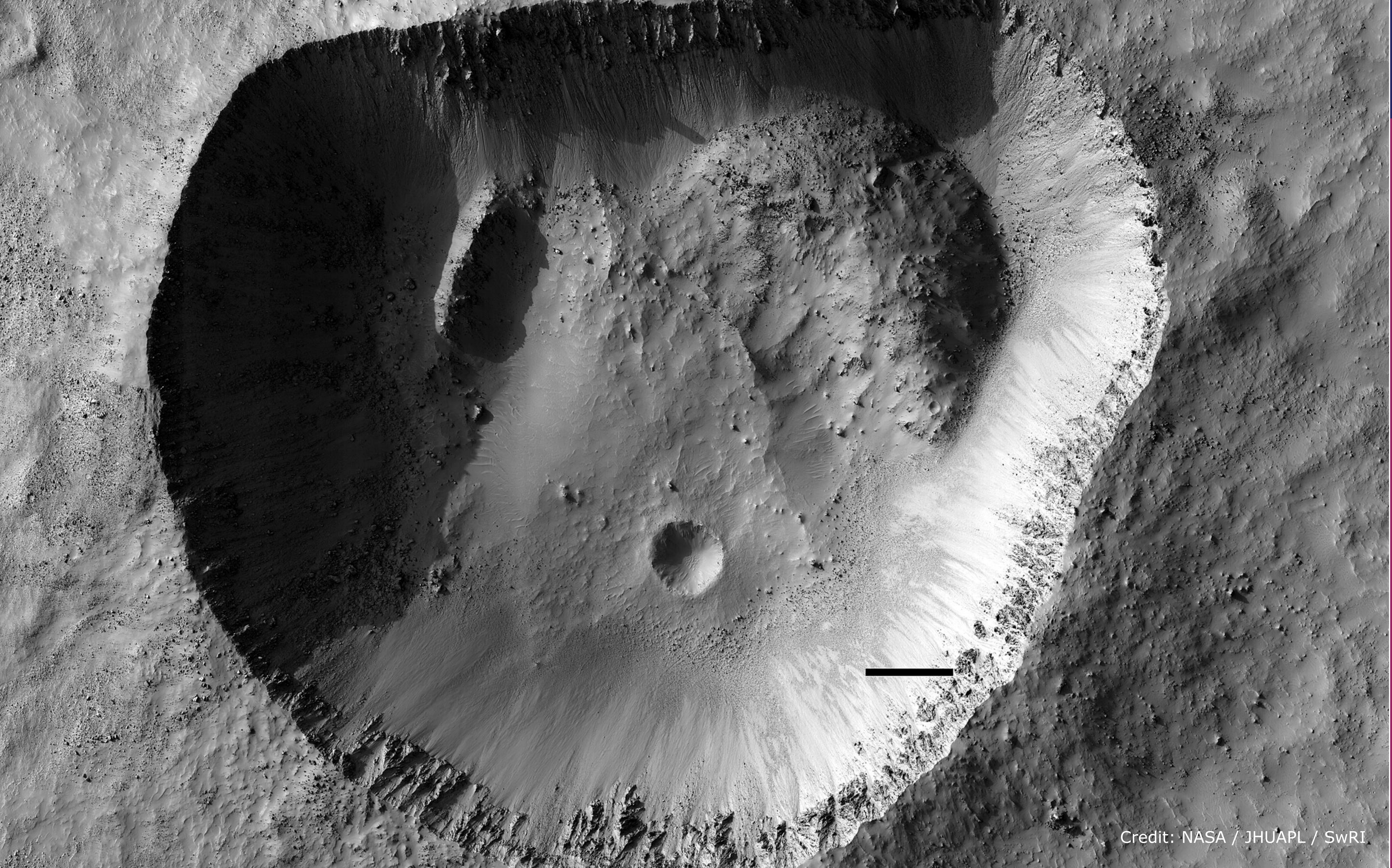
LUNAR GEOLOGY & ROVER IMPACT

MISSION CONTROL



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LEARNING OBJECTIVES

- Understand the geological features of the Moon and the formation of craters.
- Analyze the impact of craters on lunar rover exploration and design.

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LUNAR GEOLOGY

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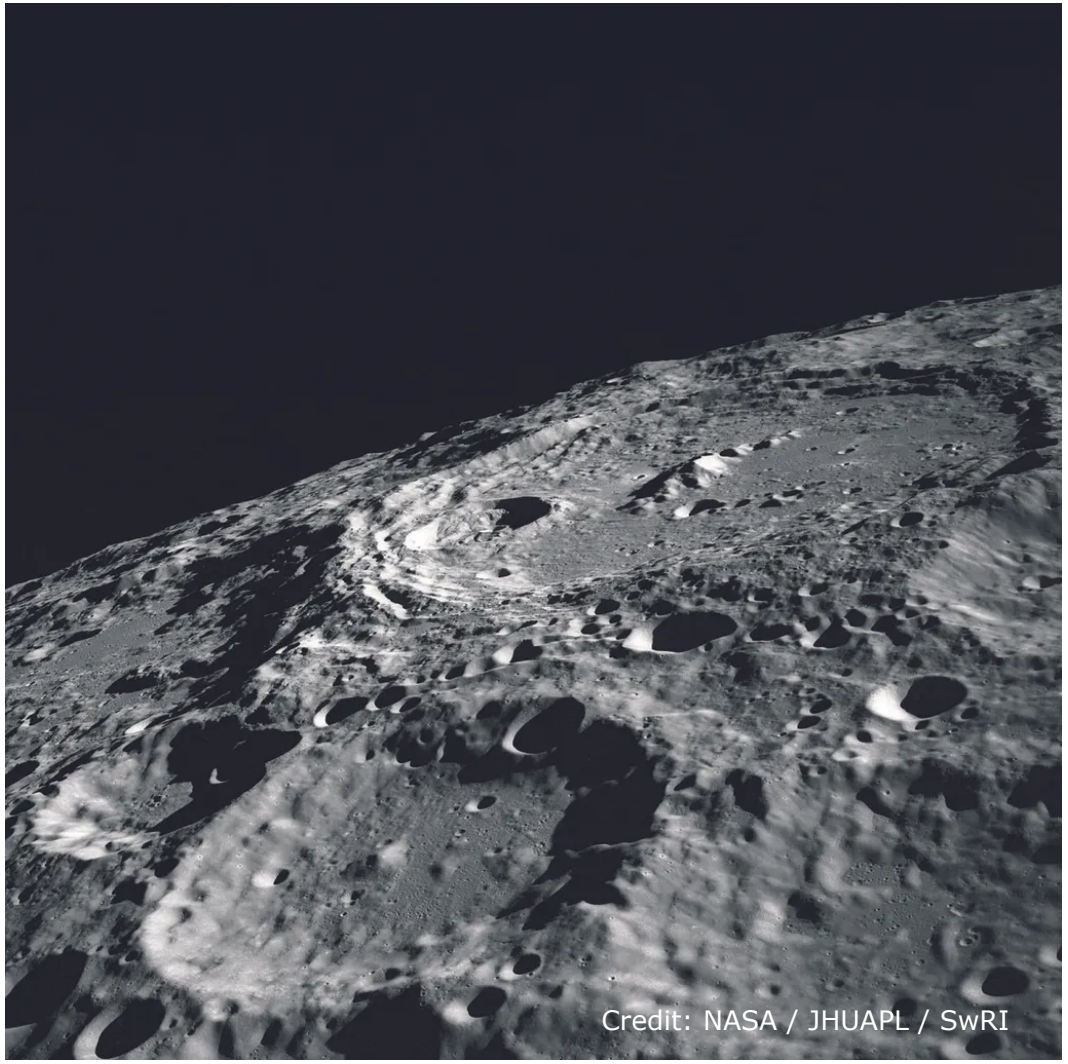
LUNAR SURFACE

Understanding impact craters, maria, highlands, rilles, and regolith is crucial for lunar exploration as they provide valuable insights into the Moon's geological history, formation processes, and surface characteristics. Studying these features helps scientists identify potential landing sites, assess surface conditions, and unravel the mysteries of lunar evolution.



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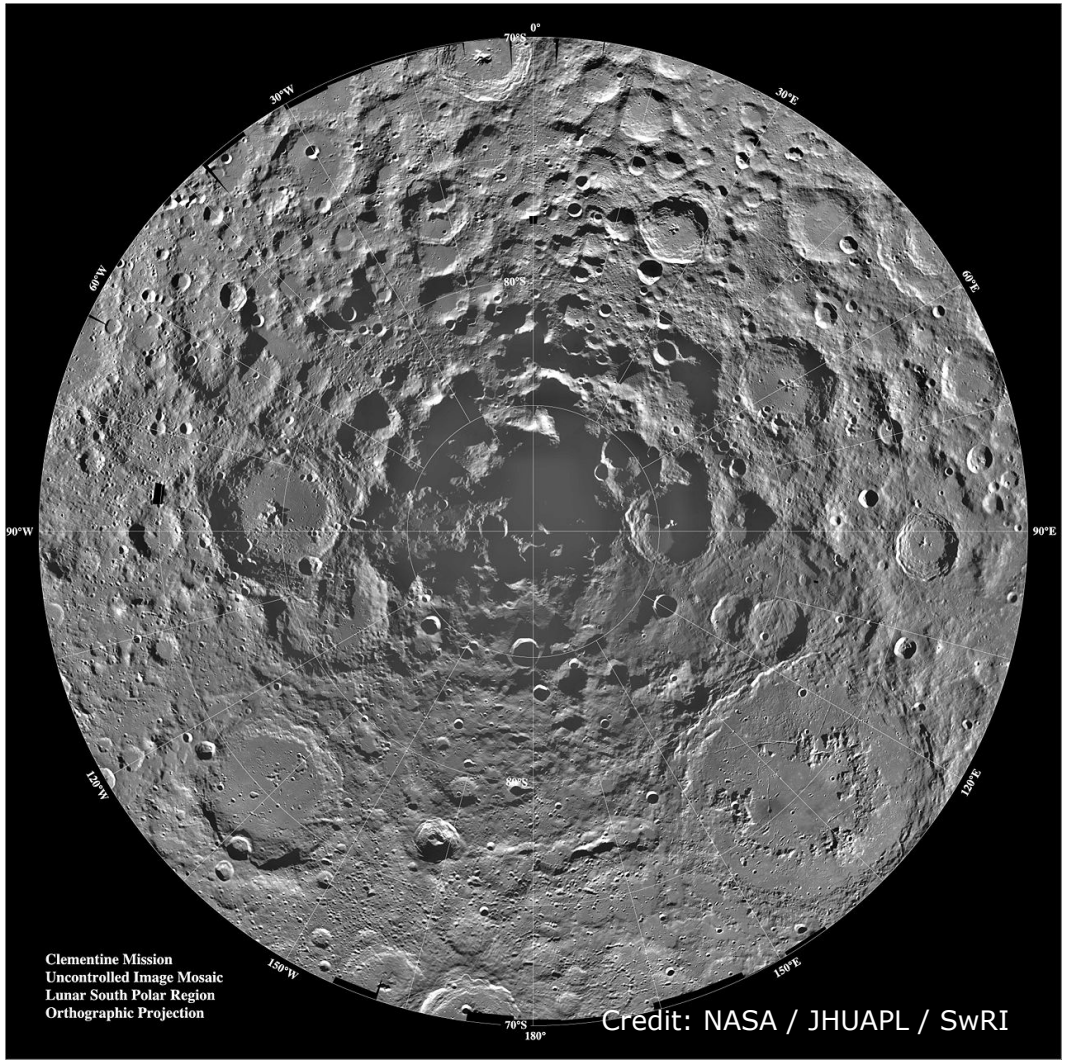
IMPACT CRATERS

Craters on the lunar surface are formed through impacts caused by meteoroids, comets, and asteroids. These depressions represent scars from celestial collisions, varying in size and shape across the Moon's landscape.



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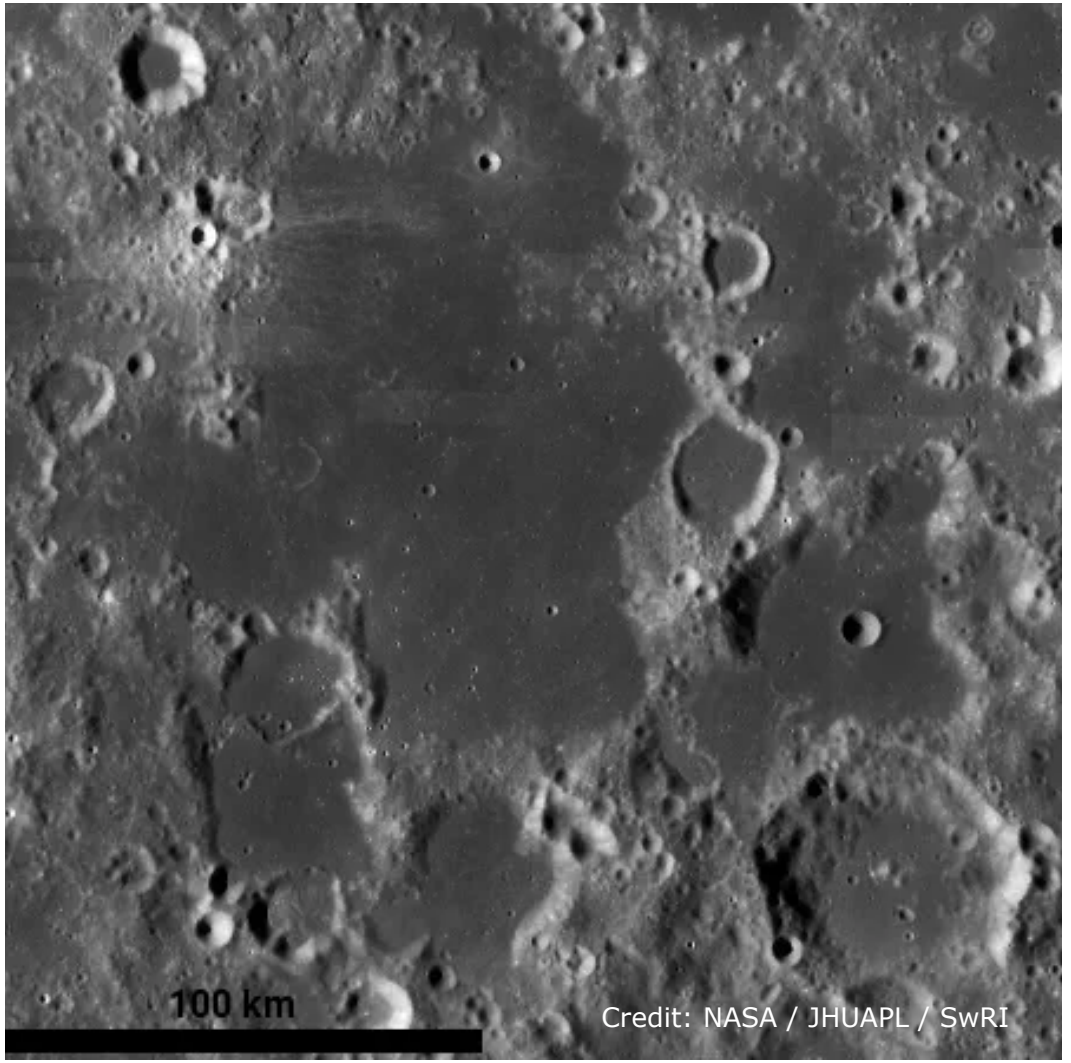
MARIA (SEAS)

Maria, also known as seas, are expansive, dark, and flat plains on the Moon, originating from ancient volcanic eruptions. These features, visible as dark patches on the lunar surface, played a significant role in shaping the Moon's geological history.



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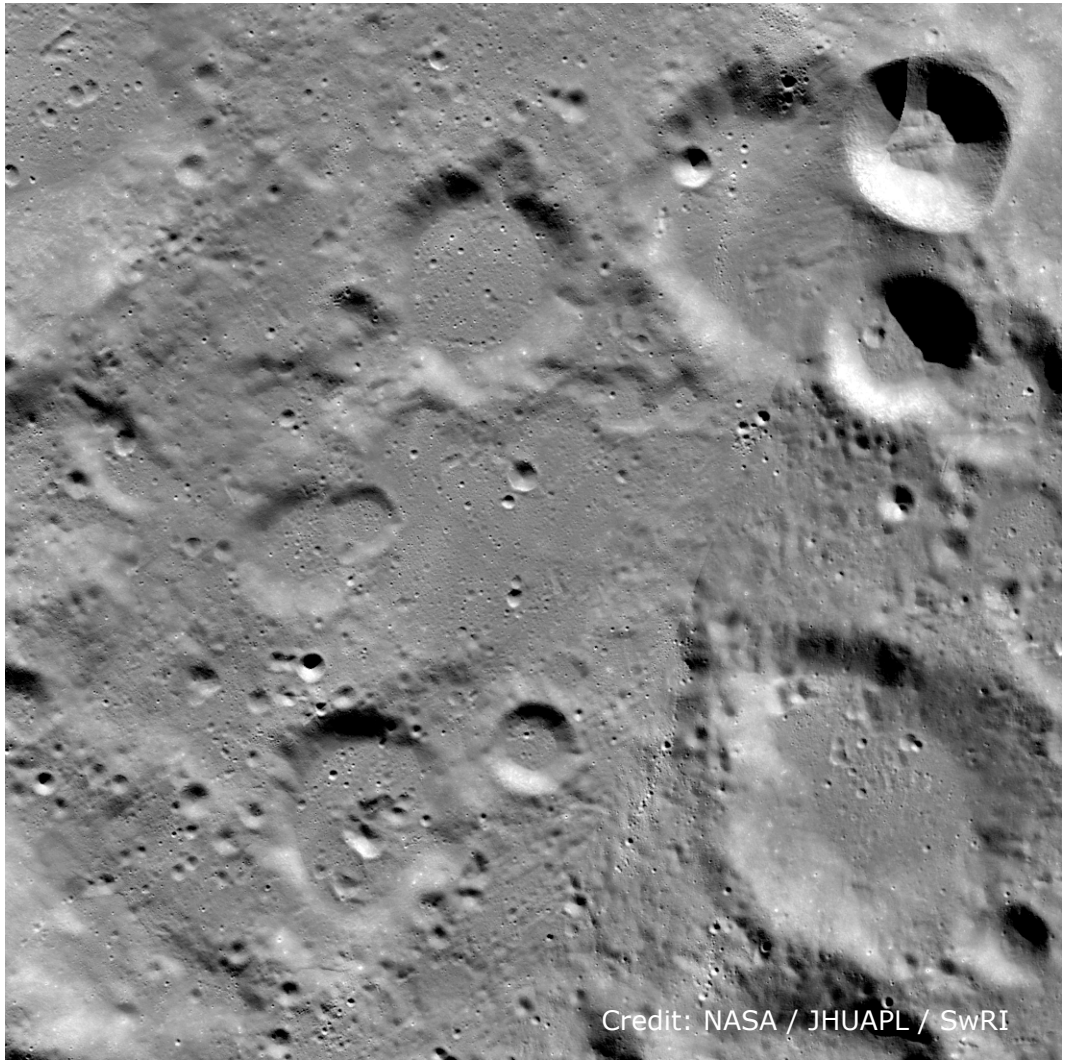
HIGHLANDS

Highlands on the Moon are elevated areas characterized by rugged terrain, mountains, and a profusion of impact craters. These regions, lighter in colour than the maria, contribute to the diverse and dynamic landscape and are part of the Moon’s crust.



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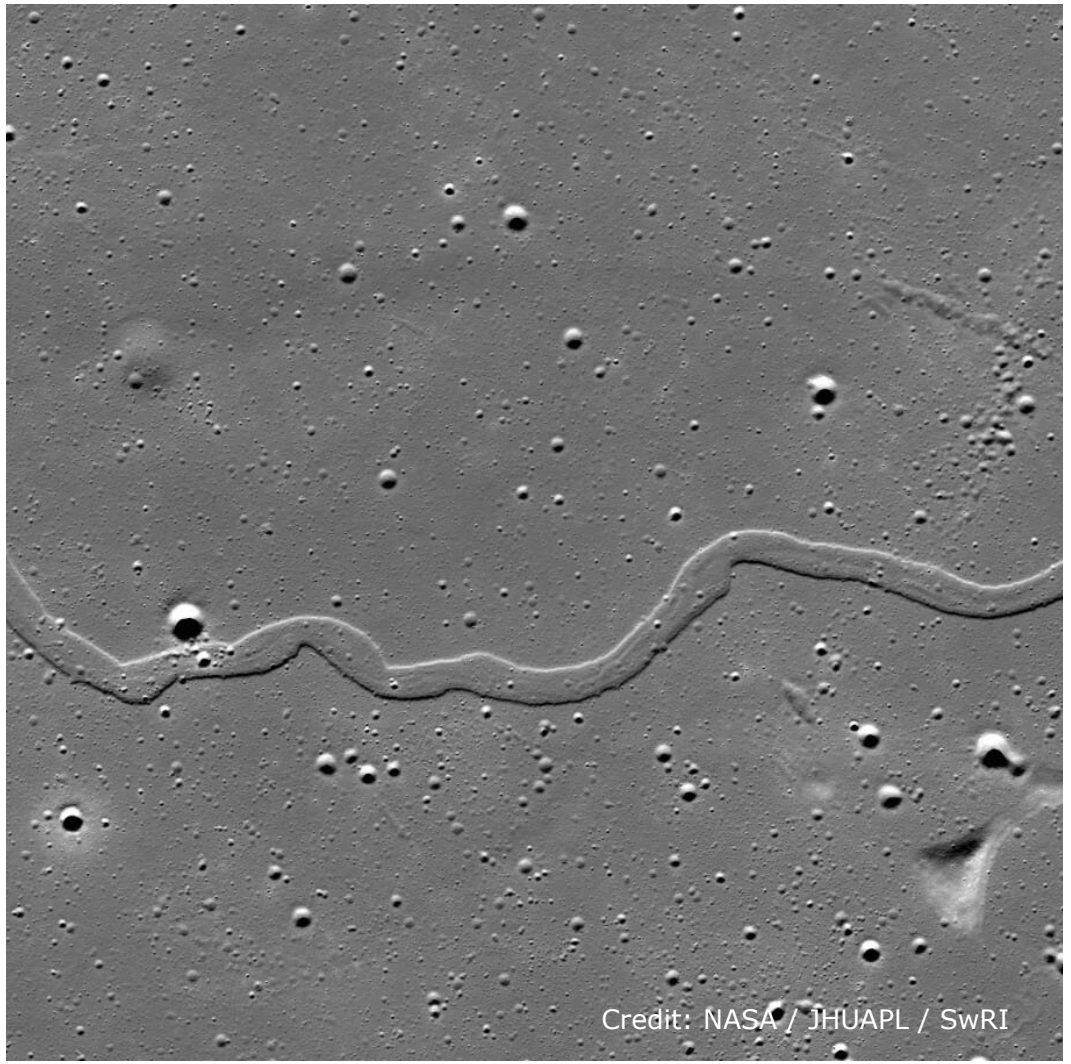
RILLES

Rilles are elongated and narrow depressions or valleys present on the lunar surface, thought to be formed by ancient lava flows. These features indicate the Moon's geological history, revealing clues about past volcanic activity.



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REGOLITH

Regolith is a layer of loose, fragmented material that blankets the lunar surface, composed of soil, dust, and small rock particles. This sharp and corrosive layer is the result of accumulated debris from countless meteoroid impacts over the Moon's history. Navigating regolith can be challenging for rovers if it is deep.

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GROUP ACTIVITY

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GET INTO GROUPS

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HANDS ON SIMULATION

The hands-on simulation is a vital component of this lesson, enabling students to directly interact with lunar geology and crater formation concepts. Materials needed include trays, flour, cocoa powder, small balls (representing asteroids or meteoroids), rulers, and optional safety goggles and dust masks. You will experiment with dropping balls from different heights and angles into trays filled with flour, measuring crater dimensions, and discussing observations.

Credit: Experiment Archive Labs

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RESEARCH TIME

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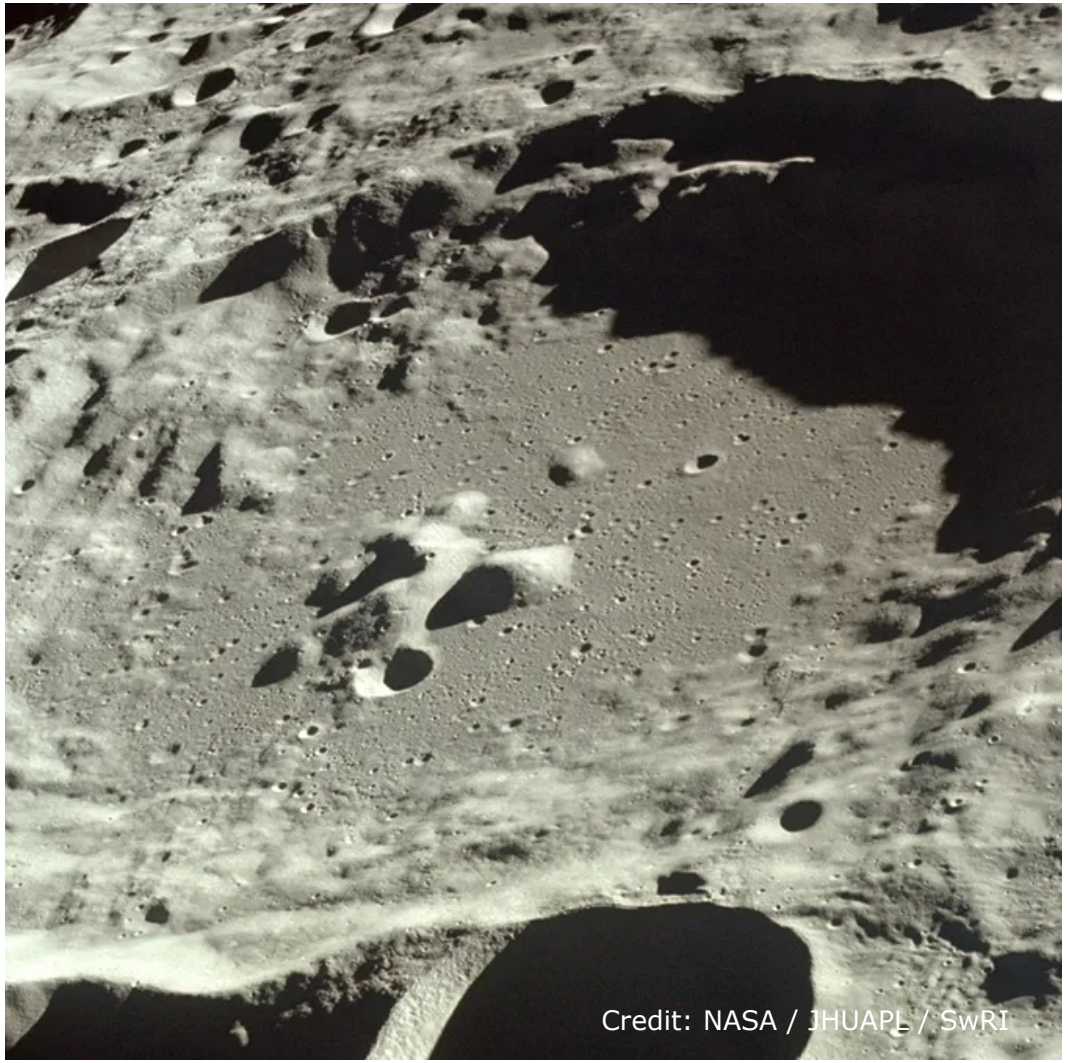
DISCUSSION

1. What did you notice when you dropped the balls to create impact craters?
2. Were there differences in the size and shape of the craters based on the height or angle of the drop?
3. Did the size of the 'impactor' affect the crater's appearance?



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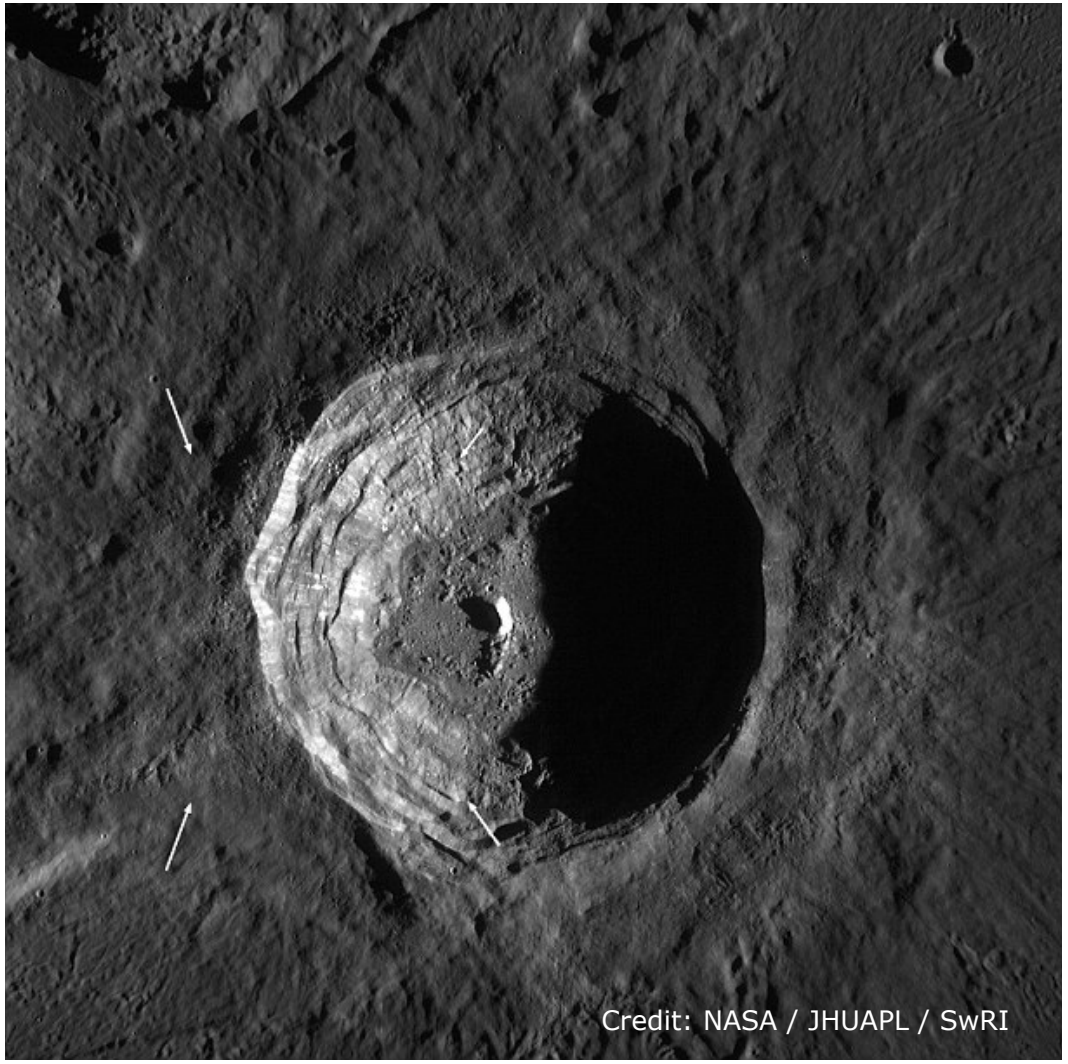
DISCUSSION

1. Why do you think craters formed the way they did?
2. What factors do you think played a role in how the craters turned out?
3. How might these observations relate to real lunar craters on the Moon's surface?



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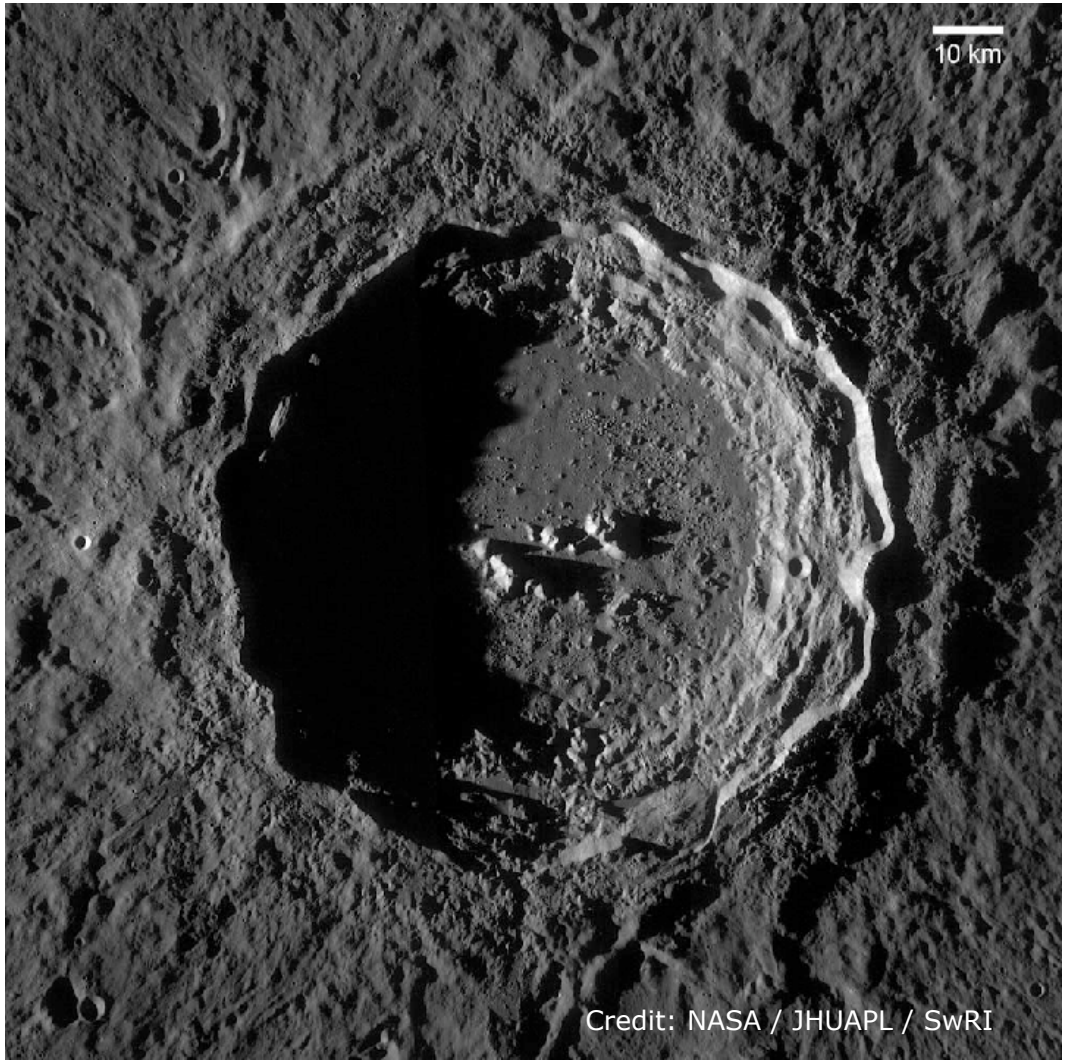
DISCUSSION

1. The Moon's surface, unlike Earth, lacks an atmosphere to protect it from impacts. How does this relate to the formation of craters on the Moon?
2. What similarities do you see between the craters you created and the actual craters on the Moon?
3. Why do you think understanding crater formation is important for lunar exploration, particularly for rover missions?



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ROVER IMPACT

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ROVER IMPACT

Craters pose navigational challenges for lunar rovers, requiring careful planning to avoid obstacles. Maria, highlands, rilles, and regolith impact a lunar rover team by influencing the selection of exploration routes and the rover's ability to manoeuvre across diverse lunar terrains.

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IMPACT CRATERS

Impact craters pose challenges for lunar rovers as they can create rough terrain and obstacles that impede smooth navigation. Rovers need to carefully manoeuvre around craters to avoid getting stuck or damaged. Impact craters can also obscure light. Depending on the depth, shadows can interrupt the solar energy needed by some designs to keep the rover warm and charge its batteries.

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MARIA (SEAS)

While flat plains are generally easier for rovers to traverse, the composition of the lunar maria may vary, impacting the rover's ability to collect samples. Rovers must adapt their exploration strategies based on the unique characteristics of each lunar sea.

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HIGHLANDS

Rugged terrain in the highlands can present obstacles for rovers. Navigating through mountainous regions and dealing with steep slopes require careful planning to ensure the rover's safety and mission success.

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RILLES

Long, narrow depressions or valleys can affect rover mobility. Rilles may introduce challenges related to navigation and may require the rover to adjust its path to avoid potential hazards.

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REGOLITH

The layer of loose lunar soil, dust, and rocks known as regolith can impact the rover's wheels and overall mobility. Rovers must be equipped to handle the varying textures and compositions of regolith, which can affect traction and manoeuvrability.

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WRAP UP

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LUNAR SURFACE

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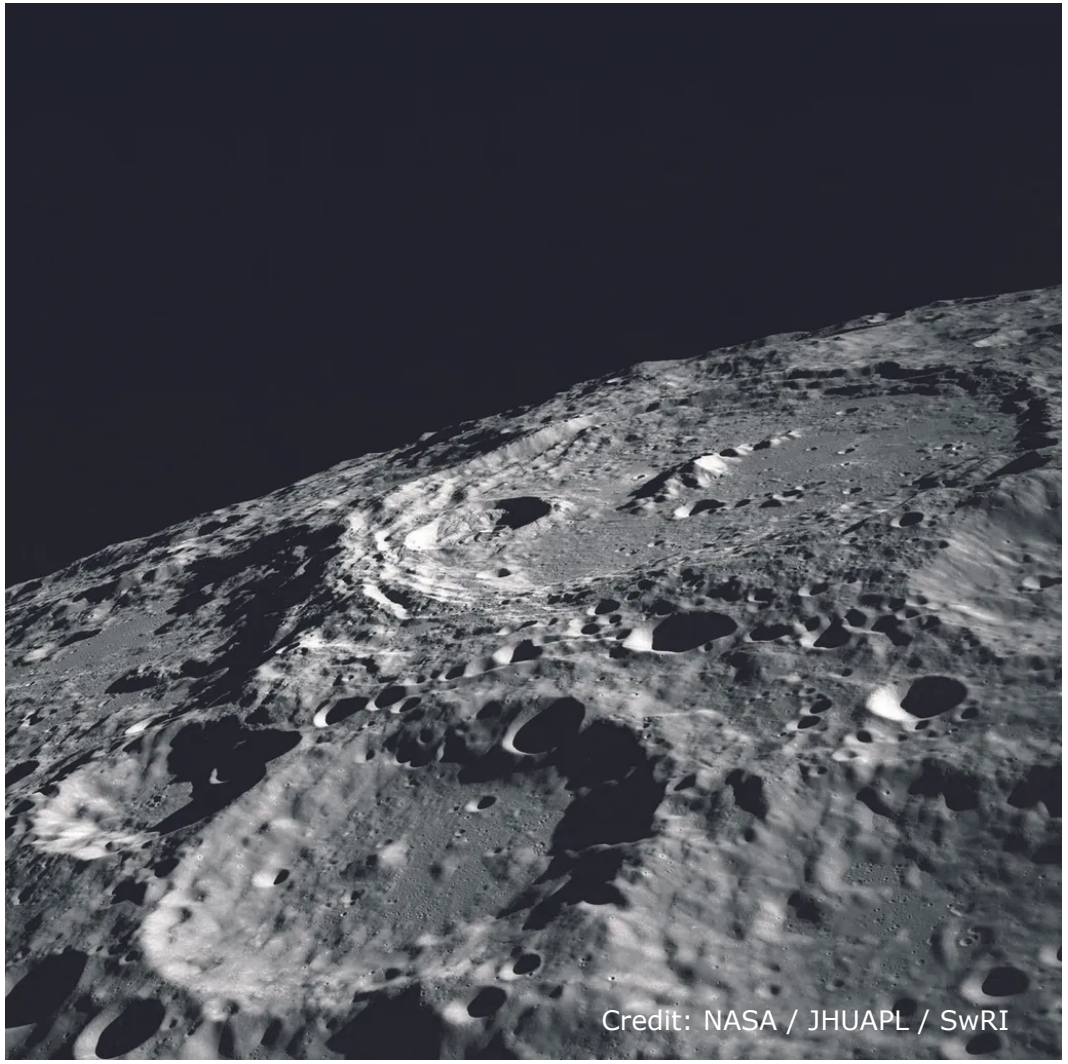

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