



Scientists Think Big Impact Caused Two-Faced Mars

Scientists think they have unraveled mystery of why Mars is two-faced

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Why is Mars two-faced? Scientists say fresh evidence supports the theory that a monster impact punched the red planet, leaving behind perhaps the largest gash on any heavenly body in the solar system.

Today, the Martian surface has a split personality. The southern hemisphere of Mars is pockmarked and filled with ancient rugged highlands. By contrast, the northern hemisphere is smoother and covered by low-lying plains.

Three papers in Thursday's journal *Nature* provide the most convincing evidence yet that an outside force was responsible.

According to the researchers, an asteroid or comet whacked a young Mars some 4 billion years ago, blasting away much of its northern crust and creating a giant hole over 40 percent of the surface.

New calculations reveal the crater known as the Borealis basin measures 5,300 miles across and 6,600 miles long — the size of Asia, Europe and Australia combined. It's believed to be four times bigger than the current titleholder, the South Pole-Aitken basin on Earth's moon.

Astronomers have long puzzled over Mars' landscape ever since images beamed back in the 1970s showed different-looking halves. An orbiting spacecraft later observed the northern lowlands were on average 2 miles lower than the southern highlands and had a thinner crust.

Scientists who had no role in the studies said the latest research strengthens the case for a colossal Martian impact, but it does not rule out the other theory that hot rock from inside the planet could have welled up and formed the different crusts.

"The betting odds have gone up a lot in favor of the impact model," said Walter Kiefer, a staff scientist at the Lunar and Planetary Institute in Houston.

The idea of an ancient impact was first advanced by Steve Squyres of Cornell University and Don Wilhelms of the U.S. Geological Survey in the 1980s. Squyres, currently the lead scientist for the twin Mars rovers, had always hoped other scientists would "pick that ball up and run with it."

"It wasn't a totally nutty idea that there could have been an impact," Squyres said.

But finding evidence of one proved difficult because part of the basin rim is now covered by a bulging volcanic range.

For one study, a team of scientists from the Massachusetts Institute of Technology and NASA's Jet Propulsion Laboratory recreated what the Martian surface would have looked like before the volcanoes formed using gravity and surface measurements from spacecraft. They determined the impact basin is oval-shaped, similar to what

would be expected if a space object had hit at an angle.

"The shape is really one of the key pieces of evidence that it was probably formed in a giant impact," said MIT postdoctoral researcher Jeffrey Andrews-Hanna, whose original "gut feeling" favored the other theory.

A separate group led by the California Institute of Technology developed 3-D simulations to determine the "sweet spot" of conditions that would form the basin.

According to their calculations, a 1,000-mile-wide object traveling at more than 13,000 miles per hour — or 24 times faster than a jetliner — would hit Mars at an angle between 30 and 60 degrees. The collision would be equal to an explosion of 75 trillion to 150 trillion megatons of TNT.

In the third study, a team of researchers led by the University of California, Santa Cruz, found that shock waves from such an impact would disrupt the southern crust.

All three teams believe there was a single giant blow and not several small hits because there's no evidence of other basins.

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