TEXT - Zircon discovery offers clues to Earth's formation

Integrated Science

# A. Preview the text: title/sub-title, source, date, hook; relate to self/own knowledge

# B. Closely Read, marking up as follows:

*• Circle and then define/find synonyms for new vocabulary*

*• Underline sources of information: experts, affiliations, publications*

*• Highlight the reasons for the* ***excitement about****, and the* ***confidence in****, this particular find; paraphrase in the left margin*

A zircon crystal embedded in sandstone found on a sheep ranch in Australia is the oldest piece of the Earth’s crust to be discovered, shedding new light on our planet’s formation. The zircon, described in the journal Nature Geoscience, is about 4.4 billion years old and much smaller than a single grain of rice. But the tiny crystal carries an outsize significance: It is evidence that by that point in its history, Earth had gone from a superheated ball of molten rock to a congealed surface eventually capable of supporting life.

“One of the main goals of the space program is to understand if there’s life elsewhere in the universe,” said John Valley, a University of Wisconsin professor who led the study, collaborating with scientists in Australia, Canada and Puerto Rico. By studying how the conditions of life came together on our planet, scientists believe we will learn what to look for on other planets. But the earliest rocks and first evidences of life have been subject to dispute over the years. Some scientists, for example, maintain that the earliest evidence of life is about 3.8 billion years old and found in Isua, Greenland. Skeptics, however, note that no fossils were found in the Greenland rock. They point instead to 3.5 billion-year-old evidence of life found in rocks in Pilbara, Australia. That’s no small difference — 300 million years.

The age of the zircon described by the Valley team, however, does not appear to be in dispute. The Valley team used a new technique called atom-probe tomography, which allowed them to confirm the accuracy of the crystal’s age. The new instrument, made in Wisconsin, is so sensitive that researchers were able to identify the atomic number and mass of each atom in the sample.

“I think they have shown unequivocally, beyond a shadow of a doubt, that this grain is that old,” said Samuel Bowring, an expert in the early history of the Earth and a geology professor at the Massachusetts Institute of Technology. Bowring was not involved in the new study. “It’s only one grain, mind you,” he added, “but it’s very significant.”

Jim Mattinson, a professor emeritus in the department of earth science at University of California, Santa Barbara, said zircons have been found previously that were about the same age as the one in the current paper, but the earlier discoveries were met with skepticism. “This paper drives a nail into that coffin (of doubt),” Mattinson said. “We’re really getting back as far as we can go in the Earth’s geologic records.”

Zircon crystals are composed mainly of the elements zirconium, silicon and oxygen. Small amounts of uranium also appear in zircon. The uranium decays at a set rate, forming lead. Because of these characteristics, scientists can use the lead and any remaining uranium in a zircon crystal to calculate the age.

Zircon is found embedded in younger rock. Valley found the zircon used for the current study in sandstone collected in the arid Jack Hills of western Australia, a region known to contain some of the oldest pieces of the planet’s crust. “The oldest rock in Australia was collected not far from where we were working,” Valley said.

Dating of the zircon helps clarify an early chapter in the Earth’s history. Scientists have theorized that one of the crucial early events occurred when an asteroid roughly the size of Mars struck a glancing blow to the Earth, vaporizing the mantle and crust. Dust from the collision merged to form the moon. The enormous energy from the collision transformed the surfaces of the Earth and moon into oceans of molten rock. Both subsequently cooled. Zircon was one of the minerals formed when the planet cooled.

Although minerals also were formed as far back in history, what makes zircon so valuable to geologists is its ability to endure. Zircon is a very hard mineral with stable chemistry able to survive extreme temperatures. “We like to say that zircons are forever,” Valley said. “They really persist in the rock record.”

Johnson, Mark. "Zircon Discovery Offers Clues to Earth's Formation." *Newsela*. 6 Mar. 2014. Web. 03 Feb. 2016.

**C. Assignment:** Answer the Juno multiple-choice follow-up titled *Zircon Text.*

**The age of this sample of zircon is not disputed because**

It is the first such sample

Its embedded in younger rock

It was determined using new sensitive instrumentation

It was collected in an area of western Australia, a region known to contain some of the oldest pieces of the planet’s crust.

**All of the following explain the value of zircon in understanding early Earth EXCEPT**

It is a very hard mineral

It is composed of silicon

Its stable chemistry allows it to withstand high temperatures

Zircon contains radioactive uranium

**The discovery of zircon crystal is significant because of the following reason:**

It will help scientists study the composition of various elements to recreate prehistoric Earth's condition in a lab.

It provides evidence on how the Earth's conditions changed and became capable of supporting life.

It helped scientists devise a new technique to confirm the age of Earth and various other fossils discovered so far.

It has provided the scientists with an opportunity to study the composition of zircon to recreate the collision that transformed the surface of the Earth.

**The article draws a connection between all the following EXCEPT:**

zircon crystal found and atom-probe tomography

zircon crystal found and conditions revealing Earth's formation

rocks found in Australia and the earliest evidence of life

rocks found in Greenland and evidence of life on other planets

**Read the sentence from the article.**

"This paper drives a nail into that coffin (of doubt)," Mattinson said.

**What figure of speech is used in the above sentence?**

alliteration

idiom

metaphor

Personification

**Which of the following sentences contains a word that means "a feeling of doubt"?**

But the earliest rocks and first evidences of life have been subject to dispute over the years.

Zircons have been found previously that were about the same age as the one in the current paper, but the earlier discoveries were met with skepticism.

Skeptics, however, note that no fossils were found in the Greenland rock.

It is evidence that by that point in its history, Earth had gone from a superheated ball of molten rock to a congealed surface eventually capable of supporting life.