AMERICAN HERITAGE

WORLDWIDE

CHARACTER › SCHOLARSHIP › LIBERTY

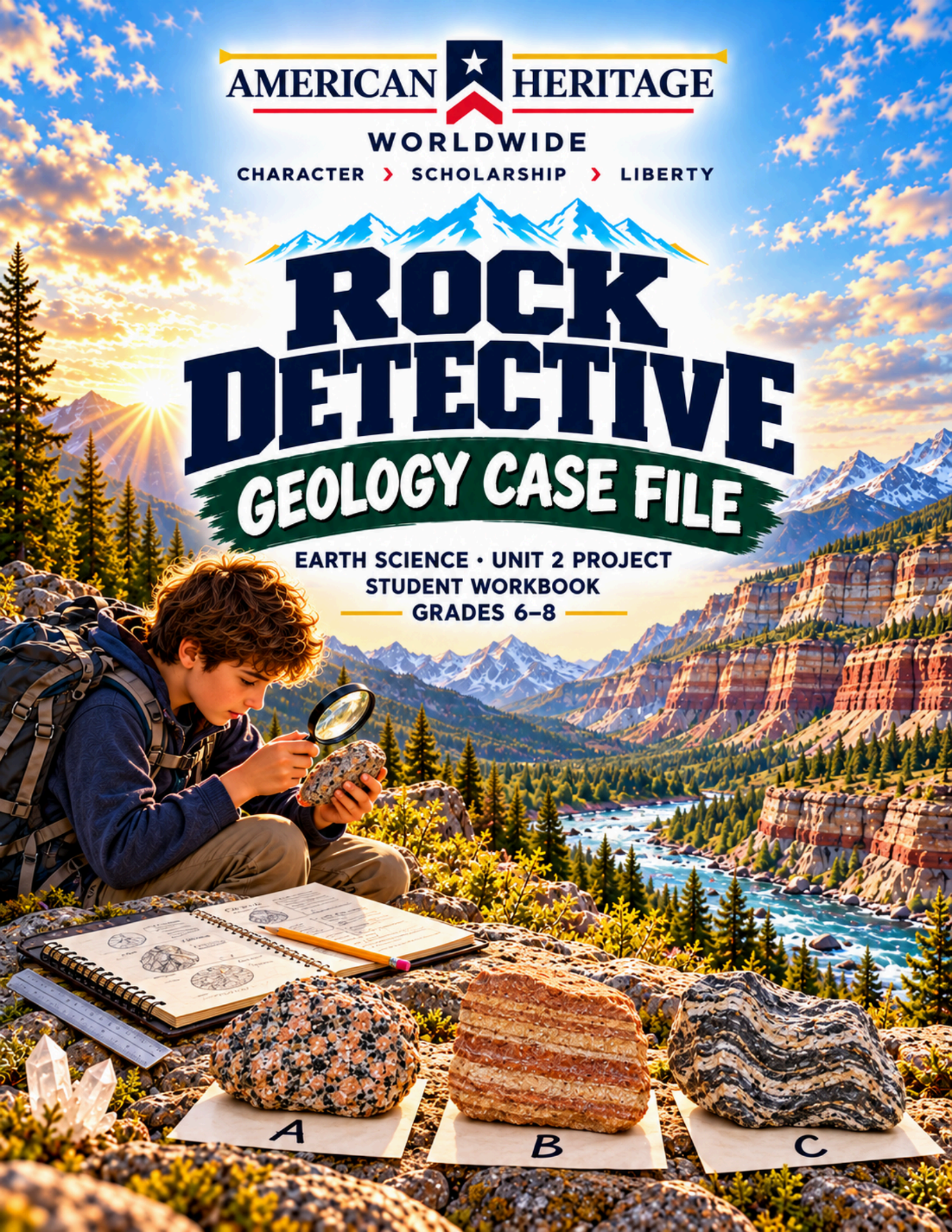
ROCK DETECTIVE

GEOLOGY CASE FILE

EARTH SCIENCE • UNIT 2 PROJECT

STUDENT WORKBOOK

GRADES 6–8



Rock Detective: Field Geologist Case File

AHS Worldwide · Earth Science · Unit 2 Project · Grades 6–8

Name:		Date:	

Your Challenge

Collect three rocks near home and work each one like a field geologist: identify its minerals' properties, classify its family and subtype, forecast how it will weather, and read its history from the evidence.

Two uploads	The one big idea
• DAY 4 — pages 1–5 and one photo of your labeled carton. • DAY 8 — this whole packet and one 2- to 3-minute "Case Closed" video.	Every rock is a record of the processes that formed it. Its minerals, texture, and shape are evidence you can use to classify it, explain its past, and predict its future.

THE ONE BIG TRAP: Do not name a rock by its color. One mineral can come in many colors, and very different rocks can look alike. Streak, hardness, luster, cleavage, and texture are better evidence.

How a Field Geologist Works

Habit	What it looks like in this packet
Claim + evidence	"Rock __ is ___ because ___ and ___. It is *not* ___ because ___." Two pieces of evidence, and one possibility ruled out.
Exact vocabulary	Use the science words: streak, cleavage, intrusive, lithification, metamorphism, oxidation.
Predict from data	Use your test results to forecast what will happen next — not just describe what you see.
The carton is your case board	Every day, add new data to each rock's label until it becomes a full ID card. *Example: "B — Old Stripey — gray streak — H 3 to 5½ — dull — no cleavage — fizz — SEDIMENTARY, biological (limestone)"*
One star suspect	On Day 5 you pick one rock and trace its past, present, and possible futures.

Your Field Kit

☐ 3 rocks from your yard, a park, or a driveway	☐ A steel nail
☐ An egg carton or a paper plate	☐ The back of a tile, or the rough bottom of a mug
☐ Tape and a marker	☐ A few drops of white vinegar
☐ A coin	☐ A pencil *(a magnifying glass helps)*

One page a day, 10–15 minutes. Days 1–4: Identify. Days 5–7: Trace the history. Day 8: Read the cliff and close the case.

IDENTIFY · DAY 1

Meet Your Suspects: The Five-Rule Test

Lesson 9 · 10–15 min

FIELD RULES: Look in your yard, a park, or a driveway. Ask a grown-up before you take a rock — some parks have a no-collecting rule. Collect real rocks, not brick, concrete, or asphalt. Choose three that look different.

Rock A	Rock B	Rock C
Nickname:	**Nickname:**	**Nickname:**

Sketch each suspect: shape, grains, crystals, layers, holes, or stains.

To Be a Mineral, It Must Pass All Five Rules

A mineral is **(1) naturally occurring**, **(2) solid**, **(3) inorganic** — not made by living things, **(4) has a definite chemical composition**, and **(5) has an ordered crystal structure** — its atoms repeat in a pattern. A ROCK is a natural solid made of one or more minerals (and sometimes glass or organic matter). A mix of minerals has no single chemical formula, so it is a rock.

Rule — circle what you can tell	Rock A	Rock B	Rock C
1. Naturally occurring	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL
2. Solid	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL
3. Inorganic (no shells, plant bits)	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL
4. One definite chemistry (looks like one material)	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL
5. Ordered crystal structure	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL	YES · NO · CAN'T TELL
My decision — tick one	☐ MINERAL ☐ ROCK	☐ MINERAL ☐ ROCK	☐ MINERAL ☐ ROCK

Push Further: Which rule can you *not* fully test at home, and why?	

CARTON CLUE: Label cups A, B, and C. Write each rock's letter and nickname on its label.

IDENTIFY · DAY 2

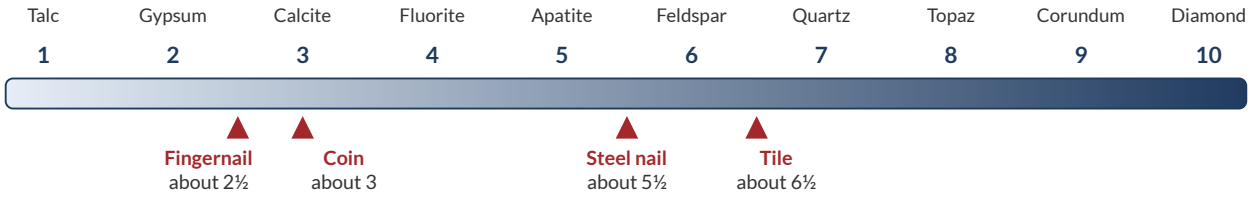
Four-Property ID

Lesson 9 · 10–15 min

Run Four Tests

1. STREAK — Rub a corner hard across the rough back of the tile. Record the powder's color. No powder and the tile is scratched? Write "none" — the rock is harder than the tile.
2. LUSTER — How light reflects: METALLIC (like a spoon), GLASSY (like glass), PEARLY (soft shine, like the inside of a shell), or DULL (no shine, like chalk).
3. CLEAVAGE or FRACTURE — Look at a broken edge or at single grains with a magnifier. CLEAVAGE: breaks along flat, shiny planes. FRACTURE: breaks unevenly or in curves.
4. HARDNESS — Try fingernail, then coin, then nail. Record the first tool that leaves a groove that does not rub away. Scratch away from your fingers, with a grown-up nearby.

Mohs Hardness Scale — 1 is softest, 10 is hardest



Property	Rock A	Rock B	Rock C
Streak color			
Luster — circle	METALLIC · GLASSY PEARLY · DULL	METALLIC · GLASSY PEARLY · DULL	METALLIC · GLASSY PEARLY · DULL
Breaks by — circle	CLEAVAGE · FRACTURE	CLEAVAGE · FRACTURE	CLEAVAGE · FRACTURE
First tool to scratch it — circle	NAIL · COIN FINGERNAIL · NONE	NAIL · COIN FINGERNAIL · NONE	NAIL · COIN FINGERNAIL · NONE
Mohs range	between ___ and ___	between ___ and ___	between ___ and ___

Range example: the coin could not scratch it, but the nail could → between 3 and 5½. Tool values are approximate.

Push Further: Which test was least reliable, and why?	

CARTON CLUE: Add streak, hardness range, luster, and cleavage to each label.

IDENTIFY · DAY 3

Read an Igneous Rock Two Ways

Lesson 10 · 10–15 min

Clue 1 — Texture tells WHERE it cooled	Clue 2 — Composition tells WHAT it is made of
INTRUSIVE — magma cooled slowly underground. Crystals had time to grow: **large, visible, interlocking crystals.** **EXTRUSIVE** — lava cooled quickly at the surface: **tiny crystals**, **glassy** (no crystals), or **holes** from gas bubbles.	**FELSIC** — rich in silica, with lots of quartz and feldspar. Usually **light-colored** and **lighter** for its size. **MAFIC** — rich in magnesium and iron. Usually **dark-colored** and **heavier** for its size. *Rocks in between are called intermediate.*

THE TRICKSTER: Obsidian (volcanic glass) is usually black, but it is felsic. Color is only a clue to composition, so check weight for its size too, and treat your answer as a best estimate.



Write the letter of each igneous suspect in its box.

Not igneous?

Write the letters of any suspects with no igneous clues here. You will classify them tomorrow.

Evidence check

For one igneous suspect: I placed Rock ___ in its box because its texture shows _____ and its composition clue is _____.

CARTON CLUE: For igneous suspects, add "intrusive" or "extrusive" and "felsic" or "mafic." For the others, add "not igneous."

IDENTIFY · DAY 4

Family, Subtype, and Evidence

Lessons 11–12 · 10–15 min

Sedimentary Subtypes — formed by lithification	**Metamorphic Subtypes** — formed by metamorphism
CLASTIC — broken pieces of other rocks, compacted and cemented: sandstone, shale, conglomerate. **CHEMICAL** — minerals that crystallized out of water: rock salt, some limestone. **BIOLOGICAL** — remains of living things: fossil-rich limestone, coal. *Clues: layers, rounded grains, fossils, gritty feel.*	**FOLIATED** — flat minerals lined up in layers or bands. This happens when pressure is stronger in one direction: slate, schist, gneiss. **NON-FOLIATED** — no bands; often formed mainly by heat, or from rock made mostly of one mineral: marble, quartzite. **PARENT ROCKS:** shale → slate → schist → gneiss · granite → gneiss · limestone → marble · sandstone → quartzite

Igneous subtypes come from Day 3: intrusive or extrusive, felsic or mafic.

Rock	Rock __ is _____ (family, subtype) because _____ and _____. It is *not* _____ because _____.
A	
B	
C	

Metamorphic suspect? Also name its likely parent rock and say whether it is foliated or non-foliated.

CARTON CLUE: Add each rock's family and subtype to its label.

UPLOAD 1 — DAY 4
Photograph your carton from above with all three rocks and labels readable. Upload it with pages 1–5 of this packet.

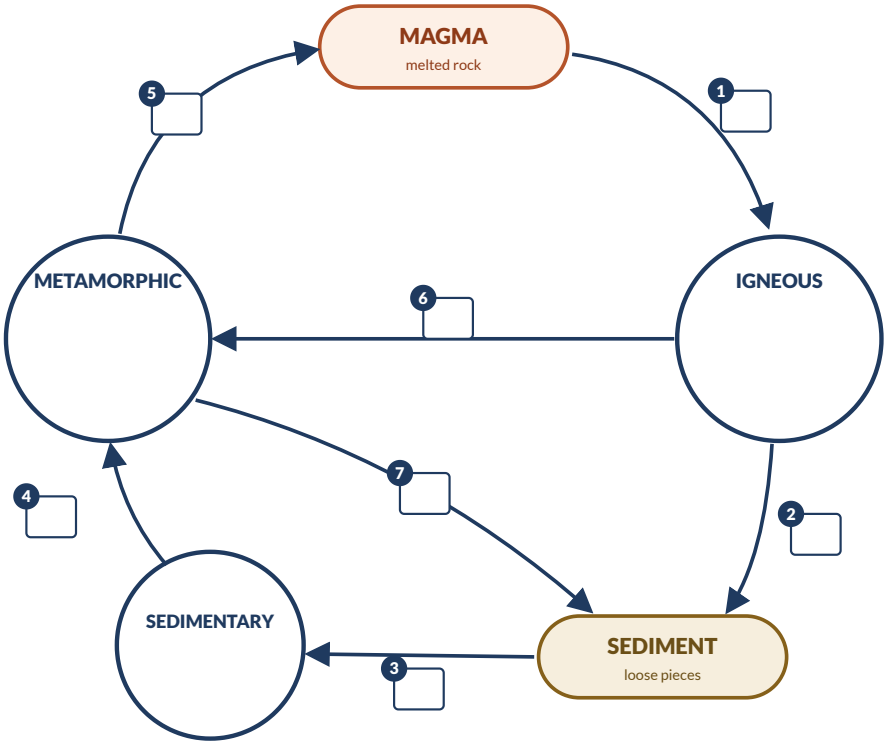
TRACE THE HISTORY · DAY 5

Rock Cycle Pathways

Lesson 13 · 10–15 min

Word Bank — write a letter in each numbered arrow box

A Weathering & erosion
B Deposition, then compaction & cementation (lithification)
C Heat & pressure (metamorphism)
D Melting
E Cooling & crystallization
Some letters are used more than once.



What powers it? — tick one per row	Earth's interior heat	Surface processes (Sun-driven water and wind, plus gravity)
A · Weathering & erosion	☐	☐
C · Heat & pressure	☐	☐
D · Melting	☐	☐

Star Suspect: Rock ___ (circle it in the diagram)	
Its past: it formed by…	
Future 1: if ___, it becomes…	
Future 2: if ___, it becomes…	

CARTON CLUE: Draw a star on your star suspect's label.

TRACE THE HISTORY · DAY 6

Weathering Forecast

Lesson 14 · 10–15 min

Mechanical weathering — same minerals, smaller pieces	Chemical weathering — the minerals change
FREEZE-THAW — water in a crack freezes, expands about 9%, and wedges the crack wider. **ROOT WEDGING** — growing roots pry cracks apart. **ABRASION** — rock grinds against rock in moving water, wind, or ice, rounding edges.	**OXIDATION** — iron in minerals reacts with oxygen and water, forming rust-colored iron oxides. **ACID DISSOLUTION** — rainwater absorbs carbon dioxide and becomes weakly acidic. It slowly dissolves calcite, the mineral in limestone and marble.

FIZZ TEST — ALL THREE ROCKS: Scratch a spot with the nail to make powder. Add ONE drop of vinegar and watch closely. Bubbles are carbon dioxide gas released as the acid reacts with calcite. A fizz means calcite is present; it does not by itself prove limestone. Wipe the rocks and wash your hands.

	Rock A	Rock B	Rock C
Fizzed?	YES · NO	YES · NO	YES · NO

Star Suspect: Name the Process	
Circle the process at work:	FREEZE-THAW · ROOT WEDGING · ABRASION · OXIDATION · ACID DISSOLUTION
My evidence:	

Forecast: Rank Your Suspects			
My local climate — tick two:	☐ Wet ☐ Dry | ☐ Freezes in winter ☐ Rarely freezes		
Fastest → slowest to weather:	1st: Rock ___	2nd: Rock ___	3rd: Rock ___
Why — use your hardness, fizz, and crack or layer data:			

CARTON CLUE: Add "fizz" or "no fizz" to every label, and the weathering process to your star suspect's.

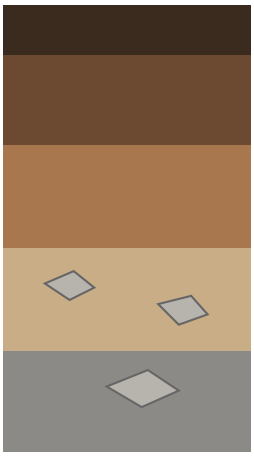
TRACE THE HISTORY · DAY 7

Erosion Evidence and the Soil Link

Lesson 15 · 10–15 min

Shape is evidence of the trip	Energy is evidence of the mover
ROUNDED edges — a long trip with lots of abrasion, usually tumbling in water. **ANGULAR** (sharp) edges — a short trip: fell by gravity, was broken nearby, or was moved by people. Glacial ice can carry rocks of every size and shape, often scratched.	**Faster flow carries bigger pieces.** A gentle stream moves sand and silt. Pebbles and cobbles need fast water, like a flood. **Wind** can carry dust and sand, but not a walnut-sized rock. **Deposition** happens when the mover slows down and drops its load.

Star Suspect: Prove the Mover	
Its edges are — circle:	ROUNDED · SOMEWHAT ROUNDED · ANGULAR
The mover — circle:	WATER · WIND · ICE · GRAVITY · PEOPLE
My evidence, including how fast the mover had to be:	



O leaves, decaying matter

A topsoil: humus + minerals

B subsoil: clay, minerals

C weathered parent material

R solid bedrock

SOIL RUB: Rub a pinch of soil from where you found your star suspect on white paper. Look for sand grains, smooth silt, sparkly flecks, and plant bits. Wash your hands after.

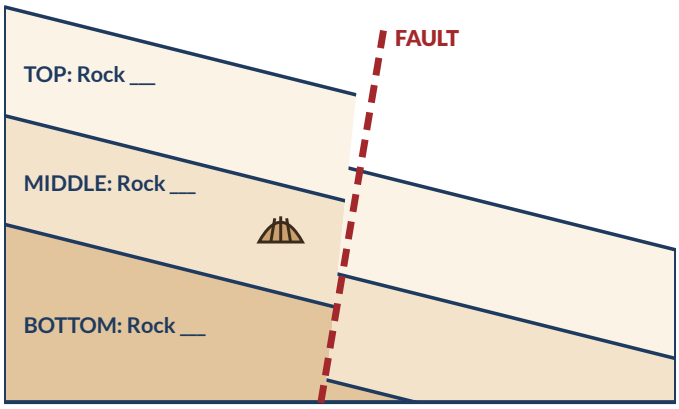
My pinch likely came from horizon — circle:	O · A · B
Soil is the "child" of its parent material because…	

Parent material is often the bedrock below, but it can also be sediment carried in by rivers, wind, or glaciers.

CARTON CLUE: Add the mover and edge shape to your star suspect's label.

Read the Cliff

Three Rules of Relative Dating	
SUPERPOSITION	In undisturbed layers, the oldest layer is at the bottom and the youngest is at the top.
ORIGINAL HORIZONTALITY	Sediment layers are first laid down flat. If layers are tilted or folded, that happened *after* they formed.
CROSS-CUTTING	A fault or vein that cuts through layers is younger than the layers it cuts.



A "what-if" cliff: write one of your rock letters in each layer. The shell is an index fossil.

#	Event	Rule
	The layers were tilted.	SUP · HOR · CROSS
	The middle layer was deposited.	SUP · HOR · CROSS
	The fault cut through the layers.	SUP · HOR · CROSS
	The bottom layer was deposited.	SUP · HOR · CROSS
	The top layer was deposited.	SUP · HOR · CROSS

Number the events 1 (oldest) to 5 (youngest), then circle the rule that tells you.

INDEX FOSSIL: An index fossil comes from a species that lived for a fairly short time but spread over a wide area. Finding the same index fossil in two places tells geologists those layers formed during the same time span.

Push Further — *optional*

These rules tell you the *order* of events, not how many years ago they happened. What would you need to put a real number of years on your oldest layer?

CLOSE THE CASE · DAY 8

Case Closed: Your Video

Lesson 16 · 2–3 min video

Video Note Card — fill it in, then present it on camera

1. **Each rock.** "Rock ____ is _____ (subtype) because _____ and _____." *— Say this for A, B, and C. Your carton labels have the evidence.*
2. **Star suspect's life story.** "It formed by _____ (process). It is weathering by _____ (specific process). _____ moved it here; I know because its edges are _____. Its next stop could be _____ *or* _____."
3. **The cliff.** "The oldest event was _____. I know because of the _____ rule."
4. **One limitation.** "One thing I could not prove is _____ because _____."

In the Shot — tick each one

- ☐ My carton with all three ID-card labels readable
- ☐ My rock-cycle pathways (page 6) and my cliff (page 9)
- ☐ I use at least three exact vocabulary words

UPLOAD 2 — DAY 8

Two to three minutes. Present like a geologist reporting to a team: claim, evidence, and what you could not prove. Watch it back once, then upload it with this whole packet.