Space

Asteroid Bennu may have got its spinning-top shape from landslides

Asteroids that are shaped like spinning tops, such as Bennu and Ryugu, may have been slowed down and shaped by a series of huge landslides

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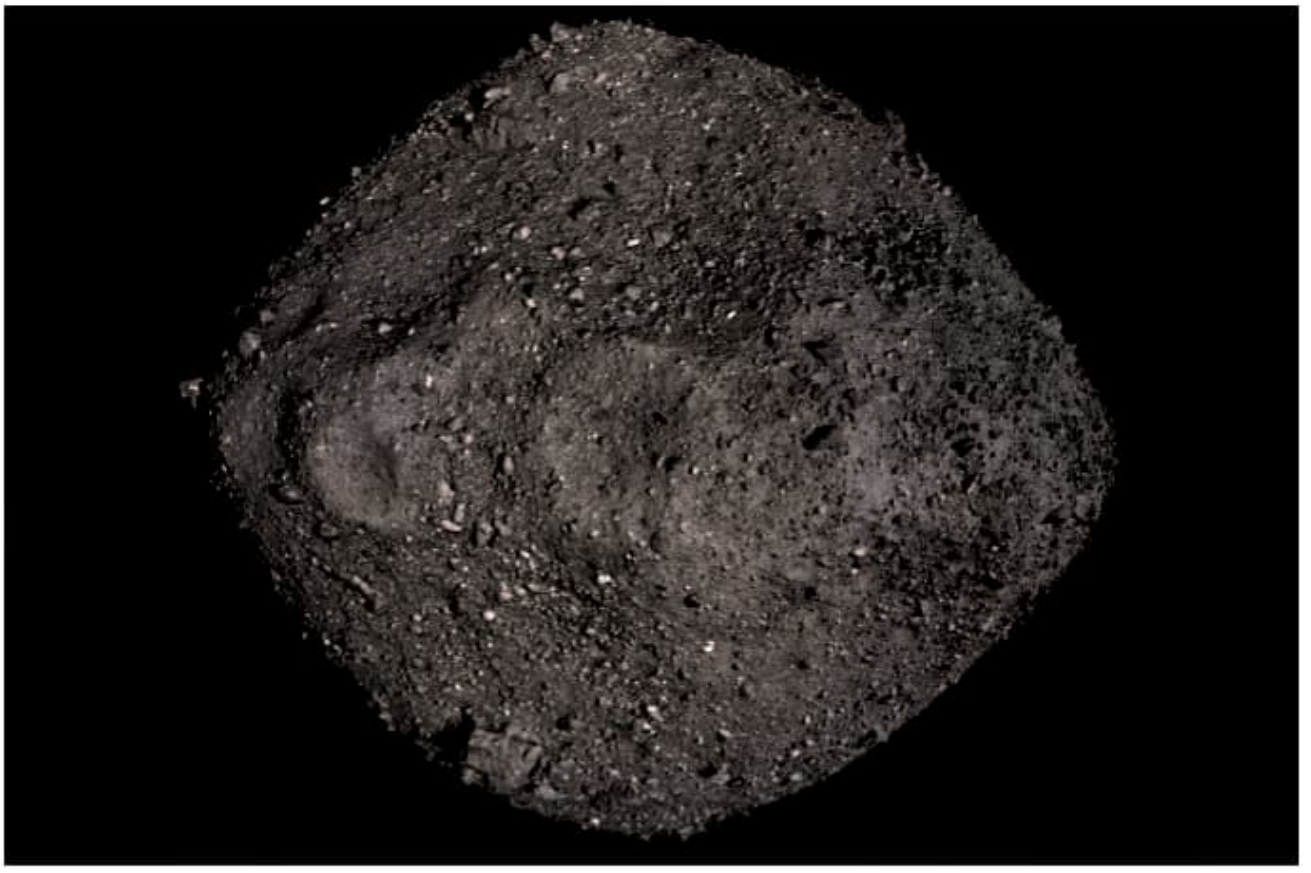

NASA/Goddard/University of Arizona

Huge landslides on the asteroid Bennu and other, similar space rocks may have been far more important to their evolution than researchers previously realised. They may have given these asteroids their odd spinning-top shapes, as well as slowed their rotation and helped prevent them from falling apart.

Bennu is most likely a rubble-pile asteroid, meaning that instead of one big rock, it is made of many chunks of rock held together by gravity. This means that it isn't particularly hard for even a relatively small impact by another space rock to jostle the loose pebbles on the asteroid's surface, causing landslides. Ishan Sharma at the Indian Institute of Technology Kanpur and his colleagues calculated how these events may have affected Bennu as a whole.

They found that there was probably an interplay between the asteroid's spin and the movement of rocks and dust on its surface. The spinning directs the flow of rubble, and the moving rubble affects the rotation rate. "Landslides generally flow toward the body's equator, thereby [adding volume towards the middle and] slowing it down, just like a spinning ballerina who spreads her arms," says Sharma.

Over the course of the past 1.75 million years, the researchers estimated that Bennu would have been hit by about 25 space rocks big enough to cause major landslides. This would have slowed its rotation rate by about 0.1 revolutions per hour, while thickening the asteroid's equator to give it the shape we see now. The total effect over the asteroid's entire lifetime may have been more significant, particularly taking into account smaller landslides.

This process could explain the shape of Bennu and Ryugu, two asteroids that recently had dedicated missions, but landslides in general may have been important for other small celestial bodies as well.

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