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# SKY & TELESCOPE

THE ESSENTIAL GUIDE TO ASTRONOMY

NOVEMBER 2022

## WEBB TELESCOPE'S Big Debut

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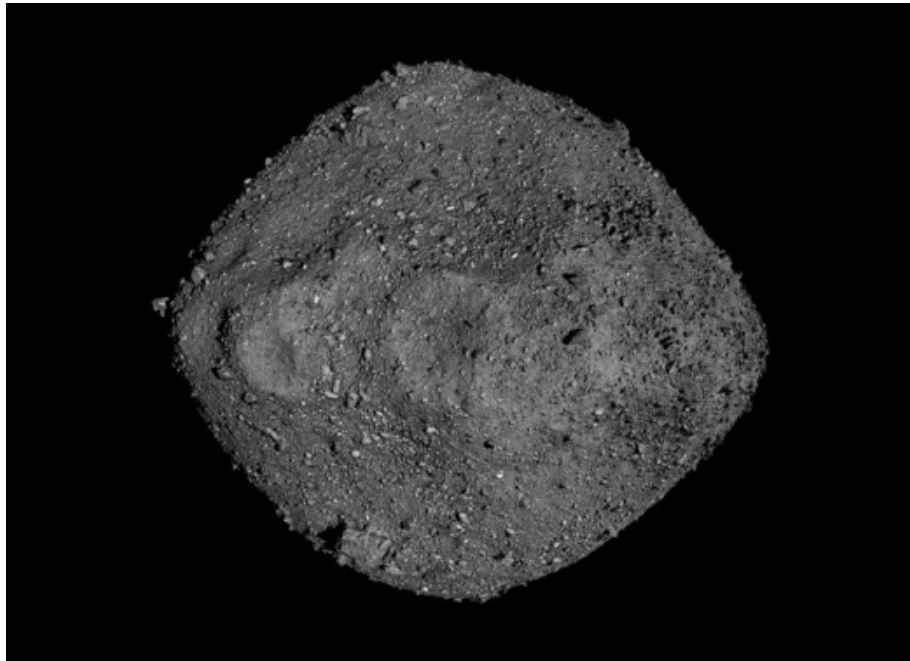
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◀ Asteroid 101955 Benu, as imaged by the OSIRIS-REX spacecraft

explains principal investigator Dante Lauretta (University of Arizona).

In practice, the jet blasted out 6,000 kilograms (13,000 pounds) of dust and rock, creating an elliptical crater 9 meters long. “What we saw was a huge wall of debris radiating out from the sample site,” Lauretta says. “We were like, ‘Holy cow!’”

What’s more, TAGSAM didn’t stop when it touched the surface. It kept on going, pushing another half-meter down before the spacecraft reversed course. Particles stuck to the spacecraft as well as to the TAGSAM, overflowing the collector, and even jamming the cover until they were carefully shaken out days later.

The new analyses show that there’s no cohesive force holding together Benu’s outer layers other than the asteroid’s feeble gravity. “The particles making up Benu’s exterior are so loosely packed and lightly bound to each other that they act more like a fluid than a solid,” Lauretta explains.

Other work, published July 11th in *Nature Astronomy*, explains why Benu’s surface is so rough and boulder-strewn, rather than dust-covered as planetary scientists had expected (*S&T*: July 2019, p. 8). Close examination of other small rubble-pile asteroids, such as 162173 Ryugu, has also shown little dust. Hsiang-Wen Hsu (University of Colorado, Boulder) and colleagues used lab experiments to show that static electricity on these small worlds’ surfaces makes dust jump like popcorn, ejecting most small particles from km-size asteroids within a few million years.

Observations of Benu so far have shown this near-Earth asteroid is a strange world in its own right. Analysis of the 250 grams that OSIRIS-REX is carrying, to be returned to Earth late next year, will reveal further details.

#### ■ JEFF HECHT

Watch OSIRIS-REX encounter Benu at <https://is.gd/RubblePile>.

◀ The spacecraft extended a robotic arm toward Benu’s surface (left), then stirred up particles for sample collection (right).

#### SOLAR SYSTEM

## Asteroid Benu Almost Swallowed Spacecraft Whole

**WHEN NASA’S** OSIRIS-REX took a sample from the asteroid 101955 Benu on October 20, 2020, it revealed that this little world is more rubble pile than solid rock. New analyses in the July 7th *Science* and *Science Advances* show that when the probe touched down, it punched right through the surface. If the spacecraft hadn’t lifted itself back

out a few seconds later, the asteroid would have engulfed it.

On sampling day, a 3.35-meter (11-foot) articulated arm attached to the probe unfolded to deploy an aluminum collection head; together, these pieces make up the Touch and Go Sample Acquisition Mechanism (TAGSAM). The probe approached the surface at a slow 10 cm/s (0.2 mph). The plan was then for the TAGSAM head to touch the surface and stay there for 5 seconds while a jet blew nitrogen gas into the surface material, swirling some of it up into the collection head. Lab tests of the sampling procedure “barely made a divot,”



MOSAIC OF BENU: NASA GSFC / UNIVERSITY OF ARIZONA; BEFORE/ AFTER IMAGES OF OSIRIS-REX TOUCHDOWN: NASA GSFC