layers did you draw?** | |
| **Which one do you think is the hottest?** | |
| **Which one do you think is the thickest?** | |

# Now Read This

One step a day

## The Four Layers, From the Middle Out

1. INNER CORE — solid metal, and the hottest place on Earth. Almost as hot as the surface of the Sun.
2. OUTER CORE — liquid metal, moving all the time.
3. MANTLE — thick rock that moves very slowly. This layer is most of the Earth.
4. CRUST — the hard, thin layer you live on. It is by far the thinnest of the four.

## Now Go Back and Compare

| | |
|---|---|
| **One thing my guess got right:** | |
| **One thing I did not expect:** | |

**MY DOUGH PLAN:** Fill this in before you build.

| | |
|---|---|
| **Which layer do you think will need the MOST dough?** | |
| **Which layer will need the LEAST?** | |

## Think Deeper

Why would a scientist write down a guess they expect to be wrong?

BELOW THE CRUST · STEP 2

# Build the Core and the Mantle

One step a day

## Build Log

- ☐ Inner core rolled into a ball.
- ☐ Outer core wrapped all the way around it, with no gaps.
- ☐ Mantle wrapped around both cores, and it is the thickest layer so far.
- ☐ Rolled smooth. No inner colors peeking through.

**WRAP, DO NOT STACK:** Each layer has to go all the way around the one before it, like a coat — not sit on top of it like a hat. If you can still see the layer underneath, keep wrapping.

## The Dough Report

| | |
|---|---|
| **Which layer used the most dough?** | |

Did that match your plan on page 3?

☐ **YES** ☐ **NO**

| | |
|---|---|
| **If it did not match, what surprised you?** | |

## Think Deeper

The mantle is the thickest layer by far. Why does that matter for what happens up on the surface, where you live?

BELOW THE CRUST · STEP 3

# Add the Crust, as Thin as You Can

One step a day

## Build Log — tick each one when it is true

- ☐ Fourth color flattened as thin as I could get it, then thinner.
- ☐ Wrapped around the whole ball, with no bare spots.
- ☐ Ball put somewhere safe. Not cut open yet.

**THE APPLE CHECK:** The real crust is thinner than the skin on an apple. Yours is going to come out about ten times too thick, and there is nothing you can do about it — dough will not go that thin. You lose no points for that. You do have to know it.

Compared to the real Earth, my crust came out

☐ **TOO THICK** ☐ **TOO THIN** ☐ **JUST RIGHT**

## Write It Down

Why could you not make the crust thin enough?

## Think Deeper

If your model gets the crust wrong on purpose, is it still a good model? Why?

BELOW THE CRUST · STEP 4

# Cut It Open

One step a day

| Before the Floss Goes In | |
|---|---|
| **Go back to your drawing on page 2. Circle the one layer you are surest you got right. Then write it here. I am surest about:** | |

**Flag Check — one toothpick flag per layer**

☐ INNER CORE ☐ OUTER CORE ☐ MANTLE ☐ CRUST

| After the Cut | |
|---|---|
| **One thing my guess got right:** | |
| **One thing that surprised me:** | |
| **The layer that is bigger than I thought:** | |

**THIS IS YOUR FIRST UPLOAD**

Photograph the cut side with all four flags standing in it, and upload the photo. If a flag has fallen over, stand it back up first — we have to be able to read all four.

**Think Deeper**

Your guess and your model are both pictures of something nobody has ever seen. So how do scientists know what is really down there?

# Label What Is Happening Above

One step a day

## Six Things to Know About Your Plate

- Your plate is the INDIAN PLATE. It is a piece of crust, riding on the mantle.
- It is moving north, straight into the EURASIAN PLATE.
- It moves about 5 cm a year — roughly the length of your thumb.
- It has been crashing into Eurasia for about 50 million years.
- That crash built the Himalayas, including Mount Everest.
- Those mountains are still getting taller, because the crash never stopped.

## Do These Five, in This Order

1. Read the six facts about your plate, up above.
2. On the picture on the next page, write INDIAN PLATE in the left box and EURASIAN PLATE in the right box.
3. Write HIMALAYAS in the box pointing at the peaks. Mount Everest is in there.
4. Draw one arrow on each plate, in the direction it is moving.
5. Add labels for MANTLE and CRUST in their correct box.

*Coloring is not required. The picture is outlined, so color it in if you want to — labels and arrows first, color after.*

## Two Questions About the Picture on Page 8

| | |
|---|---|
| **What is the hot layer underneath doing to the two plates?** | |

Two plates pushing together make a

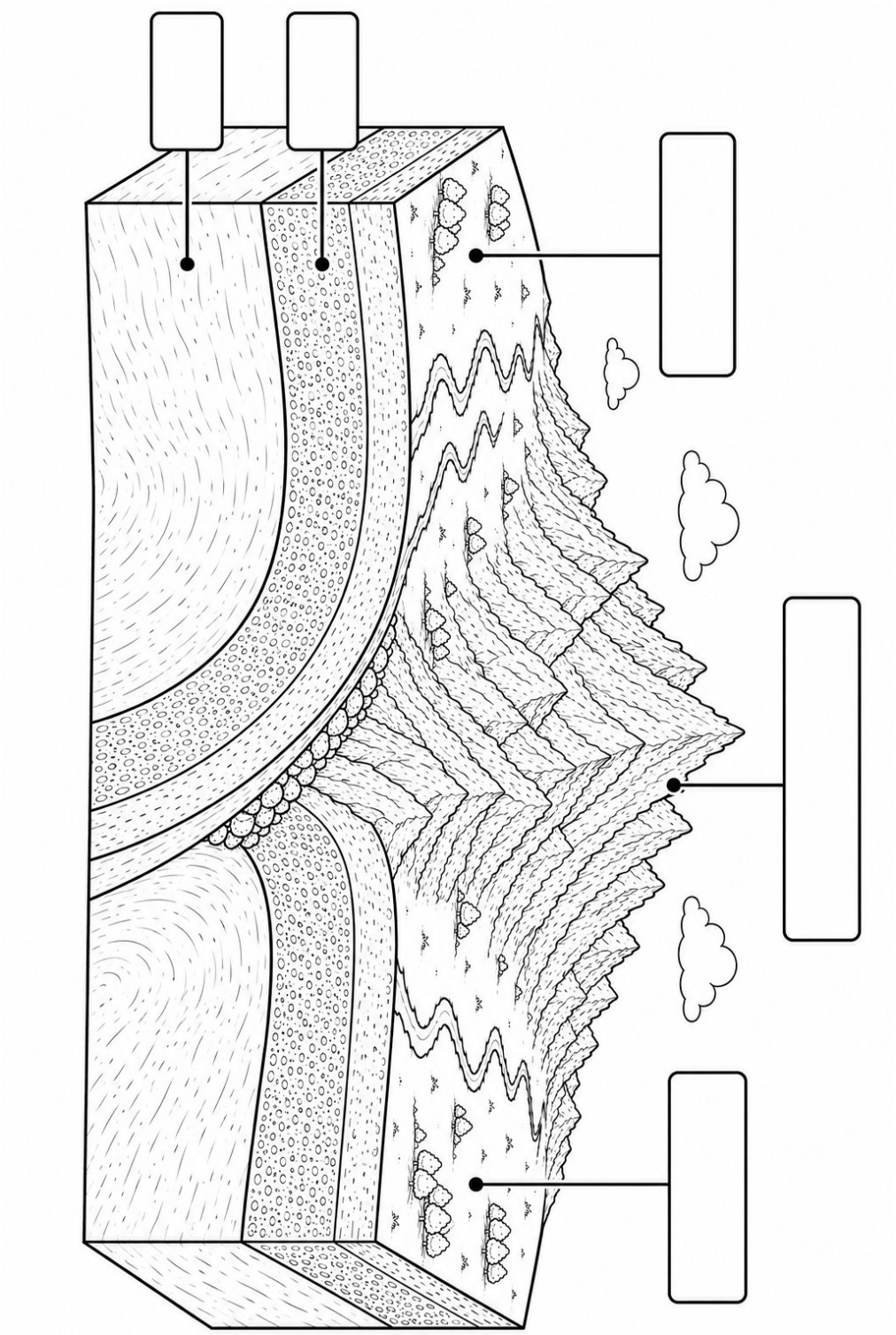
☐ **CONVERGENT** ☐ **DIVERGENT** ☐ **TRANSFORM**

## Think Deeper

Nothing pushes the plates from the side. So what is moving them?

# What It Looks Like Above the Crust





*Turn this page sideways. Label the boxes, then draw one arrow on each plate to show which way it is moving. Coloring is optional.*

ABOVE THE CRUST · STEP 6

# Design Your Mountain Model

One step a day

## Pick Your Plates — tick the two you will try

☐ Two bath towels ☐ Two hand cloths ☐ Two dish towels

| | |
|---|---|
| **Something else:** | |

*My plan, drawn from the side. Sketch what sits on the table, and draw an arrow where each hand pushes.*

**MY PREDICTION:** Fill this in before you push.

| | |
|---|---|
| **What will happen where the two plates meet?** | |
| **How tall will my mountain get?** | |
| **What will I measure it with?** | |

## Ready to Test

☐ Everything is set up on the table, and I have not pushed anything yet.

## Think Deeper

Why do scientists write down what they expect before they run a test?

# Test Your Model

One step a day

**SLOW AND EVEN:** Push fast and the plates just slide over each other. Push both plates slowly, at the same speed, and the material folds upward — which is what the real rock does. Measure with your ruler both times.

| Test 1 | | Test 2 — New Material | |
|---|---|---|---|
| **Material:** | | **Material:** | |
| **How tall it got:** | | **How tall it got:** | |
| **What happened where they met:** | | **What was different this time:** | |

| What the Two Tests Show | |
|---|---|
| **Which material built the taller mountain, and why do you think it won?** | |
| **One way my model matches the picture on page 8:** | |
| **One way it does not match:** | |

## Think Deeper

Real mountains take millions of years to rise. Your model takes four seconds. What does that change about what your model can prove?

EXPLAIN · STEP 8

# Explain Both Models on Video

One step a day

## All Three in the Shot — tick each one

- ☐ My cut-open Earth, with the layers showing
- ☐ My labeled picture from page 8
- ☐ My mountain model, pushed up

## Say All Six of These on Camera

1. Set all three where the camera can see them: the cut-open Earth, the picture, and the mountain model.
2. Name the four layers, from the middle out, pointing at each one.
3. Say what the mantle is doing, and what it carries on top of it.
4. Name your two plates, show which way each one is moving, and say what type of plate it is.
5. Show your mountain model, and say what a mountain is made of.
6. Say one thing your models get wrong on purpose.

**THIS IS THE ONLY UPLOAD**

Two to three minutes. Hold the camera still, talk like you are teaching somebody who has never heard of a plate, and watch it back once before you send it.

## Think Deeper

If you had to teach this to a younger child using only one of your two models, which one would you pick, and what would they miss?