ExMASS Asteroid 101

Clear Lake High School

Rahul Yesantharao, Lekha Yesantharao, Eric Chen, Anshuman Kumar, George Zhang

Definitions

- Regolith – The rocky material covering a surface of a body.
- S-type – silicate asteroids, moderately bright
- V-type – moderately bright

Image 1

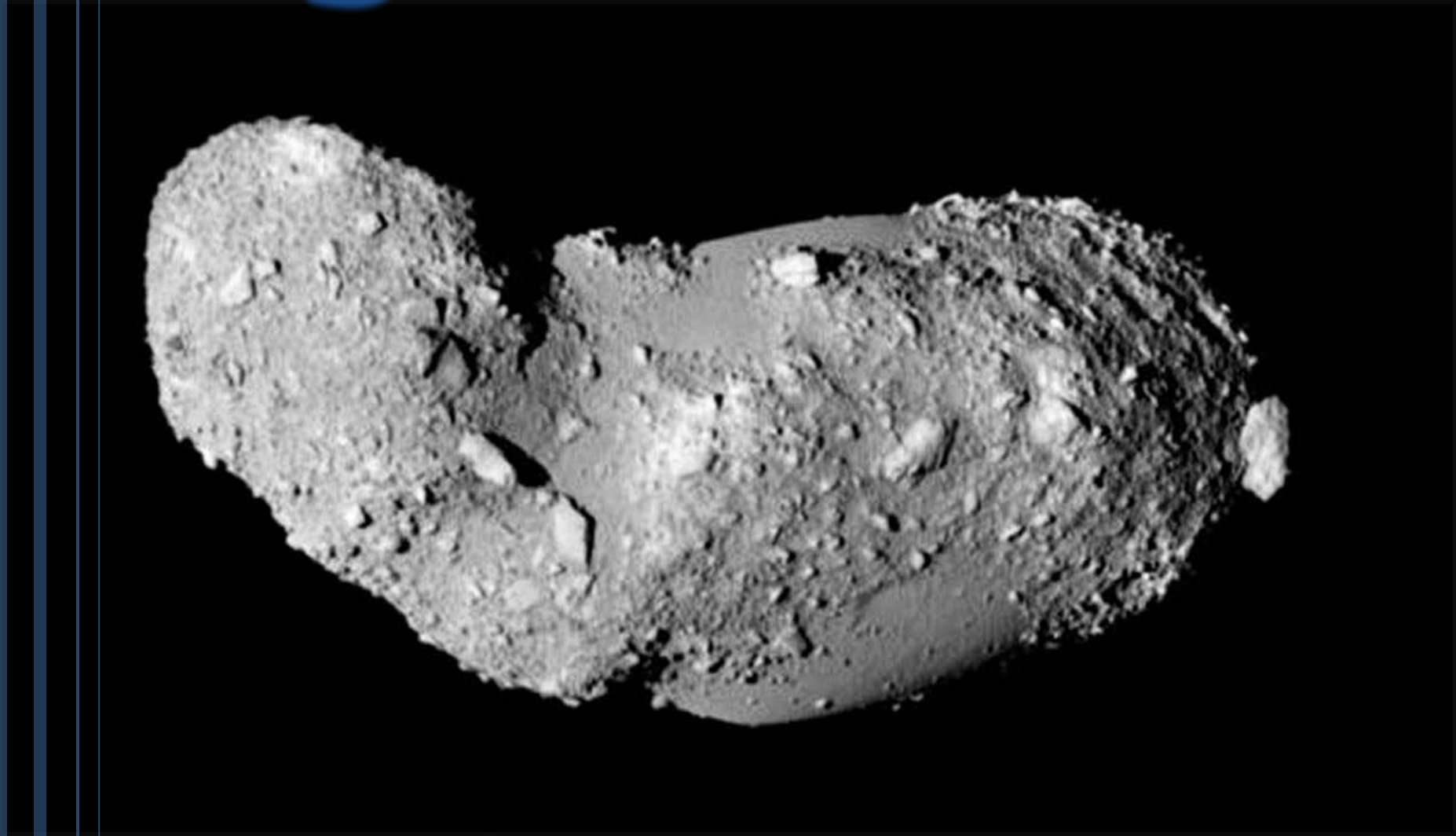

Image 1 Analysis

- Image 1 depicts the asteroid Itokawa, an S-type asteroid.
- Major features include the appearance of the asteroid as bent near the left side, indicating that the asteroid was created through the fragmentation and reaccretion of a larger, pre existing parent body.
- The rocky surface indicates that the asteroid was fragmented and then re-accreted into a rubble pile asteroid.
- Another feature present are impact craters on the right end of the asteroid; their presence is indicated by the shadows that are evident on the right end. This suggests that this portion of the asteroid is older, because over time foreign impact objects have chipped away at this end.
- The regolith present on the surface was formed after formation by small scale impacts; clearly they weren't big as there are not many visible craters.
- Relative Ages: the asteroid first formed from the collision of two objects to create one. Following the unification, impacts by foreign objects created the impact craters and regolith.

Image 2

Image 2 Analysis

- Image 2 depicts the asteroid Vesta, a V-type asteroid
- Differentiated, rocky body: At formation, Vesta was internally melted and differentiated as denser materials sank to the center.
- There is a graben; a large forked groove running from the right to the left side on the image. It was probably formed when a large body hit the asteroid; because it is differentiated, grabens formed. It was probably the same collision that formed those large craters (Rheasilvia and Veneneia)
- Impact craters of all sizes about asteroid; created by high velocity impacts of foreign objects. These in turn cause it to be covered by igneous rocks. A massive bombardment occurred 4.1 to 3.5 billion years ago, due to gravitational forces acting on the asteroid belt when the giants planets moved.
- Relative Ages: First, 3-4 billion years ago, the formation occurred as the asteroid melted and differentiated. The relative ages of the craters, which occurred after formation, can be determined by which ones are on top; notably two enormous craters are on the left side, and one enormous crater is on the far right cut off by the picture

Image 3

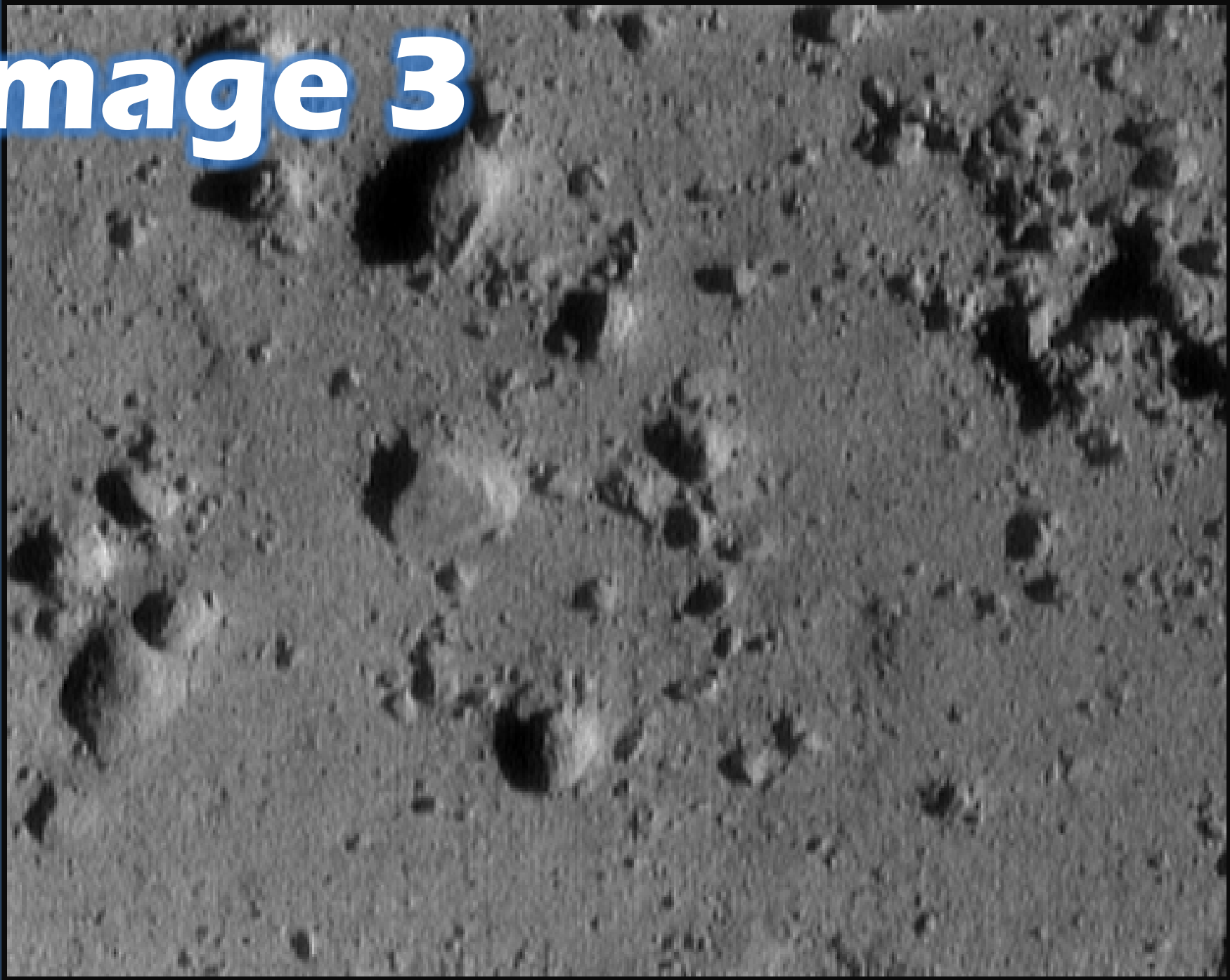

Image 3 Analysis

- Image 3 most likely depicts the asteroid Eros.
- Eros was formed as chondrites accreted and created an asteroid. This formed an S-type asteroid.
- Notable formations include the boulders that dot the surface which could have emerged from beneath the surface by a Brazil Nut effect caused by seismic shockwaves from large impacts
- The boulders could also be debris strewn about by large impacts
- Another notable feature is the apparently lack of impact craters which could also be attributed to the ejection of debris from one very large impact
- Relative Ages: The asteroid first formed due to the accretion of chrondrites; then the boulders were ejected due to one of the hypotheses above.