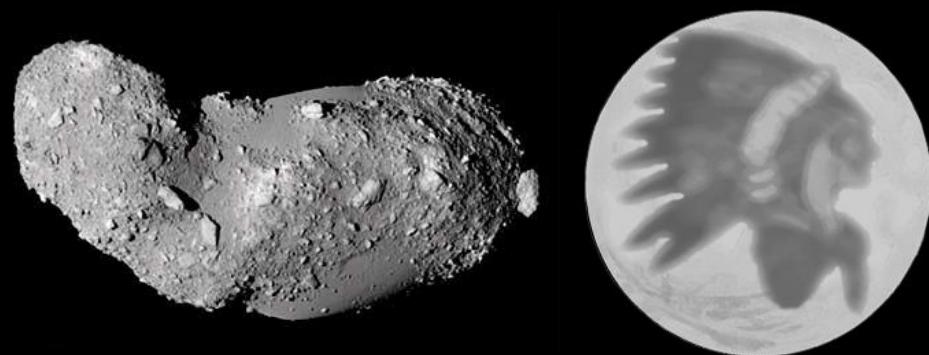




SOLAR SYSTEM EXPLORATION RESEARCH
VIRTUAL INSTITUTE

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A Geologic Characterization of Asteroids Itokawa, Vesta, and Eros

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"We choose to go to the 'Poo not because it is easy.... but because it is hard"

Objective

Explain the composition and geomorphology of asteroids Itokawa, Vesta, and Eros and relate them to other celestial bodies in the solar system.



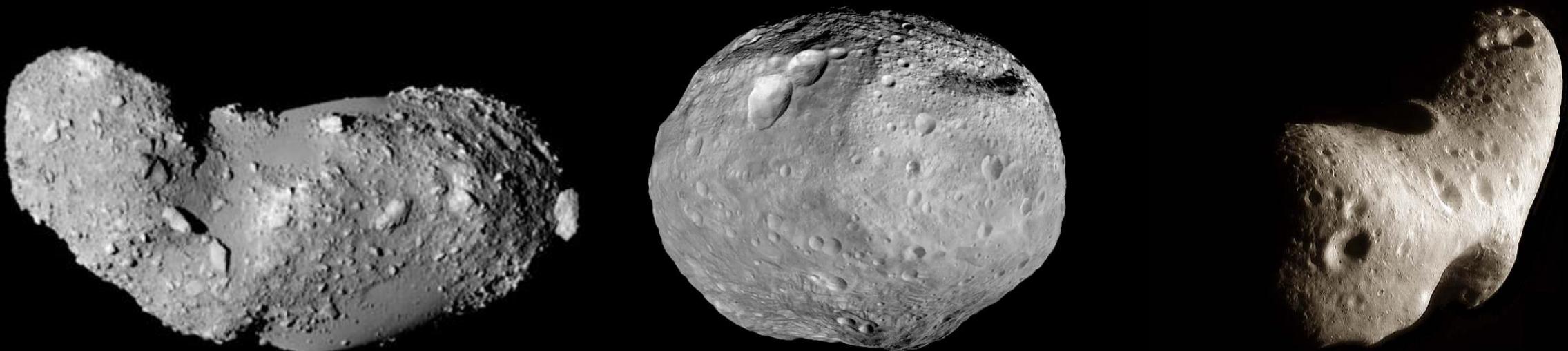
Significance of Study

To provide a better understanding of the composition and geologic processes that take place on asteroids and insight into the evolution of the solar system.



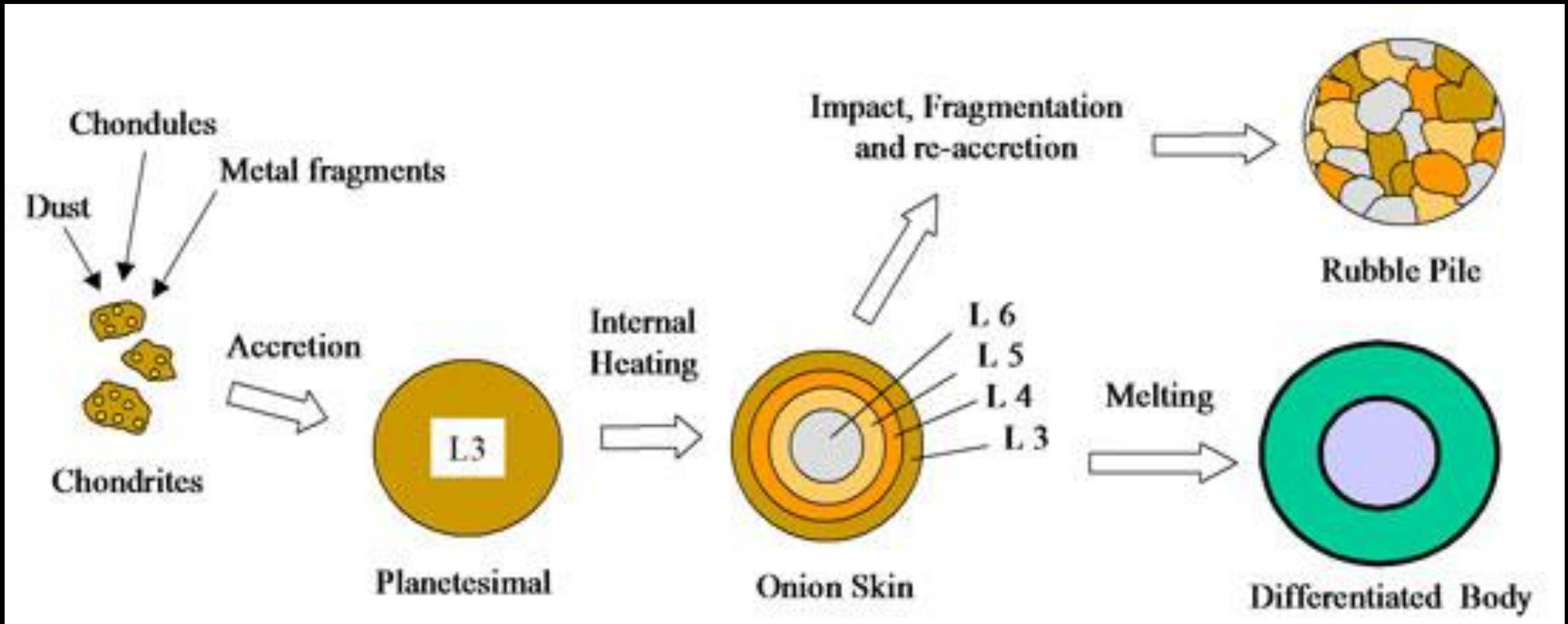
Image obtained from <http://www.lpi.usra.edu/education/timeline/>

Focus of Study



Asteroids Itokawa (left), Vesta (center), and Eros (right). All images obtained from www.Wikipedia.com
(All images are not to scale in the images above)

Asteroid Formation



Formation Theories: Itokawa

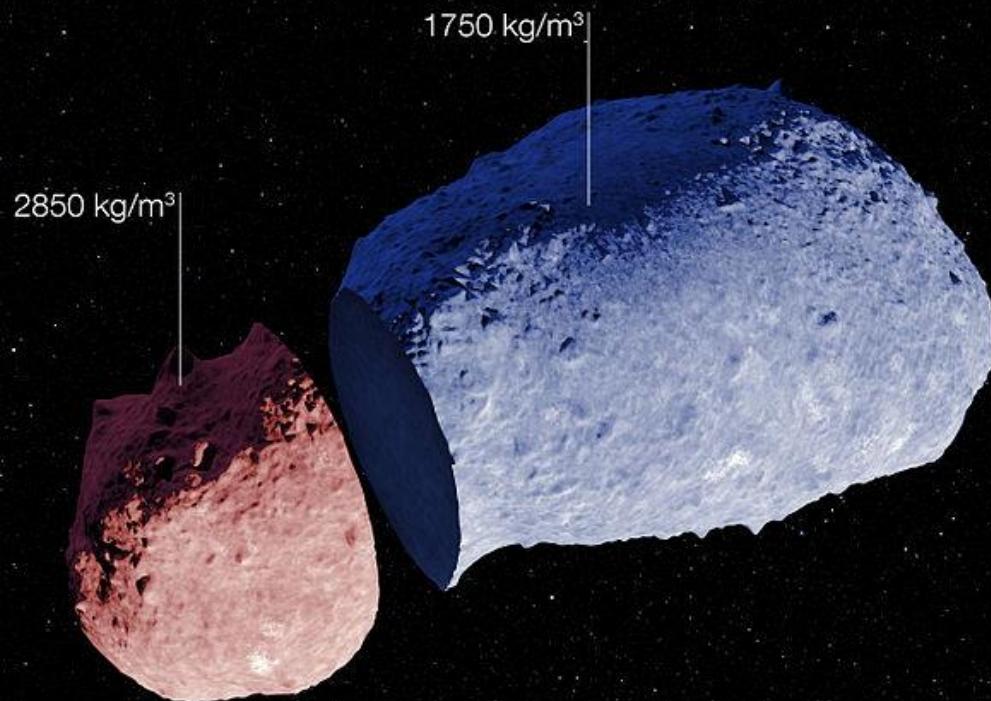
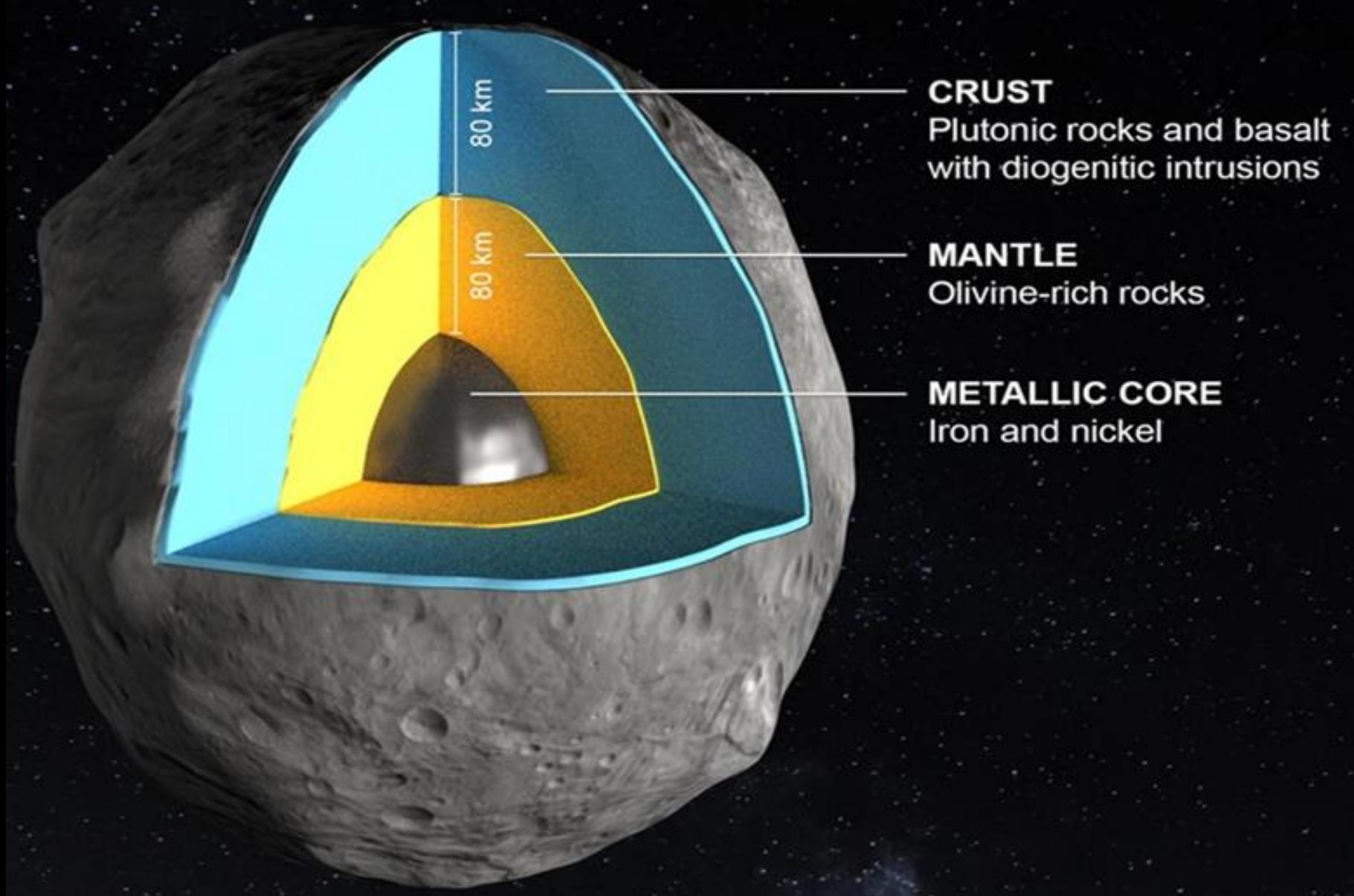


Image Source: http://en.wikipedia.org/wiki/25143_Itokawa#mediaviewer/File:Schematic_view_of_asteroid_%2825143%29_Itokawa.jpg

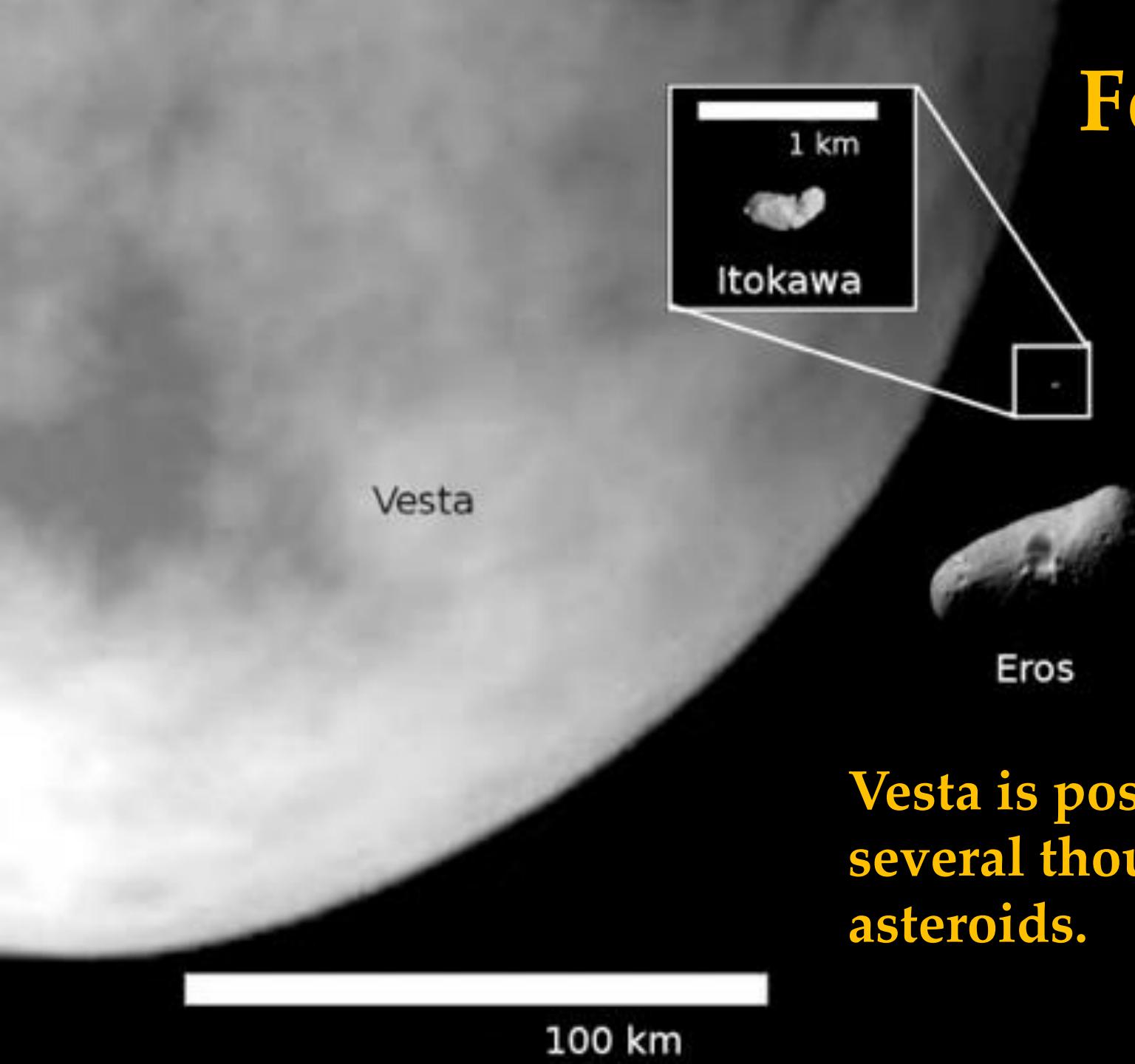
Formation Theories: Vesta



Formation Theories: Eros

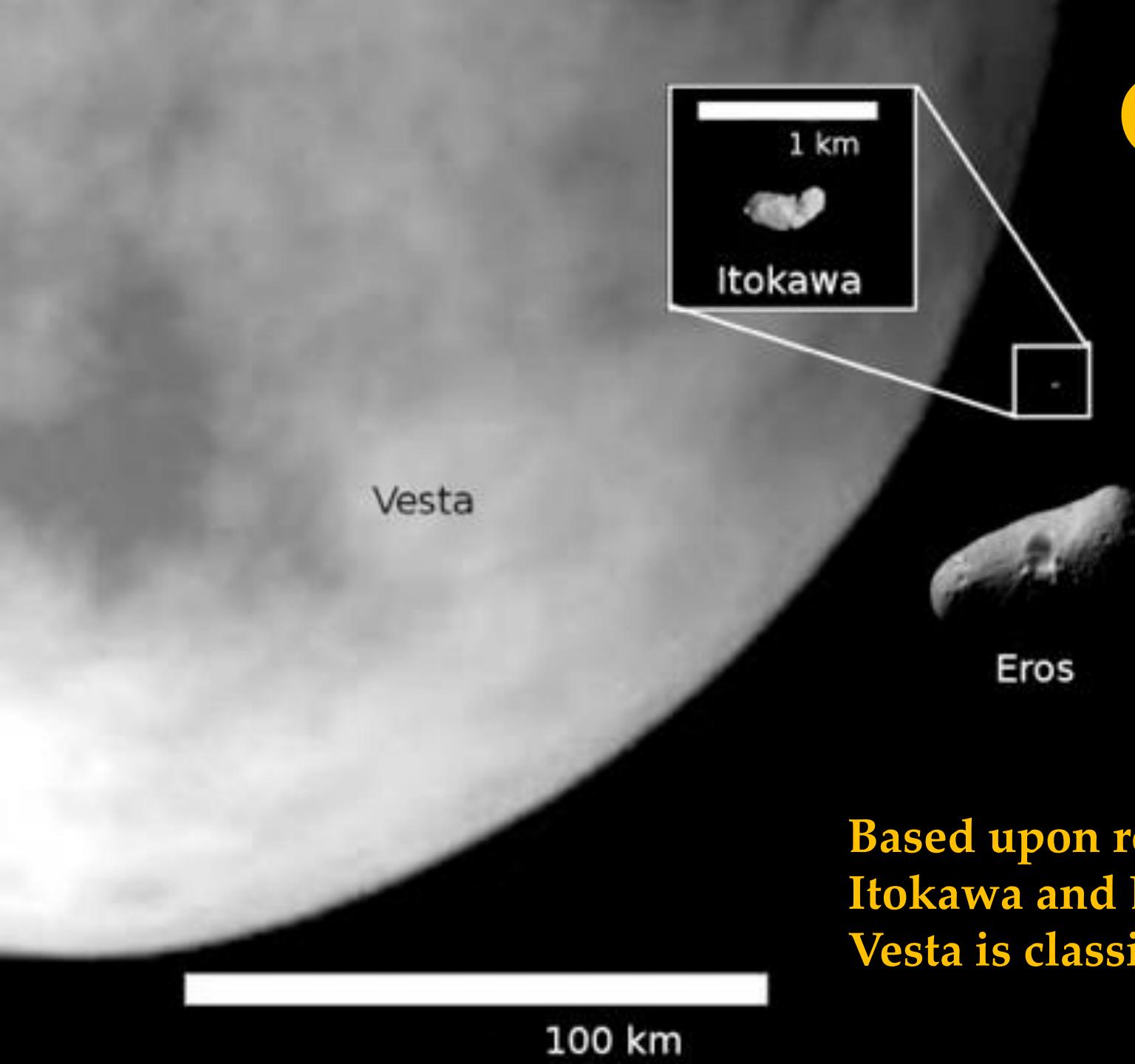


Formation Theories



Vesta is possibly a parent body of several thousand Itokawa/ Eros sized asteroids.

Composition

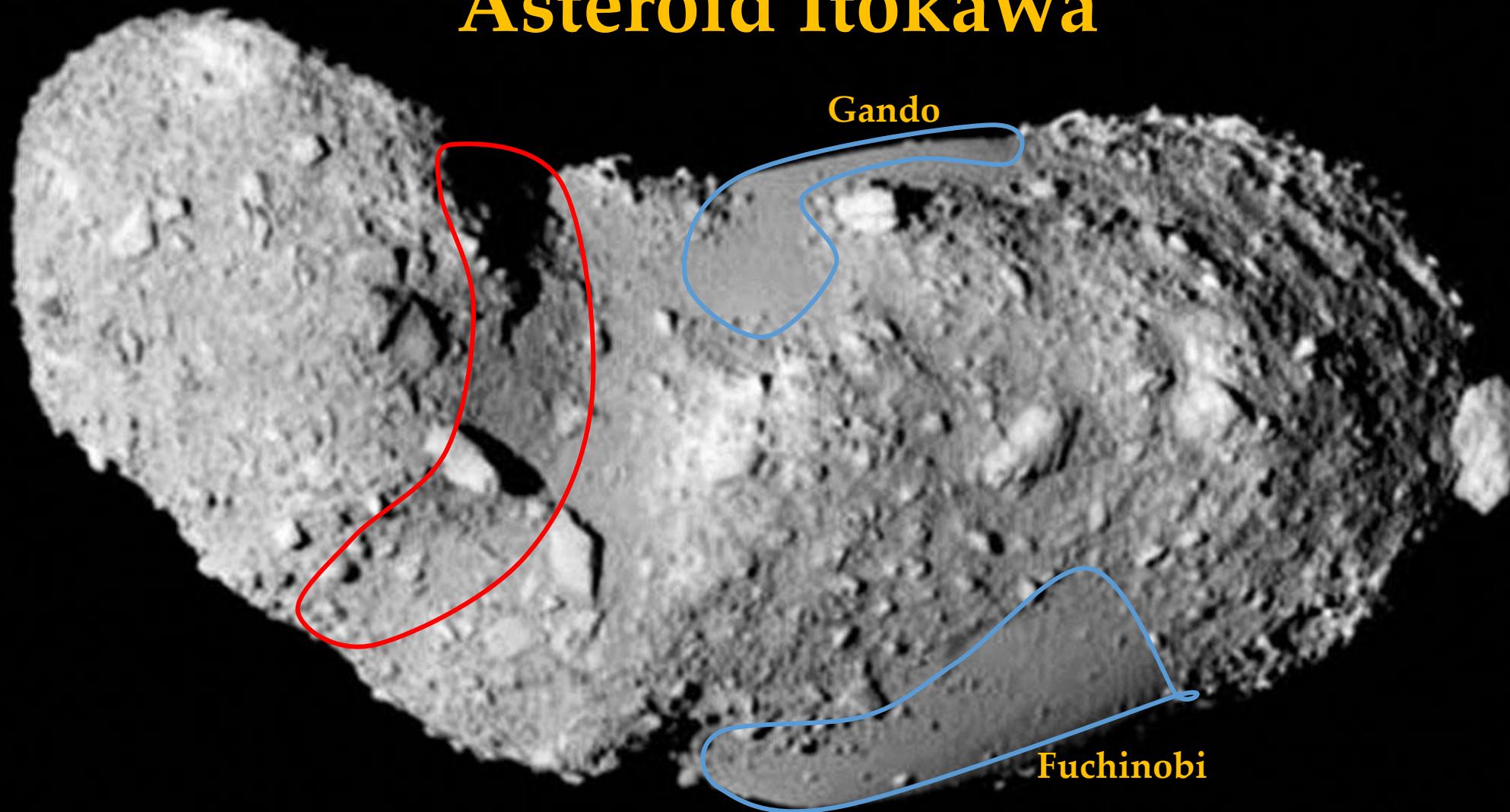


Based upon reflectance and spectral analysis ,
Itokawa and Eros are S-type asteroids and
Vesta is classified as a V-type asteroid.

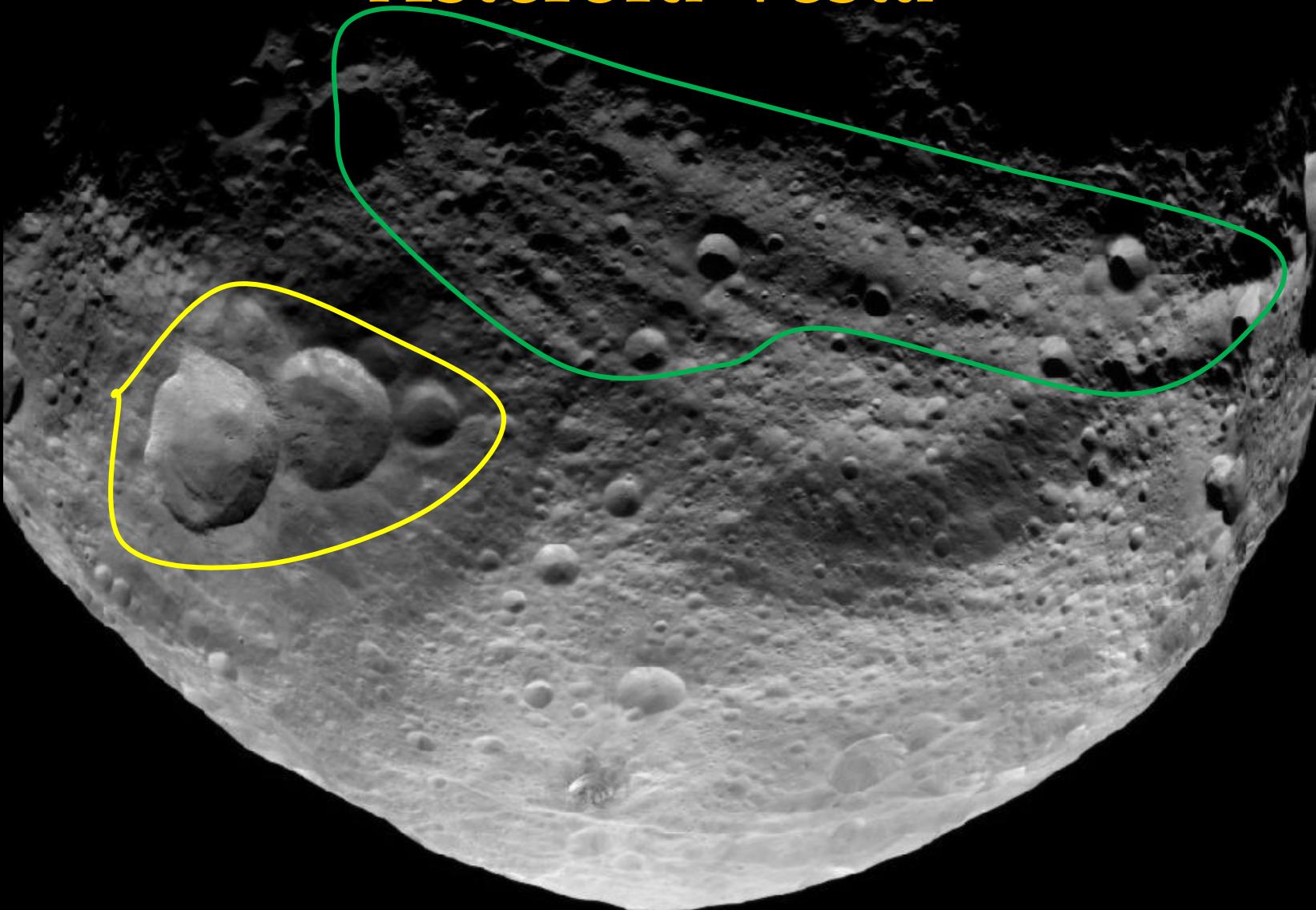
Methodology

- Analyzed images provided by the Lunar and Planetary Institute at http://www.lpi.usra.edu/exploration/education/hsResearch/asteroid_101/
 - Constraints
 - Characterization was limited to these three images
 - Images are limited in reflectivity due to rotation or position of sun-asteroid system so not all features present on the surface were able to be identified
 - Complete geologic histories were not able to be constructed due to limited image availability
 - Identified the major geological features and structures observed on the surface of each asteroid
 - Qualitatively described the albedo of these features on the surface of each asteroid

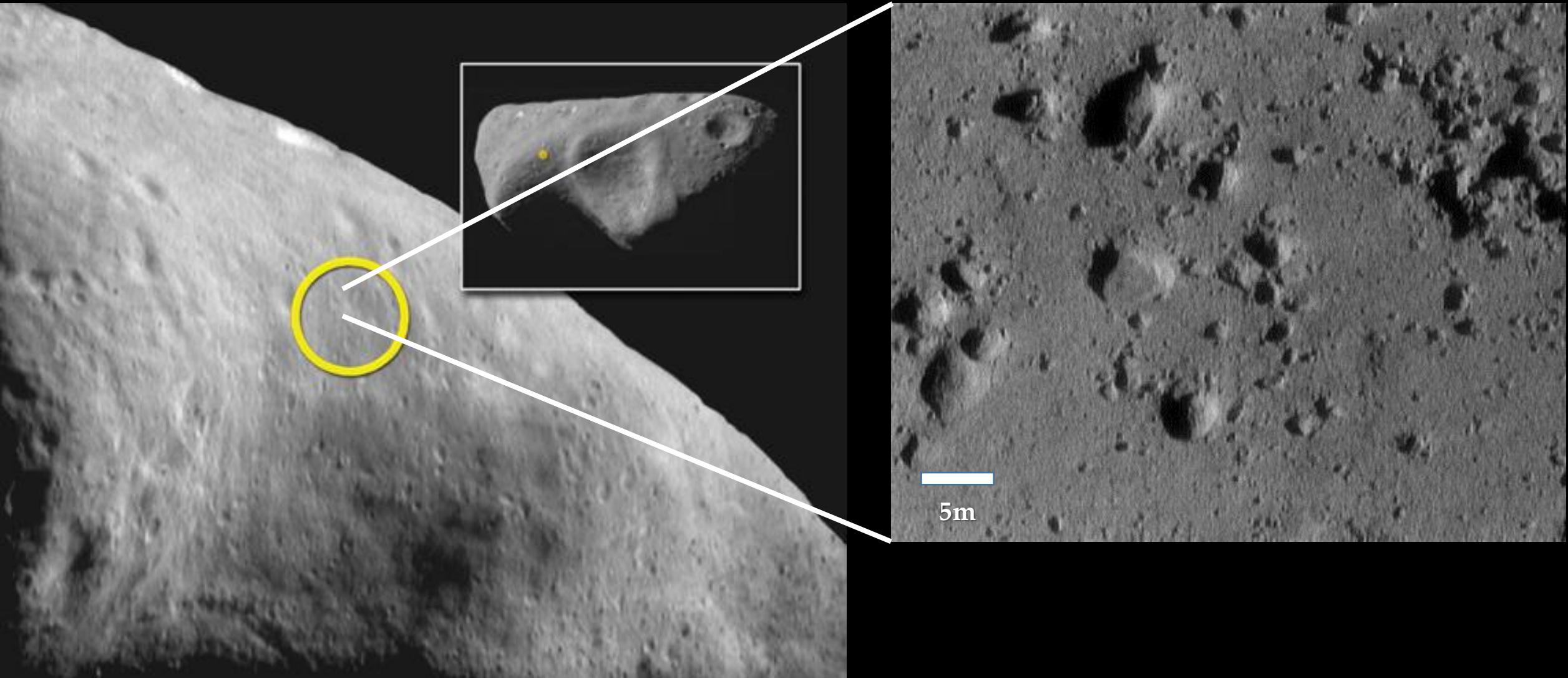
Analysis of Geomorphology Asteroid Itokawa



Analysis of Geomorphology Asteroid Vesta



Analysis of Geomorphology Asteroid Eros



Conclusions

- Asteroids Itokawa, Vesta, and Eros each demonstrate the three methods of asteroid formation.
 - Itokawa formed by the impact, fragmentation, and re-accretion into rubble pile
 - Vesta, being larger than 10km, formed by the complete melting of the interior through radioactive decay creating a differentiated interior
 - Eros formed by the accretion of chondrules resulting in uniform composition of pristine chondritic material. Metamorphism resulted in a layered, onion-like interior.
- Spectral analysis and reflectance indicate that Itokawa and Eros are S-type asteroids and Vesta is a V-type asteroid.
- Surface Geomorphology of all three asteroids indicate that impact cratering is the primary geologic process
- Depth and abundance of regolith indicates that Eros is relatively older than Vesta, which is relatively older than Itokawa.