

# An ancient asteroid once collided with and 'flipped' Jupiter's moon Ganymede

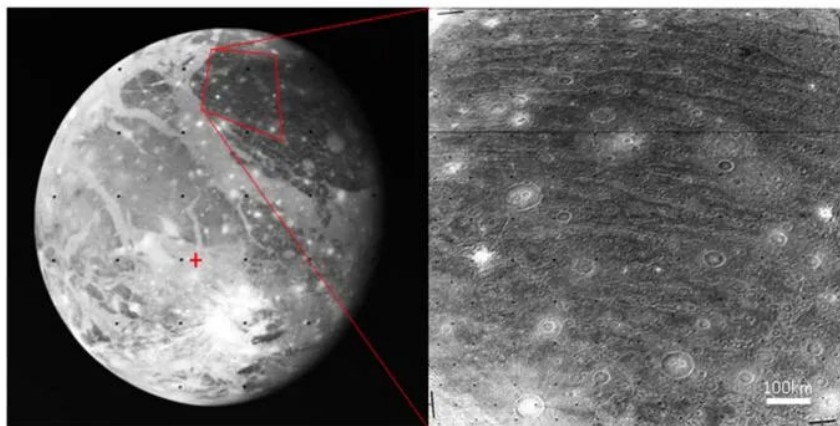
The history of our solar system can be likened to a picture of unpredictable change.

The infamous Chicxulub asteroid, which devastated Earth and caused the extinction of the dinosaurs 66 million years ago, is just one of countless meteorites that have struck planets and moons in our solar system over billions of years.

Recently, scientists conducted a study that dug deeper into an even more catastrophic collision in our solar system's distant past: An asteroid 20 times larger than the Chicxulub meteorite caused a planetary-scale disaster four billion years ago, and the unfortunate casualty was Ganymede, Jupiter's largest moon.

Specifically, in a study published on September 3 in the journal *Scientific Reports*, author Naoyuki Hirata, an astronomer from Kobe University in Japan, detailed topographic clues on Ganymede that illustrate the far-reaching consequences of this terrifying collision.

Ganymede's surface is dotted with circular grooves that appear to originate from a single point. Astronomers have long considered this evidence that something hit the planet. " *We know that this feature was created by an asteroid impact about four billion years ago* ," Dr Hirata said in a statement. " *But we are still unsure how large the impact was and what effect it had on Ganymede* ."

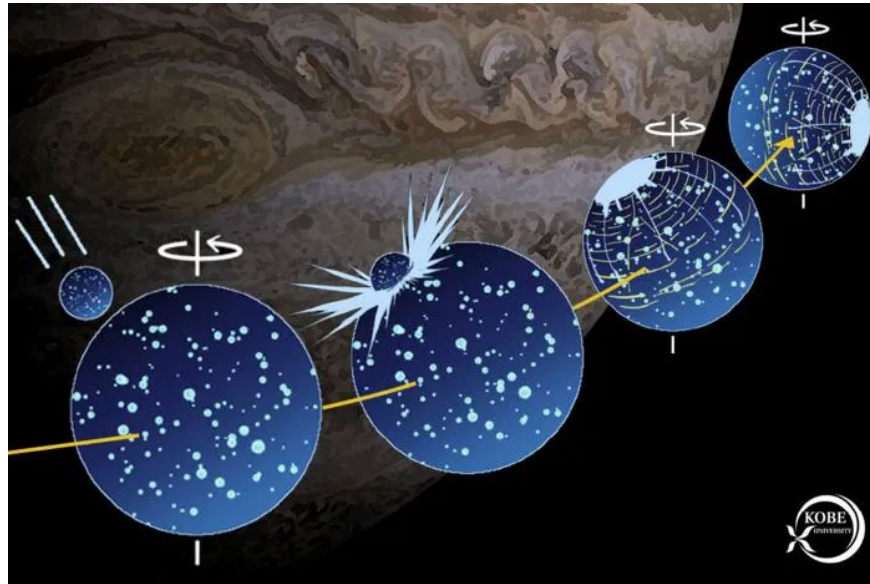


Ganymede is Jupiter's largest natural satellite, and the largest moon in the Solar System. It is even larger than Mercury, which was once considered a planet. Ganymede takes 7 days to orbit Jupiter.

What caught Dr. Hirata's attention was not the size or depth of the crater, but its location. The 'target' pointed directly away from Jupiter. The strange arrangement suggested that Ganymede had experienced a rotational shift in its past. Could the catastrophic impact that created Ganymede's characteristic scars also be behind the moon's

current configuration?

To understand the origin of Ganymede's crater system, Hirata simulated impacts on a computer to see what scenarios could have created the moon's current landscape. His models found that the asteroid and its ejecta weighed down on Ganymede at the location of the crater, enough to 'flip' the entire planet. Ganymede is a tidally locked moon, meaning it always faces the same side toward Jupiter—and because of this impact, the crater is permanently hidden from Jupiter's view.



While it may seem revolutionary, this is not the first known case of an asteroid toppling a celestial body. Scientists have speculated from images collected by NASA's New Horizons space probe that a similar asteroid collision altered the distribution of ice on Pluto and altered its orientation in the distant past.

By reversing Ganymede's position, Hirata calculated that the object that hit the moon was 186 miles wide, or about 20 times the size of the asteroid Chicxulub. When it struck Ganymede, it carved a crater roughly the size of Alaska, which was later filled with falling debris. According to Hirata, only a crater of this size could have had the force to tip Ganymede over.

Ganymede is the largest moon in the solar system. But the giant asteroid that hit it would have changed that world from the inside out. As well as reshaping the moon, Hirata says the impact also 'blew away' Ganymede's surface and reshaped its interior. Making sense of all those overlapping events on the moon's surface is a challenge. *'This is a great attempt to rewind the clock through computer simulations, looking for an explanation for the distribution of scars across Ganymede's surface.'*

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