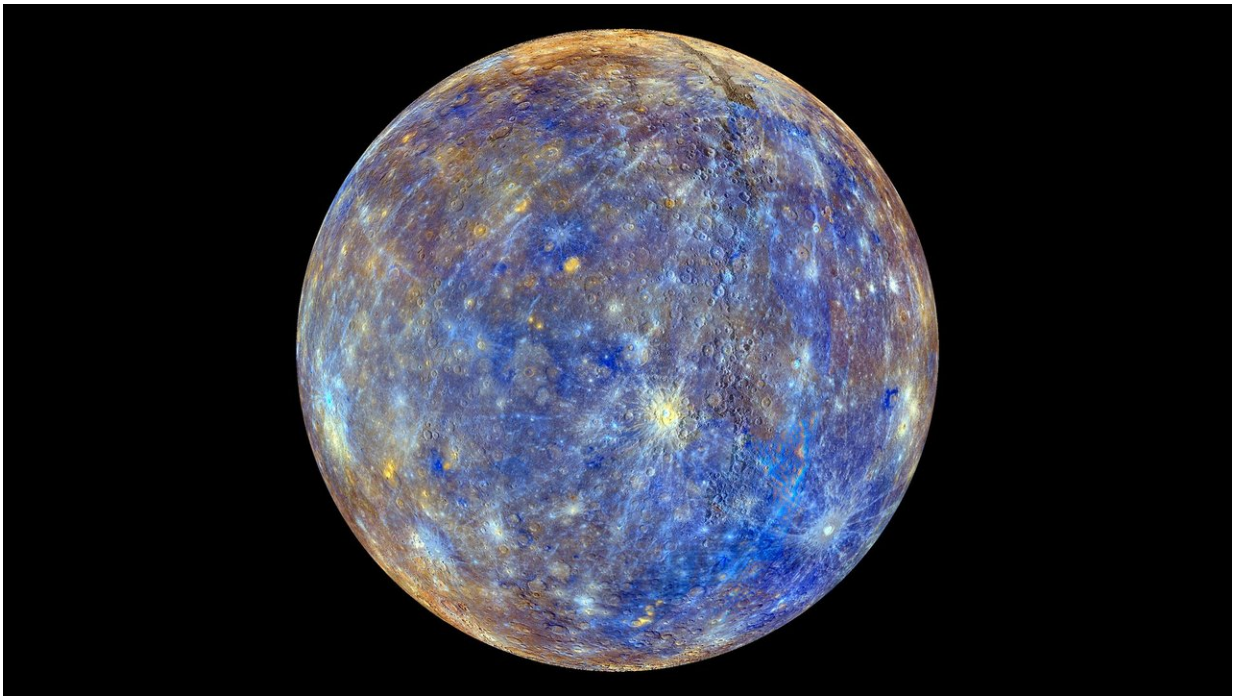
How did the Earth get its water? The answer might be found on Mercury

November 3 2020, by Paul M. Sutter



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I don't know if you've noticed by now, but the Earth is a little bit wet. How Earth got all its water is one of the major mysteries in the formation of the solar system, and a team of Japanese researchers have just uncovered a major clue. But not on Earth—the clue is on Mercury.

Here's the traditional story of the early solar system as best we know it.

The sun forms with a disk of dusted gas surrounding it. Within a certain distance from the sun, known as the snow line, the sun's radiation is too hot and too intense to support the formation of ices or lighter elements. Hence, the rocky planets form.

Beyond the ice line, which sits somewhere around the present-day orbit of the asteroid belt, ices and light elements can glue themselves together to become the giant bulky planets of the outer system.

In between is a sort of no man's land of rocks, ices, debris, and basically a whole bunch of other junk.

Once the giant planets form, they rearrange themselves, and their gravitational influence sends chunks of random junk plowing into the inner solar system, delivering all sorts of goodies like water. Those goodies land on the surfaces of the rocky worlds, where they sit for billions of years.

But a team of Japanese researchers are challenging this view by looking at the cratering record on Mercury. To explain the abundance of lighter elements within Mercury's crust, there has to be at least three times as many impacts as we observe in the cratering record. (And if you're wondering why we're so fascinated by Mercury, it's because that airless, dead world doesn't have any erosion, so it can preserve the memory of bombardments from billions of years ago).

To explain the discrepancy, the researchers believe that the bombardments were powerful enough to literally chew up the crust of Mercury, turning it into a molten sludge. That way, most of the lighter and more volatile elements that the bombardments delivered ended up buried deep underground.

And as for the Earth? A similar process may have happened, with most

of the water delivery provided by those early bombardments sunk deep beneath the surface. Thankfully they delivered enough water to leave the Earth with a healthy supply of oceans.

The upcoming European Space Agency's BepiColombo mission, currently on route to Mercury, will unlock even more answers.

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