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News

Asteroid smash turned Mars into 'takeaway pizza' planet

Legacy of ancient impact means Mars now comes with either thick or thin crust.

[Katharine Sanderson](/news/author/Katharine+Sanderson/index.html) (</news/author/Katharine+Sanderson/index.html>)

Kaboom! When a giant impact whacked into a young Mars around 4 billion years ago, the impact made such a huge dent in the northern hemisphere that it left the entire planet lop-sided.

This dent has been partly hidden from the view of scientists because of the large Tharsis volcanic range that now spans the area. But what scientists had noticed was a striking difference of up to 30 kilometres in the thickness of the planet's crust between the northern lowlands and the southern highlands.

This 'crustal dichotomy' was thought to be caused by either a giant impact, or by a shifting of the martian mantle. A set of calculations by Jeffrey Andrews-Hanna, of the Massachusetts Institute of Technology, and colleagues, now offers strong evidence for a huge impact, forming a crater four times bigger than anything seen before in our Solar System. The work is published in *Nature* [1 \(#B1\)](#).

Andrews-Hanna and his team used computer modelling to 'remove' Tharsis from the martian landscape, to try and work out why the transition between thick and thin crusts was so marked. And there he saw it – a huge crater, 10,600 kilometres long and 8,500 kilometres wide. "The lowlands of Mars is an enormous elliptical projection," says Andrews-Hanna. "There's only one process we know of that causes this kind of depression" – a very big impact.

Other known basins created by enormous impacts basins are also elliptical, and they are a similar shape to the northern lowlands of Mars, he says.

Through thick and thin

The meteorite would have blasted out the rock from the planet's northern lowlands, forming the crater called the Borealis basin, and some of this ejecta would have been deposited round on the other side of the planet, making its crust even thicker.



Not long after the planet was born, it was altered forever by a meteoric blast, as this [computer-simulated video](http://www.nature.com/nature/news/video/r) (<http://www.nature.com/nature/news/video/r>) shows.

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“This is the defining event in Mars’s history,” says Andrews-Hanna. This [computer-simulated video](http://www.nature.com/nature/newsvideo/mars-impact.mov) (<http://www.nature.com/nature/newsvideo/mars-impact.mov>) suggests what it might have looked like to anyone around back then.

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This idea that the crustal dichotomy was caused by a giant impact was suggested [2 \(#B2\)](#) in the 1980s by Don Wilhelms from the US Geological Survey and Steven Squyres, who has more recently found fame as director of the Mars Rover project. “When Don Wilhelms and I first proposed this idea almost 25 years ago, we felt that it was consistent with the observations, and our intuition was that it was physically possible,” says Squyres. “That’s really all it was, though – intuition. We didn’t actually do the calculations.”

Improved computational tools in the intervening years have now allowed this test of the idea to be done, says Squyres. “This still doesn’t prove that a giant impact created the dichotomy, of course,” he says, “we weren’t there to see it happen, and all of this is inference. But it means that it’s a physically reasonable idea, and that’s a significant step forward.”

References

1. Andrews-Hanna, J. C., Zuber, M. T. & Banerdt, W. B. *Nature* 453, 1212-1215 (2008)
2. Wilhelms, D. E. & Squyres, S. W. *Nature* 309, 138-140 (1984)

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Posted by: **Lynn Jackman** | 25 Jun, 2008

I wrote about The Mars Water Theory at my www.dimithri.blogspot.com that I would appreciate if you can read it and send

me your opinion.

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