St. Mary's School

1865 A Heritage of Purposeful Learning

One Small
Step For ...
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What we will cover:

- Age of the Moon
- Theories on how the Moon Formed
- Physical Features on the Moon
- Conclusion
- Works Cited

The Age of the Moon

- The Moon is 4.55 Billion years old
- The Magma Ocean solidified 61 million years after the formation of the moon
- Isotopic dating of anorthosites using neodymium -143, -144, and samarium-147
- It has been geologically active until 2 billion years ago

Capture Theory

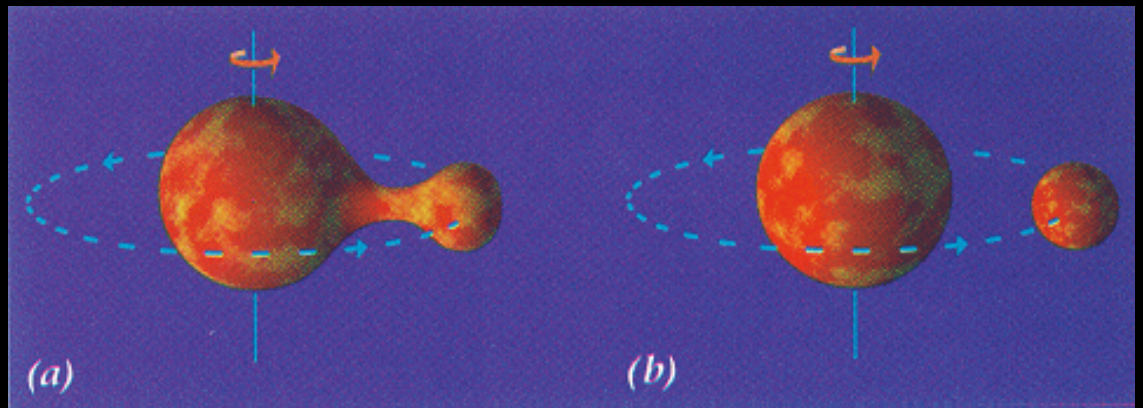
- Meteorite must be within a small range weight and size.
- at the exact right speed and angle
- caught in orbit
- could have: gotten a boost off the earth's gravity or crashed into the earth

- Probability of this occurring is extremely low:
- The makeup minerals on the moon are very similar to earth's
- The angle the moon would have to have entered at would make the moons orbit more of an ellipse than it is.

Fission Theory

- There is no "fossil evidence" backing this theory.
- There is extra baking of moon surface.

- The moon was once part of the earth.
- The earth spun so fast that the moon flew off.
- The composition of the moon is similar to the earth's mantle.
- The Pacific Ocean basin is where the moon used to be.



Double Planet Theory

The Theory:

The Moon and Earth formed simultaneously.

The Equation:

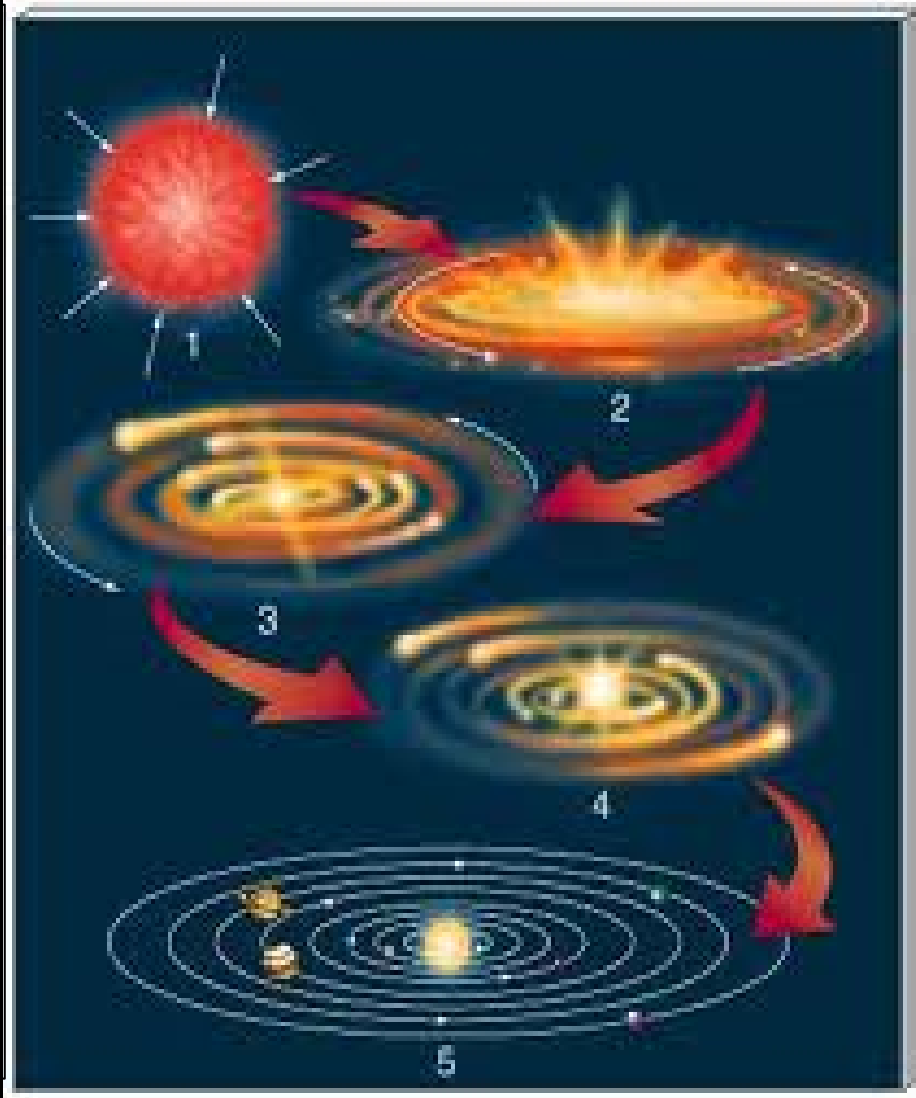
tug-of-war value=m1/m2 x (d1/d2) ^2

*m1=the mass of the primary planet

*m2=the mass of the Sun

*d1=the distance between the satellite and the Sun

*d2=the distance between the satellite and its primary planet



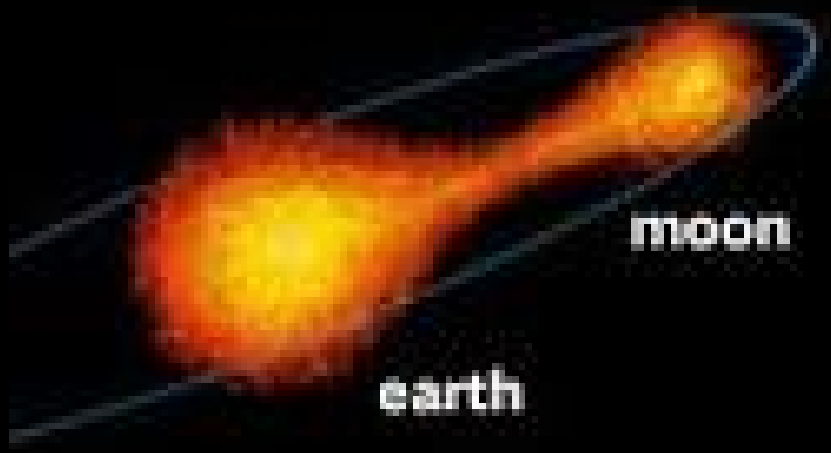
Double Planet Theory (cont.)

Problems:

Disk of warm gas would not form clumps of gas that eventually would form planets

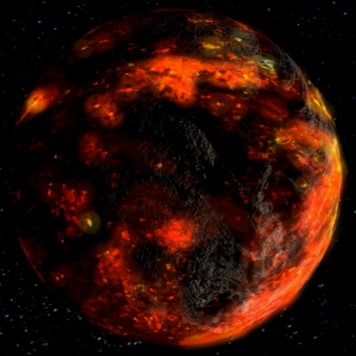
How did the Moon gain enough momentum to revolve around the Earth?

The Earth and the Moon do not have similar cores; the Moon's core is much smaller.



The Impact Theory

- debris left over from the collision
- Most favored theory.
- Supporting Evidence:
  - identical rotation of the Earth
  - moon fragments have identical oxygen isotopes
- Problems with theory:
  - energy from impact: leave ocean of magma on earth
  - moon has no dissolvable elements so how would it lose them (to earth)



The magma ocean theory

What

*energy from particles coming together created heat which partially melted the moon--created the magma ocean

*as moon crystallized lighter material floated and heavier ones sank

*lighter materials formed primary crust of moon

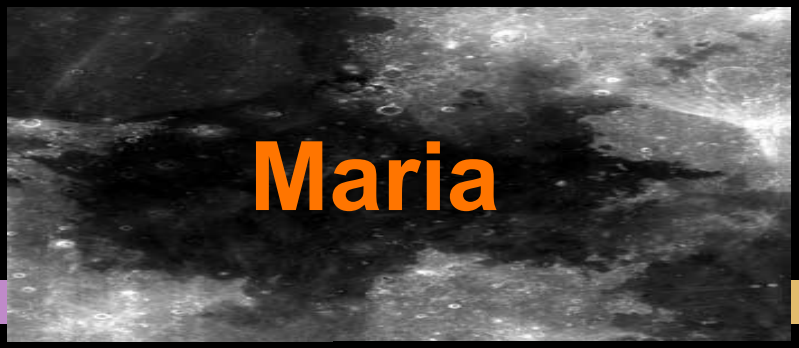
When

- Origin of Moon at 4.517 billion years ago
- 61 million years later anorthosite crust forms (about 75% crystallized)
- End of crystallization 39 million years later

Lunar Cataclysm

- Asteroidal/comet bombardment approximately 4.1 to 3.8 billion years ago.
- Evidence for the lunar cataclysm
- Cataclysm skeptics
- Possible causes
- The reason the craters on moon are visible

http://www.lpi.usra.edu/nlsi/science/lunarCat/lunarHighlands.jpg



Maria

- Low- laying dark areas on the moon
- Created by large impacts
- Filled with basaltic lava
- Basalt is a dark, fine grained rock
- Formed 3-3.5 Billion years ago

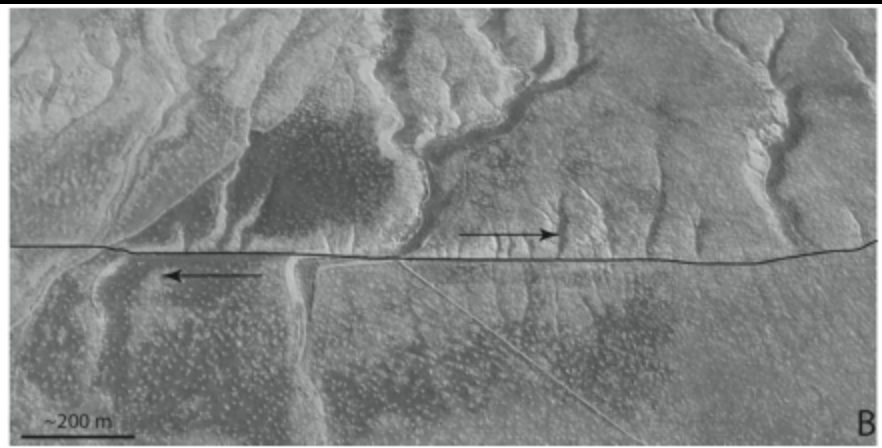
Lava Tubes

- Hollow tubular surfaces on the Moon
- Formed from basalt lava flows
- They can form to a length of up to 500 meters, longer tubes tend to collapse
- Likely candidates as shelter for manned explorations for future Moon expeditions

Faults-Earth

- On Earth, the majority of faults occur at plate boundaries. These are created by movement of tectonic plates.
- NOT character flaws.
- Some faults, grabens, can be created without plate tectonics. These occur when the crust is pulled apart and the leftover earth between the separating crust sinks down.

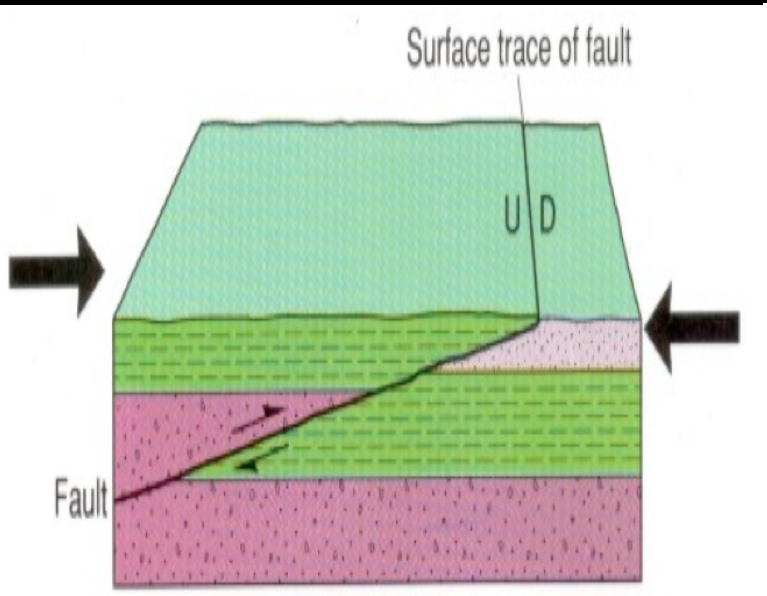
http://blog.moonzoo.org/2010/07/24/the-moon-has-its-faults/

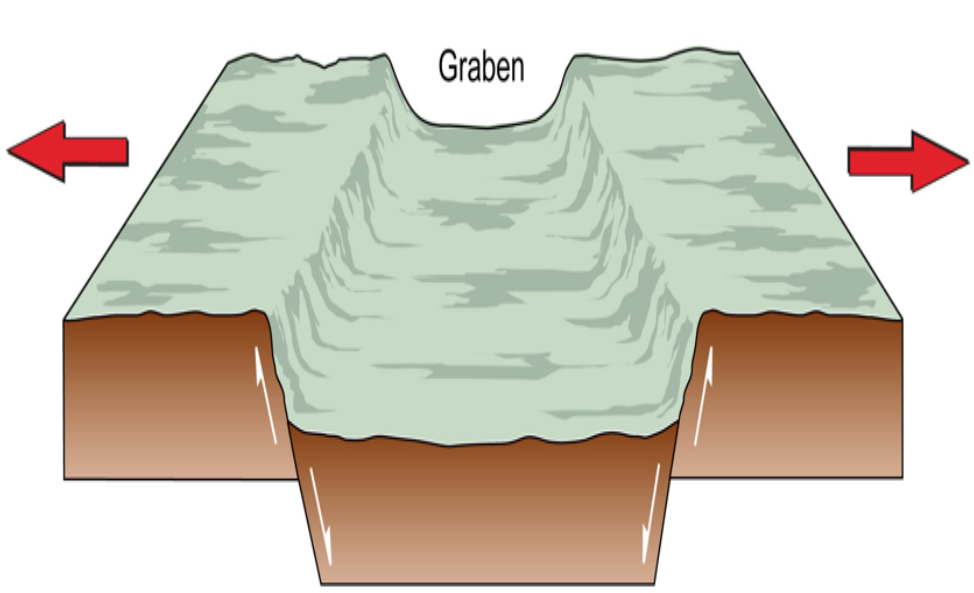


Faults-Moon

- Normal faults - caused by stretching and compression of the crust.
- 3 main types - straight rilles, Isolated normal faults, and thrust faults.
  - Straight rilles characterized by Graben, are both linear and accurate
  - Isolated Normal - very rare, very linear.
  - Thrust - caused by compression of the crust.

http://blog.moonzoo.org/2010/07/24/the-moon-has-its-faults/





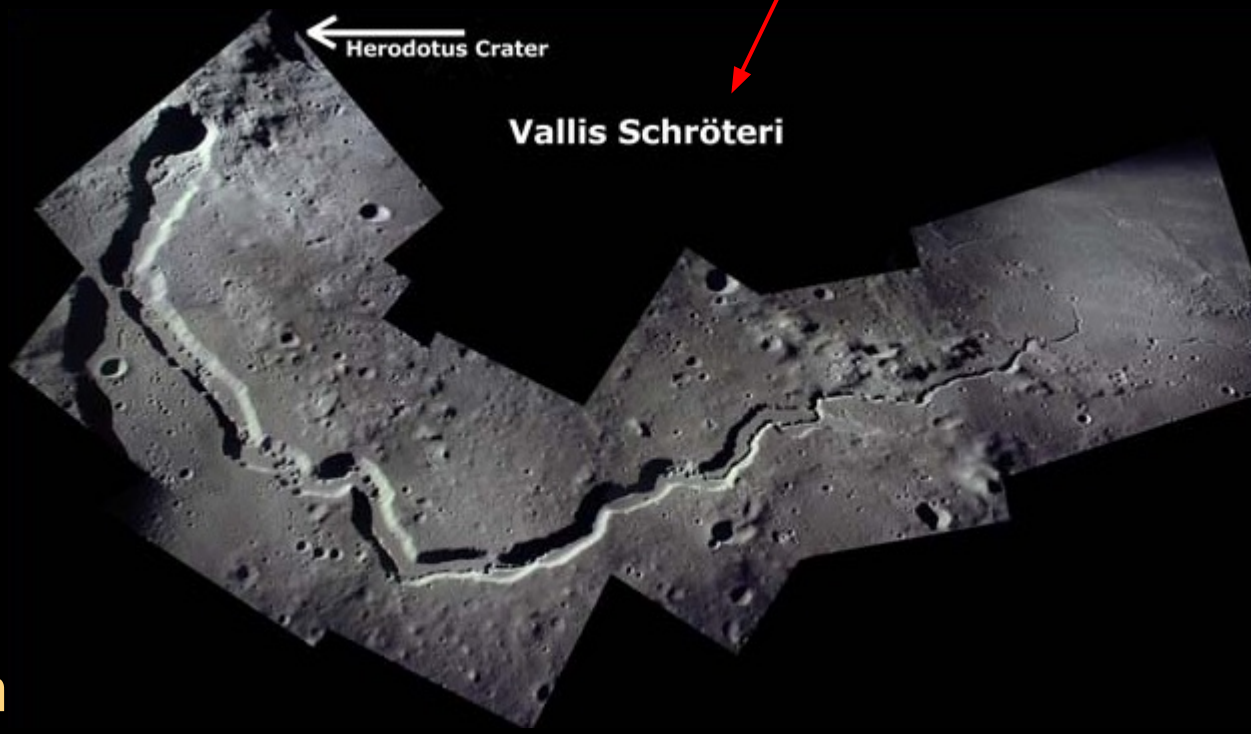
Lunar Highlands

- Composition
  - *Anorthosite*
  - *Breccias*

  Age of Lunar Material
- Appearance
- Albedo level
- Topography

Rilles

- Causes:
  a. Collapsed lava tubes
  b. Lava flows from active volcanoes
  c. Tension
- Types:
  a. Arcuate
  b. Sinuous
  c. Straight or Graben



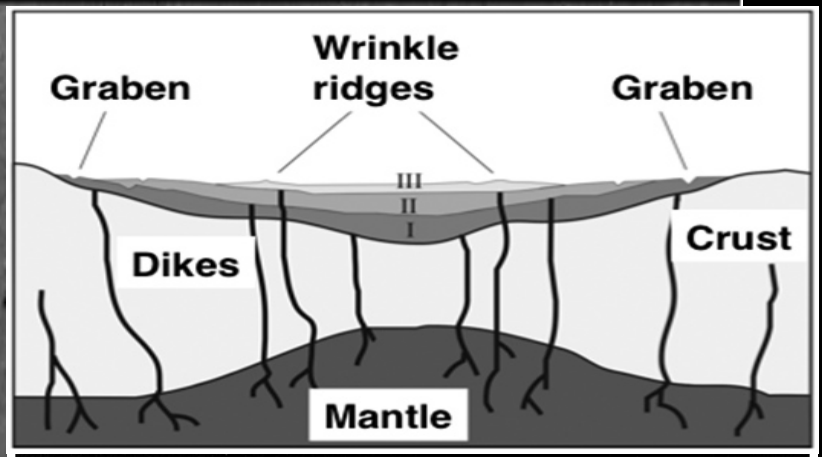
Wrinkle Ridges

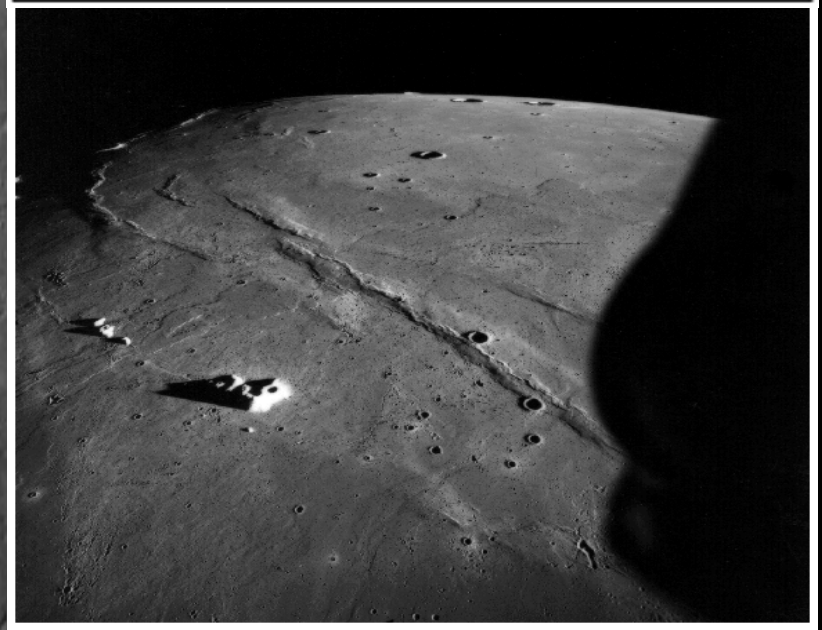
1) Dimensions vary

2) Studies began 1885

3) Found predominantly in the volcanic mare regions

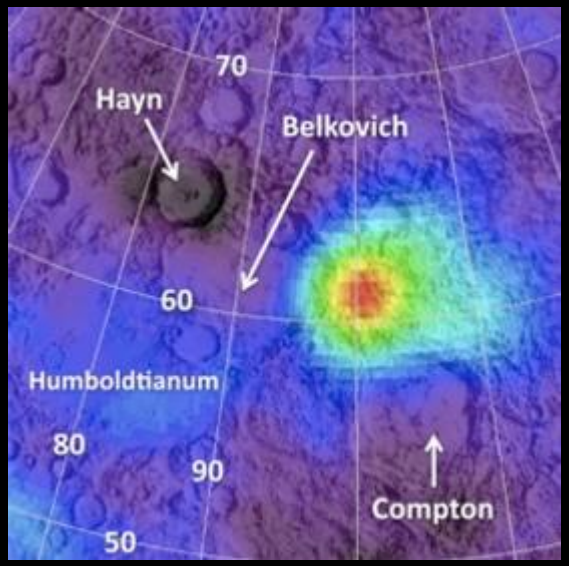
4) Formed when the cooling magma shrank

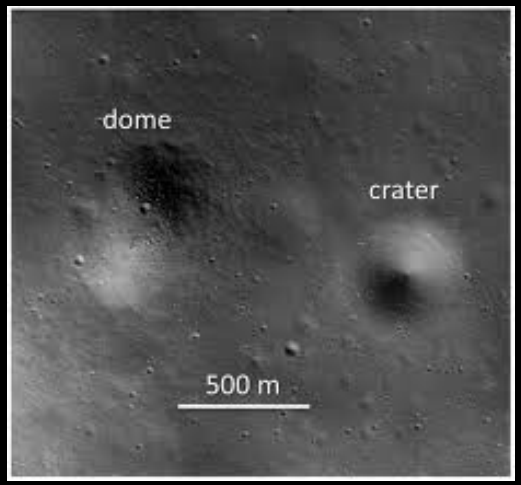




Moon Volcanoes

- Dormant silicate volcanoes recently found on the non-visible side of the moon.
  - images have proven that rare volcanoes (in the area called the Compton-Belokovich) that have been active more recently on the "far side"
- Basaltic volcanoes are located on the visible side of the moon.
  - resulted in dome like formations above the moons surface





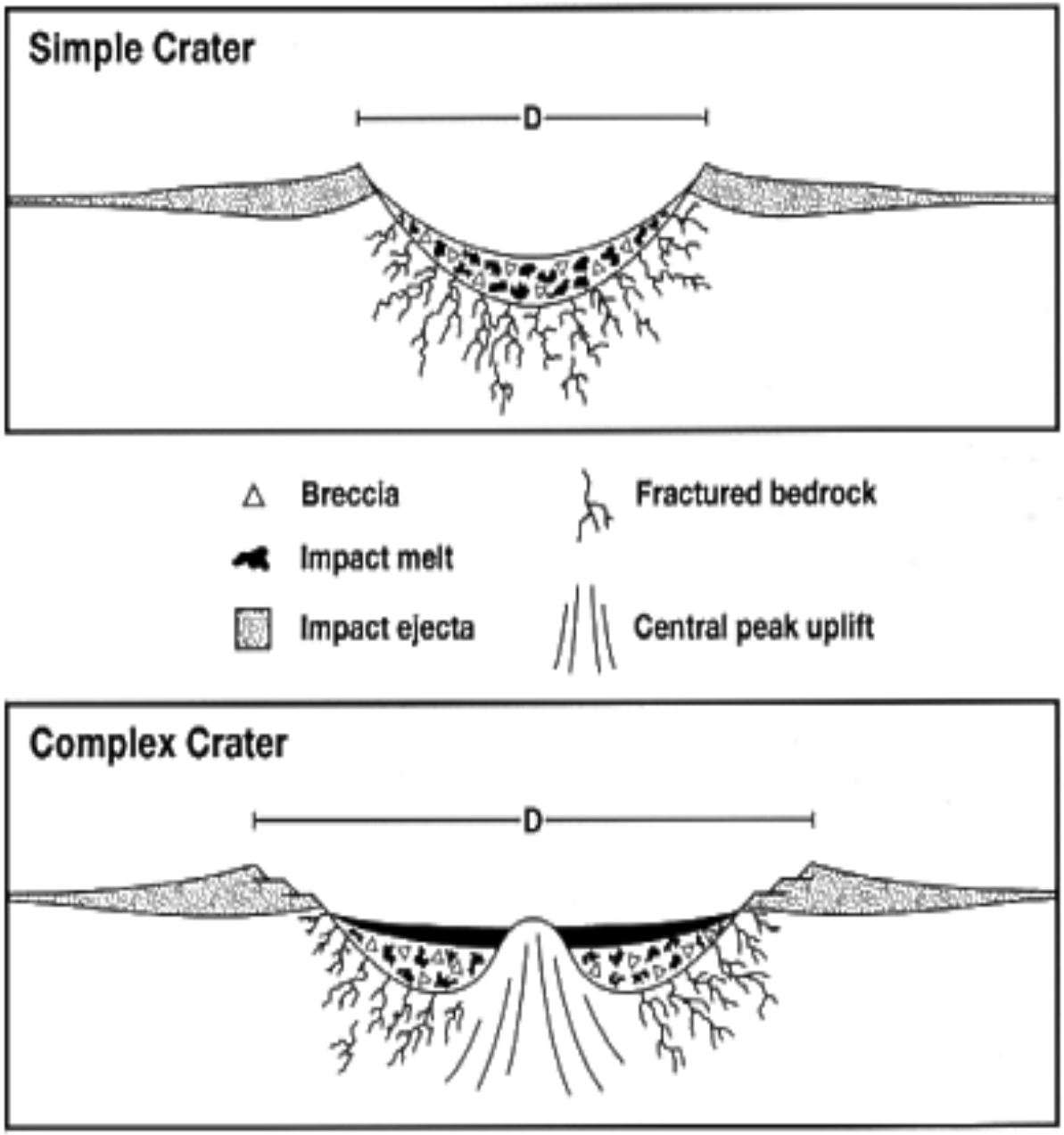
CRATERS ARE MADE WHEN OBJECTS HIT THE MOON!

SIMPLE CRATERS ARE FORMED WHEN SMALL, SLOWER MOVING OBJECTS HIT.

WHEN BIG, FAST MOVING THINGS HIT, COMPLEX CRATERS ARE FORMED.

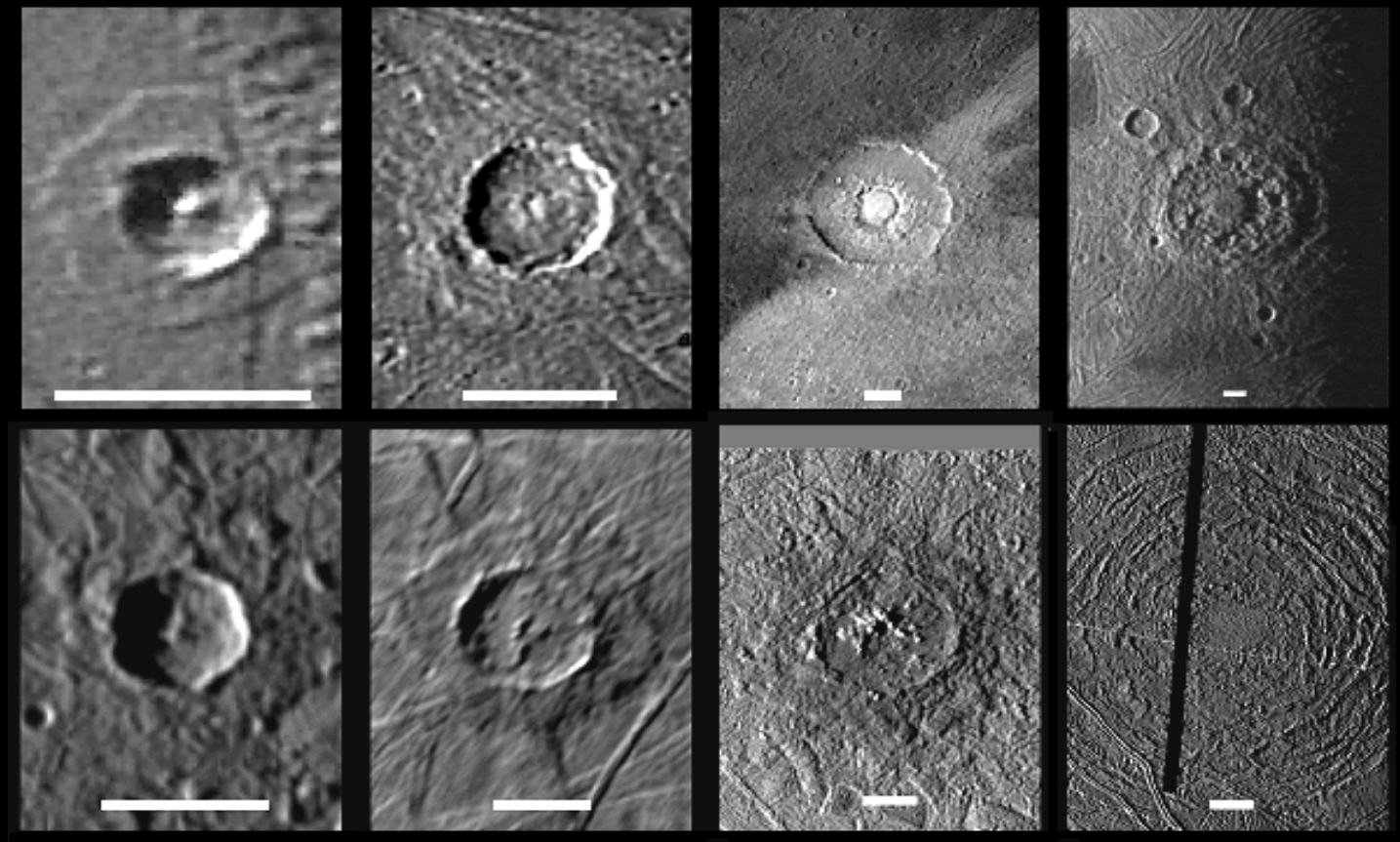
SECONDARY CARERS ARE FORMED WHEN SMALL PIECES OF LARGER CRATERS SHATER OFF AND IMPACT NEARBY.

REALLY BIG PROJECTILES FORM BASINS.

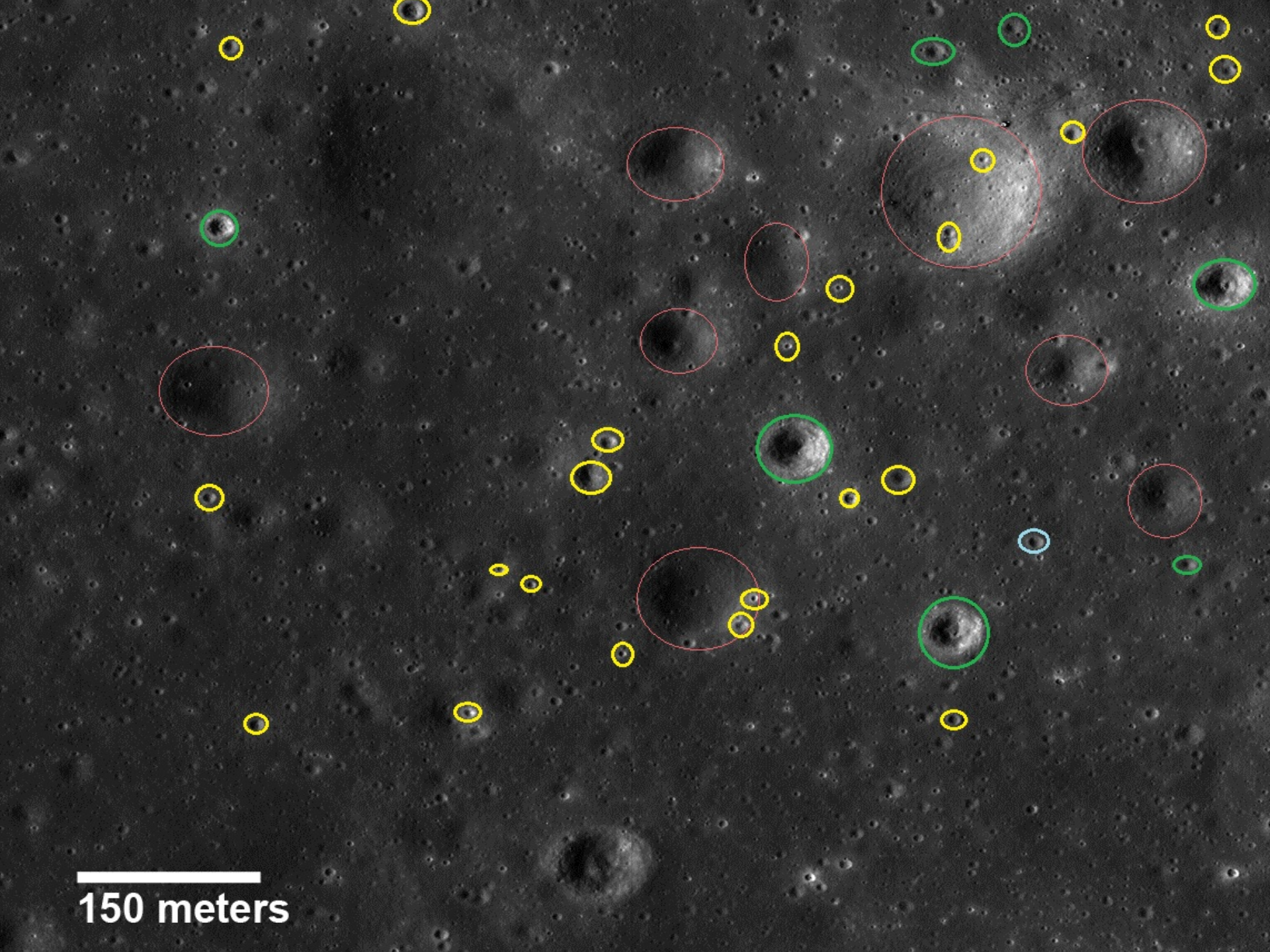


Crater Morphology

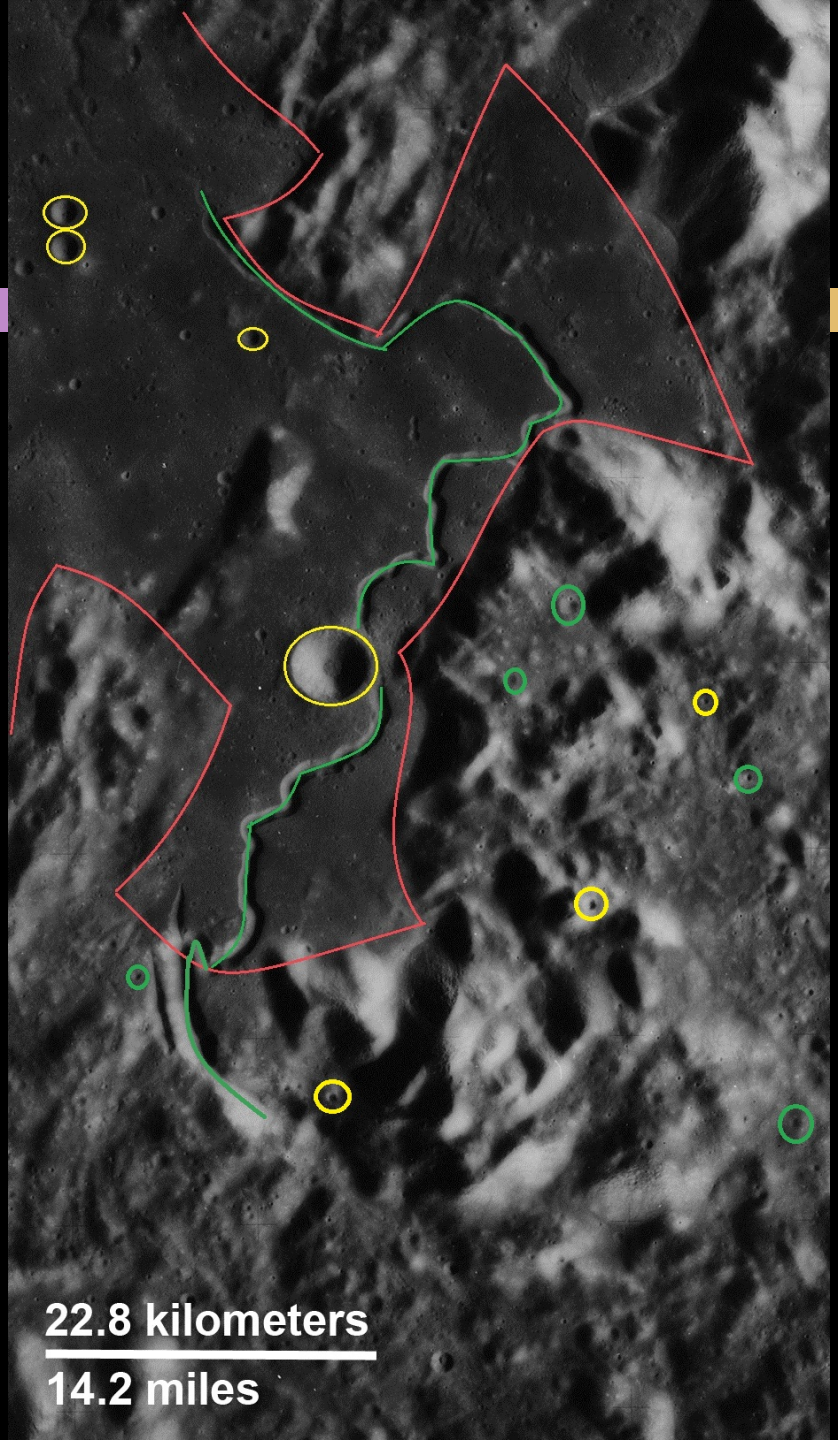
Fresh craters have raised rims.



Craters get flat and lose their shape as they age.


150 meters

1.2 kilometers


22.8 kilometers
14.2 miles

Conclusion:

Thanks for the opportunity to allow us to present. We had a great time creating the presentation and getting to know each other better as a group. Thanks again,

-Dashton Peccia, Editor

S M A R T S

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