

#308

EARTHQUAKES AND DINOSAURS

So, what's the connection?

About 220 million years ago, many, many earthquakes happened in what is now Connecticut. With each earthquake, a long, narrow piece of land dropped downward again and again forming a valley. The valley provided dinosaurs with food and water -- and a place to live. Rivers flowed into the valley, and created muddy lakes with wide muddy shorelines. Fresh spring water issued from cracks along the sides of the valley. The climate was warm and alternately wet and dry. During the wet times plants grew abundantly and dinosaurs moved in to eat and drink fresh spring water. Today in rock layers that once were the muddy lake shore, we find many, many dinosaur tracks.

Q: Why did the land drop down each time there was an earthquake?

Clue: Look at the big cracks along the sides of the valley in Diagram #1. What was happening to the land? Now look at the white arrows on Diagram #2. What was happening to Africa and the North American continent where Connecticut was located?

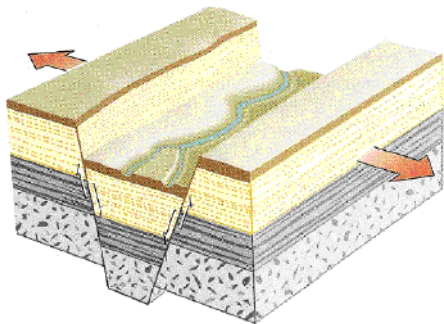


DIAGRAM #1 Shows the land being pulled apart so that big cracks form and a large piece drops downward, slowly forming a valley. Earthquakes happen each time the land moves along the crack.
Reference: F. Press and R. Siever, UNDERSTANDING EARTH: Freeman & Co, NY, 1998, Fig 10.26, p. 258

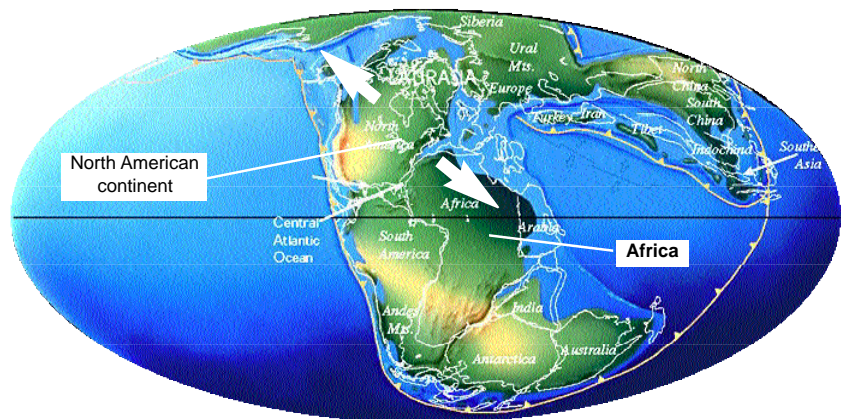


DIAGRAM #2 Shows the location of the continents 195 million years ago. The white arrows show that Africa and North America were being pulled apart.
Reference: Christopher Scotese, THE PALEOMAP PROJECT, www.scotese.com

Q: How did the alternately wet and dry climate help to preserve the dinosaur tracks?

Clue: What happens to mud when it dries out?

ANSWER SHEET

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MYSTERY SAMPLE:

— A sample of a Jurassic or Triassic dinosaur track NOTE: See Geologic Time Scale, Resource 2 in your Notebook

OBJECTIVES:

- To introduce the concept of rifting as continents are pulled apart
- To see how continents can break into pieces along big cracks, and that the pieces can move against each other. When this happens, geologists call the big cracks, 'faults'.
- To understand that valleys can form when pieces of continent drop downward
- To understand the relationship between earthquakes and continental pieces moving downward to form a valley.
- To practice locating continents as they were 195 million years ago
- To understand the effect of climate to preserve fossil footprints

ANSWERS:

- The land dropped down because it was being pulled apart in the directions of the red arrows in Diagram #1.
- During the wet times the dinosaurs left their tracks in mud, which turned into a very hard layer during the dry times. When the season turned wet again the hardened layer was buried and the tracks were preserved under more mud.

TEACHING TECHNIQUES FOR THE "STAFF MEETING":

This mystery introduces several startling Earth Science concepts: 1) 200 million years ago, there was no Atlantic Ocean; 2) huge forces slowly moved the North American continent and Africa apart and the Atlantic Ocean began to open; 3) while this was happening, dinosaurs roamed about in what is now central Connecticut; and, 4) the dinosaurs left their tracks in valleys that were pieces of the continent that dropped slowly downward as the continent was stretched.

You might want to teach these concepts in several short stages. First, divide your class into small groups each with a modern globe of the Earth, and a copy of the first page of the mystery. Have each group locate North America and Africa on both the globe and Diagram #2 of the Mystery Question Sheet. Ask the groups to look at Diagram #2 and tell what they think will happen to Africa. Prompt for the notion that in the last 200 million years the whole continent of Africa has moved East as the Atlantic Ocean opened.

Next have your groups look at the white arrows on Diagram #2 and explain what they think the arrows mean. Prompt for the notion that the arrows indicate the direction that the North American continent was being stretched. In the past 50 years or so, geologists have learned that a large area of a continent can be stretched!

To understand why we find dinosaur tracks in Connecticut, have the groups look at the red arrows on Diagram #1 and see if they can explain how the valley formed. When a large area is stretched, it can tend to break into pieces like the ones shown in Diagram #1. This process

created the valleys where the dinosaurs roamed. Note for your group that most earthquakes were small and the valleys formed very slowly over about 40 million years. Dr Jelle de Boer, a geologist in Connecticut suggests that the valleys dropped downward about 6 inches (or 15 centimeters) every 1000 years.

Dinosaurs would have enjoyed the warm climate in Connecticut 200 million years ago. Have each group compare the latitude (lines around the globe that parallel the equator) of modern Connecticut with its location in the Jurassic Geologic Period. They will find that the dinos lived in a climate like that in Florida today. So 200 million years ago, Connecticut was located at about 25° north latitude (or 25° north of the equator). Today central Connecticut is located at about 40° north of the equator; too cold for dinosaurs!

Finally, to understand how the climate helped to preserve the dino tracks, ask the whole class how they think a foot print in the mud might be preserved until next year.

For further study:

de Boer, Jelle Zeilinga, 2009. *Stories in Stone, How Geology Influenced Connecticut History and Culture*: Wesleyan University Press, Middletown, CT.

McDonald, Nicholas, in press. *Window into the Jurassic World*

Skehan, James W., 2008. *Roadside Geology of Connecticut and Rhode Island*: Mountain Press, Missoula MT.

For educators with a background in Earth Science:

Krynine, Paul D., 1950. *Petrology, Stratigraphy and Origin of the Triassic Sedimentary Rocks of Connecticut*: Connecticut Geological and Natural History Survey, Bulletin 73, Hartford, CT

-- Many of the ideas for this Rock Detective Mystery were inspired by the careful and thorough discussions in this publication.

Olsen, P.E., Whiteside, J.E., LeTourneau, P., and Huber, P., 2005. *Jurassic Cyclostratigraphy and Paleontology of the Hartford Basin*: in, *Guidebook for Field Trips in Connecticut*, 97th Annual Meeting of the New England Intercollegiate Geological Conference. State Geological and Natural History Survey of Connecticut, Dept. of Environmental Protection Guidebook Number 8