Scales

Jacques Swartz

One way or another, all the events you can recall have an order to them. Or maybe it's more accurate to say: You can give order to your own history any way you like. You can think of the different grades you've been in at school. We all understand there's a difference between middle school and high school, and between kindergarten and first grade. Each of these years of school was different in both easy and hard-to-notice ways. It may be difficult to remember the difference between kindergarten and first grade, but you likely remember which grade you started having different teachers for different subjects.

School grades are one way of organizing history. In this case, time has been organized for you by teachers, so that a plan for education unfolds at the right pace. Someone had a certain progression in mind for you, and so every year your experiences at school changed in different ways.

But every person experiences each year differently. Maybe 3rd and 4th grade seem like a blur, but you can think of ways life was very different living in one town and then moving to live in another. Places you've lived are another way of organizing history. First, you were here; then you were there; now you're here.

Drawings you made, trophies you won, notes you passed with friends—all of these come from different parts of your history, and you can think about them based on how your history is organized.

"Oh, yeah. That's my Youth League soccer trophy. I was goalie on the Mustangs with Dana that summer. That was in Hoboken, from before we moved to Teaneck."

"I was pretty good at watercolors, for a second grader! We had Ms. Stephanie. I thought she was scary at first, but she told me I could be an artist one day if I paid attention to the way my colors mixed together."

Organizing history allows us to put memories in context, to understand more about something we remember, see, or find based on when in our history it happened. The ways we organize our own history are subjective and may change shape over time. But they allow us to step back from the moment-to-moment stream of things that happen to us and understand how we have come to change, gradually, from a greater perspective.

That's exactly what scientists are looking for when they develop ways of measuring natural history: a way to group many single elements together so that they tell a bigger story on a longer scale of time. And just as we might use grades in school on one occasion, and towns we live in on others, the geologic time scale works well for measuring natural history in some cases, but in others there may be better alternatives.

That being said, analyzing rock strata is one of the best opportunities out there for using a great historical organization scheme, for one simple reason—you can see it. The whole concept is based around the idea you can slice a rock in half—or, better yet, visit a massive exposed rock formation, like the ones at Monument Valley—and clearly see the different parts of your historical time scale. And they're color-coded—by nature!

The geologic time scale has got to be one of the simplest, most ingenious applications of chronography—the measurement of time—to natural science. All the ideas it's based on are amazingly, smack-yourself-in-the-head obvious to us today, and yet they have huge implications for the way we're able to tell how old something in the natural landscape really is—including living organisms, dinosaurs and whole continents.

For example: The idea that layers of rock laid on top of each other go from youngest to oldest as we burrow further down. It's so obvious that we barely even think about it, but without a clear understanding of gravity—and a great deal of observable rock—we could never have come to rely on this principle so solidly.

Another genius foundation for the geologic time scale, and one of the most useful, is the principle of lateral continuity, which says that layers of sediment extend in a consistent manner in all directions. This means if you find two rocks that have matching patterns of strata, but are separated by a river, we can safely assume they were once joined. In other words, just by comparing these beautiful color bars on the side of the rock, we know the river between them wasn't always there.

It's a great example of how ways of measuring history can tell us about so much more than just the objects they're measuring. By examining the composition of each layer of sediment, we come to know more about what the atmosphere and other climatic conditions were like at different times of the earth's history.

By looking at what fossils are present at which layers of sediment, we learn more about when, and in many cases how, certain species came to be extinct. The geologic time scale is what allows us to describe different eras leading up to, during, and after the time dinosaurs roamed the earth. The precise event that's believed to have caused their extinction—called the K-Pg event—is marked by a thin layer of sediment that contains iridium. Iridium is rare in the earth's crust but is commonly found as part of asteroids. The sedimentary layer marking the K-Pg event helped scientists figure out the most accepted theory of why dinosaurs became extinct. And they know this from looking at rocks that are readily available today, but hold information about the world millions of years ago. All because it's the same world!

Of course, not all rock is so fixed that we can observe its inner layers millions of years later, relatively untouched. Plate tectonics remind us of that. Shifting rock, and the shapes it makes result in the creation of new ocean floors, and we realize that oceans are defined so much more by the floor beneath them than by all the water they contain. That's a radical idea worth repeating for a moment: *Oceans are defined by the floor beneath them, not only by the water they contain*. When plates shift and new ground emerges, the dynamic of the waters around it changes too. Meanwhile, the earth's size remains constant, and as new oceans emerge, old ones are overtaken.

The ways we organize our own history can tell us a great deal about our lives and help us understand the progression of events in a much broader, more insightful way. But every characteristic that has meaning, whether it's the town we live in, the grade we're in, or the teachers and parents we have, will only continue to have meaning in the future. Opportunities open and close, in the wake of shifting plates. Forces far outside our view but fundamental to our lives are constantly in motion. Even the oceans we swim in come to be and disappear on an invisible schedule.

Name: _____ Date: _____

1. What does the geologic time scale measure?

A sizes of rocks
B personal history
C natural history
D family history

2. The author compares the natural history of the earth to the personal history of people. How are these two types of histories the same?

A They both last millions of years.
B They both are organized by personal memories people have.
C They both require the use of rock strata to be measured.
D They both can be organized and put into context.

3. The historical time scale is visible within the rocks. Which evidence from the passage supports this statement?

A Layers of sediment extend in a consistent manner in all directions.
B Oceans are defined not only by the water they contain but also by the floor beneath them.
C You can slice a rock in half and clearly see the different color-coded parts of the historical time scale.
D Rocks with matching patterns of strata that are separated by a river were most likely once joined.

4. What are the different color-coded strata of rocks?

A marks created by the shifts of plate tectonics
B different layers of sediment
C paint scientists put on rocks
D marks left on rocks from the pressure of other rocks

5. What is this passage mainly about?

A how people organize their memories about kindergarten
B the creation of new ocean floors
C the different strata of rocks
D how scientists measure natural history

6. Read the following sentences from the passage: "Shifting rock, and the shapes it makes result in the creation of new ocean floors, and we realize that oceans are defined so much more by the floor beneath them, than by all the water they contain. That's a radical idea worth repeating for a moment: *Oceans are defined by the floor beneath them, not only by the water they contain*.

Why does the author repeat the statement, "*Oceans are defined by the floor beneath them, not only by the water they contain*"?

A The author wants the reader to memorize the idea word-for-word.
B The author wants to emphasize an idea he believes is significant.
C The author wants to shock the reader with an idea he believes the reader has never heard before.
D The author wants to argue that the idea is false.

7. Choose the answer that best completes the sentence below.

The geologic time scale is a helpful tool of chronography _____ it provides an organization scheme for natural history.

A finally
B however
C because
D although

8. Why does the author argue that "analyzing rock strata is one of the best opportunities out there for using a great historical organization scheme"?

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9. What is the principle of lateral continuity?

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10. What information can be learned by examining different layers of sediment? Use evidence from the text to support your answer.

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Teacher Guide & Answers

Passage Reading Level: Lexile 1210

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- **B** personal history
- **C** **natural history**
- **D** family history

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- **C** They both require the use of rock strata to be measured.
- **D** **They both can be organized and put into context.**

3. The historical time scale is visible within the rocks. Which evidence from the passage supports this statement?

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- **B** Oceans are defined not only by the water they contain but also by the floor beneath them.
- **C** **You can slice a rock in half and clearly see the different color-coded parts of the historical time scale.**
- **D** Rocks with matching patterns of strata that are separated by a river were most likely once joined.

4. What are the different color-coded strata of rocks?

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- **B** **different layers of sediment**
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7. Choose the answer that best completes the sentence below.

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A finally
B however
C **because**
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8. Why does the author argue that "analyzing rock strata is one of the best opportunities out there for using a great historical organization scheme"?

Suggested answer: Students should explain that the author reasons that this organization scheme can be seen by people, as the whole concept is based around the idea that you can slice a rock in half or visit a massive exposed rock formation and clearly see the different parts of the historical time scale.

9. What is the principle of lateral continuity?

Suggested answer: The principle states that layers of sediment extend in a consistent manner in all directions.

10. What information can be learned by examining different layers of sediment? Use evidence from the text to support your answer.

Suggested answer: Answers may vary but students can state that by matching different strata of sediment in separated rocks, one can determine whether their source of separation, such as a river, was always there or not.

By examining the composition of each layer of sediment, scientists can learn what the atmosphere and other climatic conditions were like at different times of the earth's history. Furthermore, examining what fossils are present at which layers of sediment, scientists can learn more about when, and in many cases how, certain species came to be extinct. For example, iridium, which is found as part of asteroids, is found in a thin layer of sediment which marks the K-Pg event associated with the extinction of dinosaurs. Thus, this has helped scientists come up with a theory that explains why dinosaurs became extinct.

Students should also state that different layers of sediment indicate different historical time periods.