Name Period Date

EARTH, MOON, AND SUN

Challenge Reading

Was Moon Born From Planet's Crash Into Earth?

The moon is not made of green cheese, as myth suggests. But the real story of the moon's creation may hardly be more probable.

Many scientists have thought for years that the moon was formed during the early days of the solar system when another planet collided with Earth, ejecting fragments of rocky material that condensed into Earth's only satellite.

The effect would have been as though a lousy cosmic golfer tore up a giant chunk of turf and sent it hurtling into orbit.

[However,] none of [the scientists'] models have offered a completely satisfying explanation. Now, new research offers a scenario that may work. Robin Canup, a researcher at Southwest Research Institute in Boulder, Colorado, and her colleague have fashioned an improved model using a sophisticated computer-modeling technique. It explains the size, composition, and orbital properties of both Earth and the moon. "We determined that a Mars-sized impactor would work the best," said Canup.

"Giant impact" theories explaining the moon's formation were first proposed in the mid-1970s. The two best models that emerged, however, both had inherent problems.

In one model, the mass of the Earth was right, as was the composition of the moon. But the Earth's rotation rate after the collision was unrealistically fast. An improbable second impact would have been required to slow the Earth's spin.

A second scenario suggested that the impact occurred when Earth was only half formed. That idea better explained the Earth's modern rate of rotation and the moon's orbit, but it required Earth to continue accumulating matter after the impact. That material would have been rich in iron, which composes 30 percent of Earth's mass. But the moon, which contains almost no iron, would [also] have iron-rich rock. The model offers no way to explain the moon's confounding dearth of iron.

[Now, the scientists] have proposed that the impact came from an object that was smaller than in the previous models. At one-tenth the mass of the Earth, it was about the size of Mars, the two researchers say.

The collision occurred 4.5 billion years ago, only 50 million years after the solar system formed. The colossal impact must have nearly rent the young Earth apart.

"It didn't break the Earth up, but it came pretty close," Canup said.

by Ben Harder, *National Geographic News*

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Answer the following questions about the reading.

1. What is the general theory about how the moon was formed?

2. How is the difference in composition of Earth and the Moon a problem for one of the giant impact theories?

3. What factors must any giant impact theory take into account?

4. What is different about the current giant impact theory?

5. Describe the impact that scientists currently think led to the moon's formation.