1
00:00:00,000 --> 00:00:03,837
[music throughout] It appears some pieces of asteroid Vesta

2
00:00:03,837 --> 00:00:09,876
ended up on asteroid Bennu, according to observations from NASA’s OSIRIS-REx spacecraft.

3
00:00:09,876 --> 00:00:14,280
The new result sheds light on the intricate orbital dance of asteroids

4
00:00:14,280 --> 00:00:15,982
and on the violent origin of Bennu,

5
00:00:15,982 --> 00:00:20,387
which is a “rubble pile” asteroid that coalesced from the fragments of a massive collision.

6
00:00:20,387 --> 00:00:24,324
Six boulders, ranging in size from 5 to 14 feet,

7
00:00:24,324 --> 00:00:27,927
were discovered scattered across Bennu’s southern hemisphere near the equator.

8
00:00:27,927 --> 00:00:30,597
These boulders are much brighter than the rest of Bennu,

9
00:00:30,597 --> 00:00:33,733
with some appearing as much as 10x brighter than their surroundings.

10
00:00:33,733 --> 00:00:37,170
The unusual boulders on Bennu first caught the team’s eye in images

11
00:00:37,170 --> 00:00:39,406
from the OSIRIS-REx Camera Suite instrument.

12
00:00:39,406 --> 00:00:42,742
The team analyzed the boulders using an onboard spectrometer,

13
00:00:42,742 --> 00:00:45,111

which separates light into its component colors.

14
00:00:45,111 --> 00:00:49,249
Since elements and compounds have distinct, signature patterns of bright and dark

15
00:00:49,249 --> 00:00:52,685
across a range of colors, they can be identified using a spectrometer.

16
00:00:52,685 --> 00:00:55,555
The signature from the boulders was characteristic of the mineral

17
00:00:55,555 --> 00:00:57,757
pyroxene from Vesta and the vestoids,

18
00:00:57,757 --> 00:01:00,894
smaller asteroids that are fragments blasted from Vesta

19
00:01:00,894 --> 00:01:03,630
when it sustained significant asteroid impacts.

20
00:01:03,630 --> 00:01:07,233
The team tested a few different theories to determine the origin of these boulders:

21
00:01:07,233 --> 00:01:10,670
First, it’s possible that the boulders were originally part of Bennu

22
00:01:10,670 --> 00:01:15,275
or its parent body; however, this is unlikely based on how pyroxene is created.

23
00:01:15,275 --> 00:01:19,112
This mineral typically forms when rocky material melts at high-temperature.

24
00:01:19,112 --> 00:01:21,514
Bennu is composed of water-bearing minerals,

25
00:01:21,514 --> 00:01:24,350
so it wouldn’t have experienced very high temperatures in its history.

26
00:01:24,350 --> 00:01:27,020
Next, the team considered localized heating,

27
00:01:27,020 --> 00:01:28,455
perhaps from an impact.

28
00:01:28,455 --> 00:01:31,191
The scale of an impact needed to create large pyroxene boulders

29
00:01:31,191 --> 00:01:35,128
is much more significant than what is expected to take place in the main asteroid belt.

30
00:01:35,128 --> 00:01:37,197
So, the team ruled out these scenarios,

31
00:01:37,197 --> 00:01:39,899
and instead considered other pyroxene-rich asteroids

32
00:01:39,899 --> 00:01:42,869
that might have implanted this material to Bennu or its parent.

33
00:01:42,869 --> 00:01:46,139
This is possible because as asteroids move through the solar system,

34
00:01:46,139 --> 00:01:48,208
their orbits can be altered in many ways

35
00:01:48,208 --> 00:01:51,177
including by the pull of gravity from planets and other objects,

36
00:01:51,177 --> 00:01:54,380
meteoroid impacts, and even the slight pressure from sunlight.