One rock could complete the ultimate puzzle: how the solar system formed

By Washington Post, adapted by Newsela staff on 12.12.16
Word Count **885**

Cari Corrigan examines a meteorite in the NMNH clean room. Photo: Gillian Brockell for The Washington Post

Everything in the lab gleams. There is no smell and no sound but the soft whir of the machine that pumps nitrogen gas into the dozen or so glass storage tanks lining the walls. The pressure of the gas inflates the white rubber gloves attached to the tanks and makes them reach out like ghosts.

The National Museum of Natural History's support center in Suitland, Maryland, contains some of the rarest and most precious objects owned by the American people: 17,000 rocks. They represent the bulk of the nation's Antarctic meteorite collection, which is an assortment that includes pieces of other planets broken off from collisions, rubble older than anything on Earth and crystals possibly older than the sun.

The collection offers clues to some of the biggest mysteries of existence.

"Each meteorite is a piece of the bigger puzzle about how our solar system formed," said Cari Corrigan, the Smithsonian geologist who oversees the collection. "They can tell us where we came from."

Older Than Anything Else On Earth

The oldest rocks are chondrites, or meteorites that clumped together in the swirl of dust and gas that surrounded the sun when the planets began to form. Some include pale flecks called calcium aluminum inclusions that are thought to be the most primitive substances in the solar system. Some of their crystals may even be older than the sun.

At 4.5 billion years old, chondrites are as old as our planet and a lot older than anything else on it. Tectonic activity on Earth means that most material is churned back into the interior before it gets too old. The most ancient rock known to science was formed 4 billion years ago. These space rocks offer clues into the conditions that created our planet that can't be found anywhere else on Earth.

Iron meteorites come from the heavy cores of asteroids or long-vanished planets. The smallest of these feel like a paperweight; the larger ones feel like a cannon ball.

"People study these to figure out what's going on at the center of the Earth," Corrigan said. "We are never going to get samples from the core of the Earth" because it is impossible for humans to reach.

Corrigan specializes in the rocks that result from collisions between asteroids, planets and other bits of space junk. The melt patterns on these meteorites hint at a period called the "Late Heavy Bombardment," 3.9 billion years ago, when a mysterious gravitational disturbance swung through the solar system and sent rocky bodies slamming into each other with cataclysmic results.

"You can learn what the climate was like, the temperature, the history of the surface ... all from one rock you can hold in your hand," Corrigan said.

Studied 16 Million Years Later

Antarctica is the best place to look for meteorites. The flow of ice across the continent sweeps the rocks into piles. Meanwhile, the cold, dry conditions preserve the rocks.

A small, dark rock that formed during the first few hundred thousand years of Mars' history is among the most precious in the collection. It is called Allan Hills for the spot in Antarctica where it was found.

The rock blasted off the surface during an impact 16 million years ago and fell to Earth at the end of the last ice age. It sat unnoticed in the meteorite collection for years until scientists realized it came from Mars.

Not long after, a scientist spotted strange, worm-like structures buried in the rock that hinted at the possibility of life. Within a decade, scientists had more or less settled the issue: The odd forms inside the meteorite almost certainly are not Martians.

But they were left with a new question that had not previously been considered: If a meteorite containing Martians did fall to Earth, would we even recognize them as such?

What Does Life On Mars Look Like?

Biologists and planetary scientists began working together to figure out how organisms could live on Mars and what they might look like. In 1999, NASA's Mars Global Surveyor began mapping the planet and found suggestions of liquid water on its surface. It was followed by Spirit, Opportunity and Curiosity, rovers whose mission was to seek out signs of habitability on the Red Planet.

Closer to home, biologists began to find more and more organisms living in the darkest caves, the depths of the oceans, wisps of cloud and newly formed rocks still hot from the planet's interior.

"It opened up so many new questions and lines of study we didn't even know existed then," Corrigan said. "You can do a study and have it not necessarily be correct in the end ... but you end up changing the face of science."

Antarctica May Have Answers

In November, six researchers headed to Antarctica for their 40th season of meteorite collecting. Bundled up against the wind and brutal cold, they spend weeks out on the ice, scouring the blue and white landscape for tiny bits of black. They go back year after year, retrieving rock after rock, because there's no knowing which one will be the next to change everything.

Or, perhaps one of the rocks already sitting in the Smithsonian's collection is just waiting for someone to grab it, study it more and then change what we know about our solar system.

Quiz

1 Read the following selection from the section "Older Than Anything Else On Earth."

> *Some include pale flecks called calcium aluminum inclusions that are thought to be the most primitive substances in the solar system.*

Which of the following phrases from the article provides context clues to the meaning of the word "primitive"?

(A) the swirl of dust and gas

(B) when the planets began to form

(C) pale flecks called calcium aluminum

(D) Some of their crystals

2 All of the following selections from the article help make the claim that studying rocks from space can aid scientists in understanding how the solar system was formed.

Which is the STRONGEST piece of evidence to support the claim?

(A) The oldest rocks are chondrites, or meteorites that clumped together in the swirl of dust and gas that surrounded the sun when the planets began to form.

(B) These space rocks offer clues into the conditions that created our planet that can't be found anywhere else on Earth.

(C) The melt patterns on these meteorites hint at a period called the "Late Heavy Bombardment," 3.9 billion years ago, when a mysterious gravitational disturbance swung through the solar system and sent rocky bodies slamming into each other with cataclysmic results.

(D) The rock blasted off the surface during an impact 16 million years ago and fell to Earth at the end of the last ice age. It sat unnoticed in the meteorite collection for years until scientists realized it came from Mars.

3 Read the following sentence from the article.

> *The melt patterns on these meteorites hint at a period called the "Late Heavy Bombardment," 3.9 billion years ago, when a mysterious gravitational disturbance swung through the solar system and sent rocky bodies slamming into each other with cataclysmic results.*

The author uses the word "cataclysmic" to mean:

(A) destructive

(B) exciting

(C) fatal

(D) unexpected

4 According to the article, scientists believe that life may have existed on other planets.

Which paragraph from the section "What Does Life On Mars Look Like?" BEST supports the idea outlined above?