

STARS RESOURCES

Student workbook

Observing the Moon

ACTIVITY

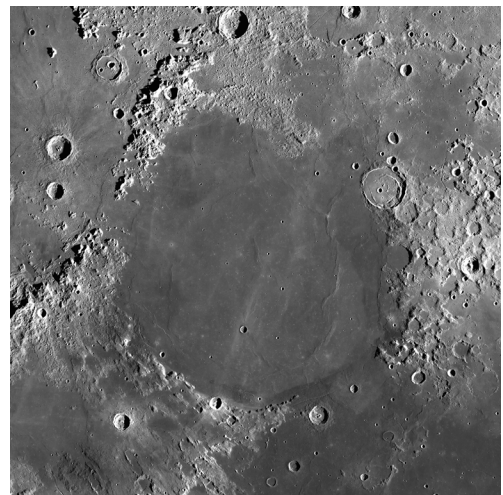
Observe the features on the Moon with the help of a telescope.

Note: it is suggested that this activity is conducted when the Moon is not full for safety reasons. The full Moon is dangerously bright and could damage your eyes.

BACKGROUND INFORMATION

The Moon formed about 4.5 billion years ago. It is thought that it was formed from a collision between the Earth and another small planet. The debris from the impact coalesced in orbit around the Earth and formed the Moon. Over its very long lifetime, it has developed some spectacular geological features on its surface.

Maria (seas): Large plains made of basalt. Basalt is a black, igneous rock that was formed during by volcanoes when the Moon was very young. Maria don't contain any water.



Mountains: Lunar mountains, known as 'mons' (singular) were formed by asteroid impacts in the distant past.

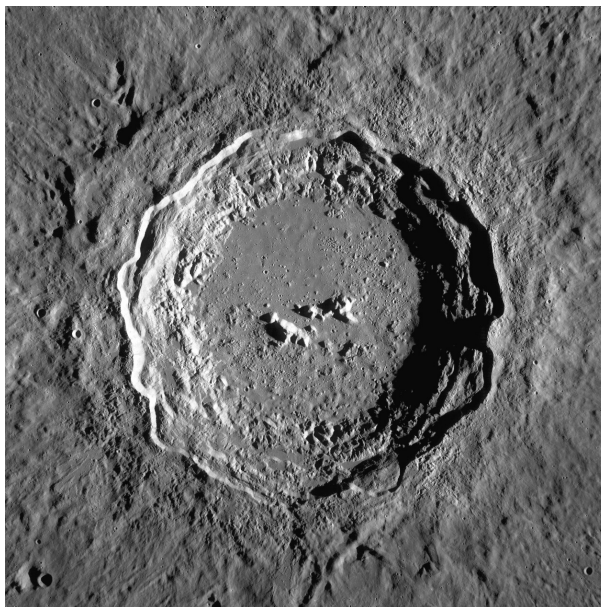


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BACKGROUND INFORMATION

Craters: Mostly created from debris from space colliding with the surface of the Moon.



Rille or rima (groove): On Earth these are formed from water running down a slope and carving out a channel. On the Moon, flowing lava carved out channels. This means you can track a rille back to the volcanic source.

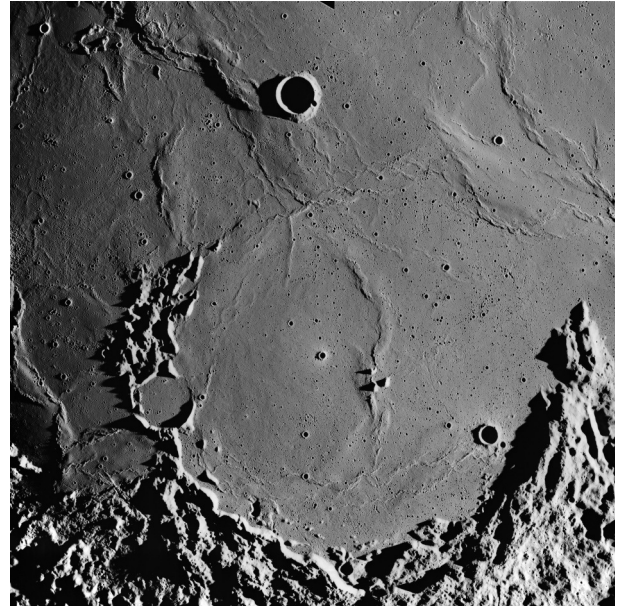


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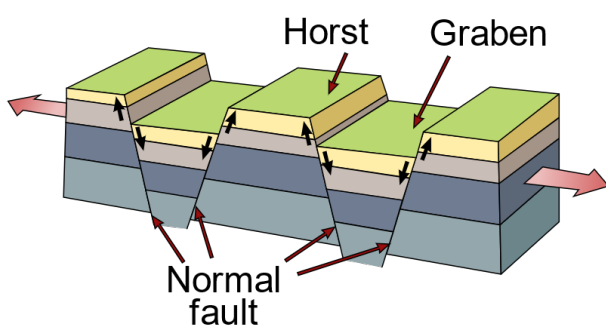
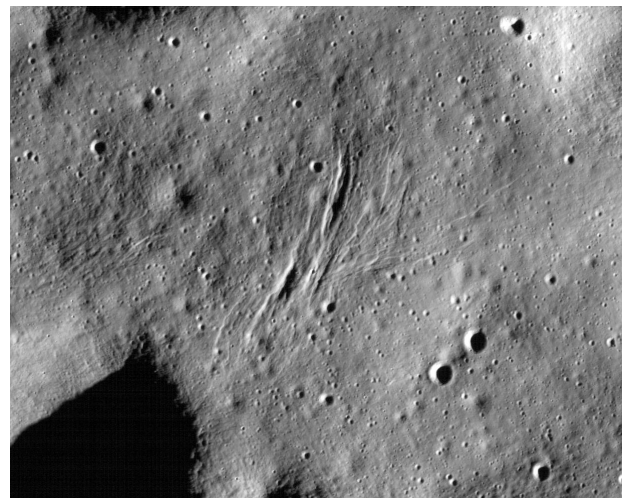
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BACKGROUND INFORMATION

Wrinkle-ridge: Found within mares, wrinkle ridges were most likely created after the lava cooled as the result of the Moon's version of plate tectonic



Graben: Found when the ground is stretched and the rock in between subsides.

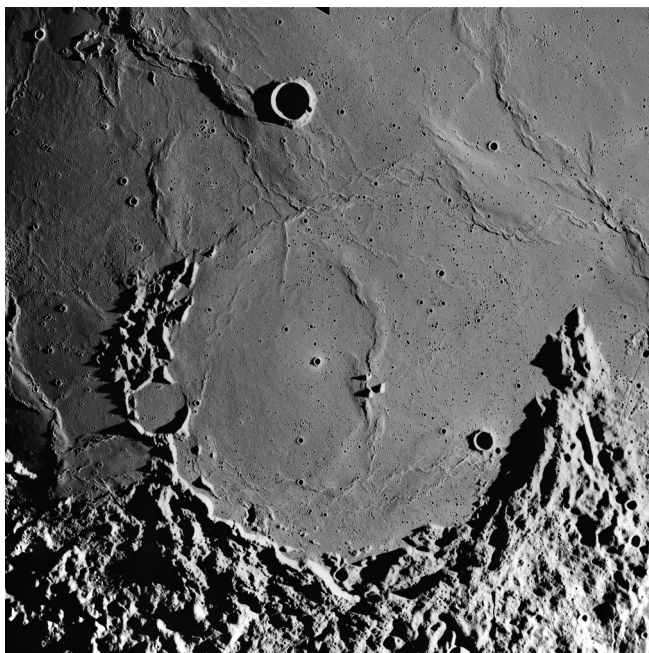


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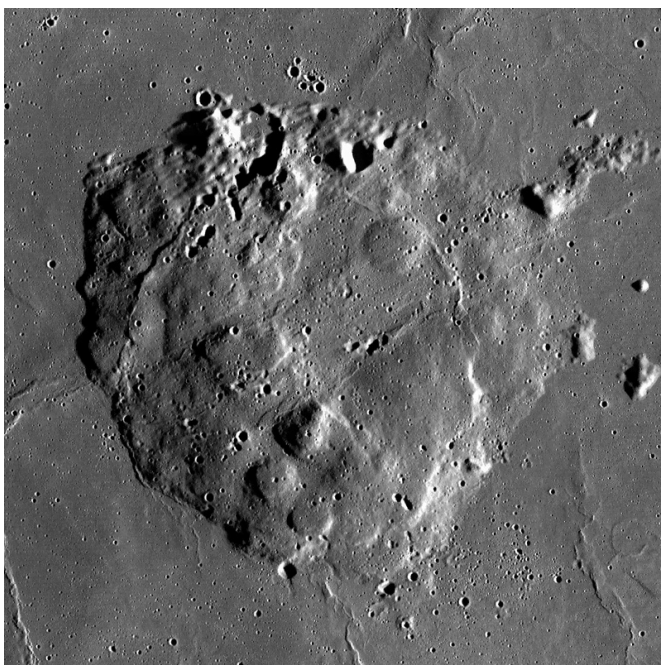
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BACKGROUND INFORMATION

Rupe (or scarp): High walls, or cliffs. On Earth we tend to call these scarps, or escarpments.



Dome: A type of shield volcano. Viscous (i.e. thick, gooey) lava created large, domes with gently sloping sides.

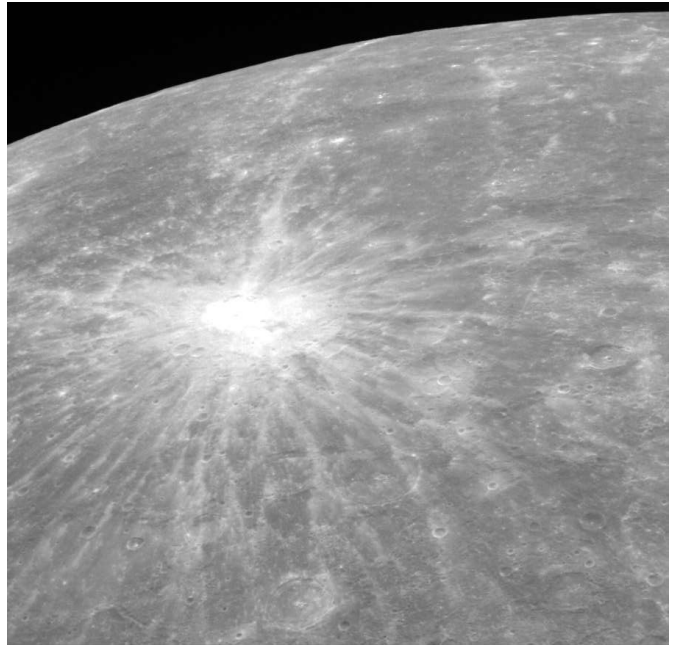


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BACKGROUND INFORMATION

Ray: A pattern formed when large objects collide with the Moon. A crater is formed at the impact site, but radiating out from that are rays, usually made of lighter colour material.



EQUIPMENT

You will need the following to complete this activity.

- Paper
- Pen/pencil
- Telescope (or binoculars)
- Internet (optional)
- Supplied map of the Moon
- More detailed maps of the Moon (optional), for example:

‘Image mosaic and topographic map of the moon’, US Geological Survey/NASA website, <https://www.usgs.gov/maps/image-mosaic-and-topographic-map-moon> (13 April 2015)

‘Color-Coded Topography and Shaded Relief Map of the Lunar Near Side and Far Side Hemispheres’, US Geological Survey website, <https://pubs.usgs.gov/imap/i2769/> (2003)

‘Moon Observation: How to Observe the Moon? (Infographic)’, Infographics Archive website, <https://www.infographicsarchive.com/infographic-how-to-observe-the-moon/> (4 Oct 2021)

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OBSERVATIONS

1. Choose the right time.

The best time to observe the Moon is two or three days after the first quarter. Most of the major features on the surface will be visible, and it won't be so bright that details are lost. Use this website to see what phase the Moon is in <https://www.timeanddate.com/moon/>.

2. Find the terminator.

Imagine that you're examining the Moon's early morning or late afternoon. The shadows are long. But this makes features such as the lunar mountains and scarps stand out.

3. When you find a new feature, sketch and plot it on the blank map of the Moon on the following page.

The following NASA webpage has some suggested features to look for.

'Moon Map for the Southern Hemisphere', Earth's Moon NASA website, <https://moon.nasa.gov/observe-the-moon-night/resources/moon-map-southern/> (16 October 2021)

In particular, look for:

* large, dark, smooth areas. These will be maria.

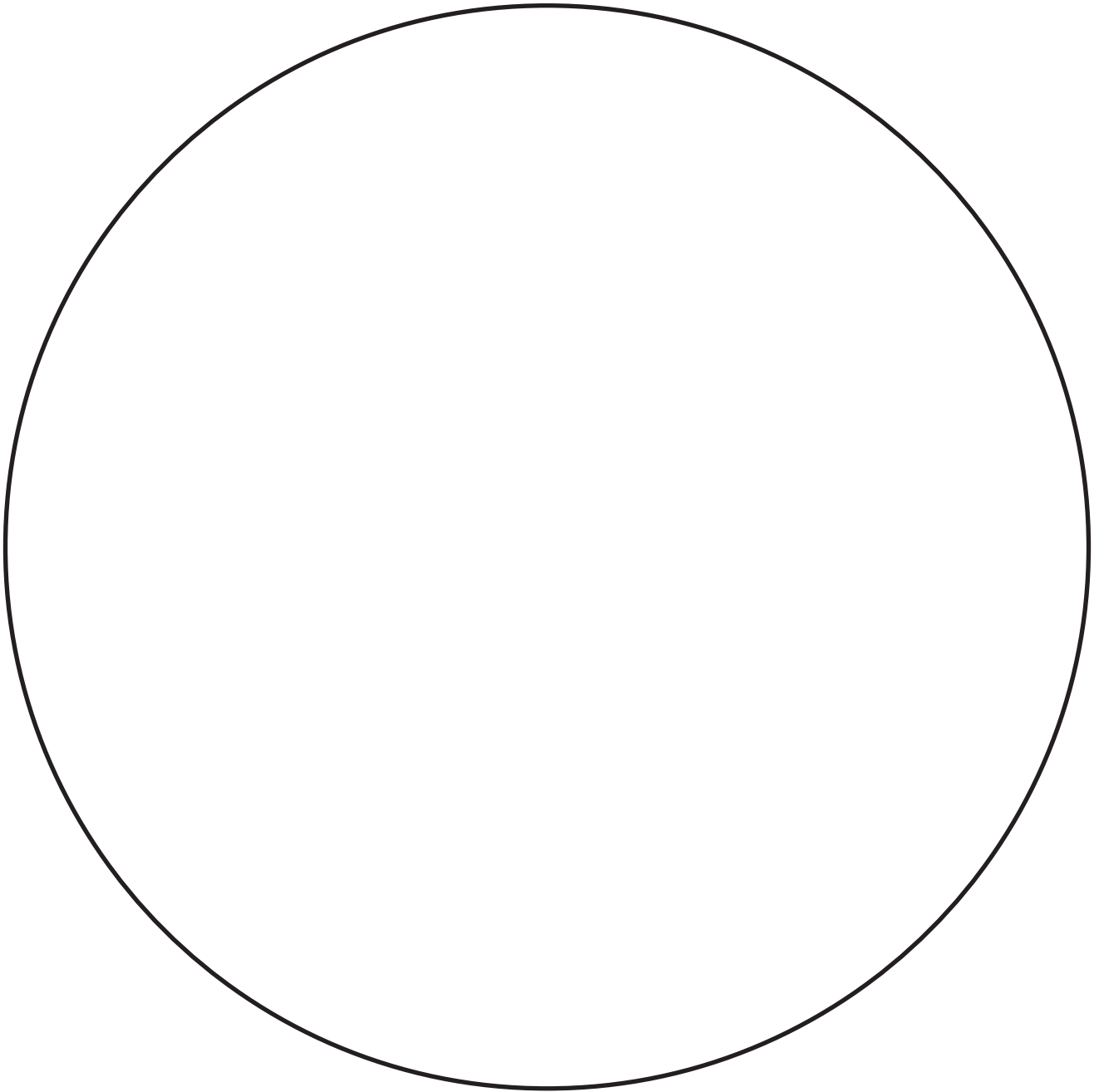
* light, brighter areas. These may be craters.

4. The Moon map on page 8 only a few select features. See how many more you can find. Depending on where the terminator is, you may see more or less features standing out.

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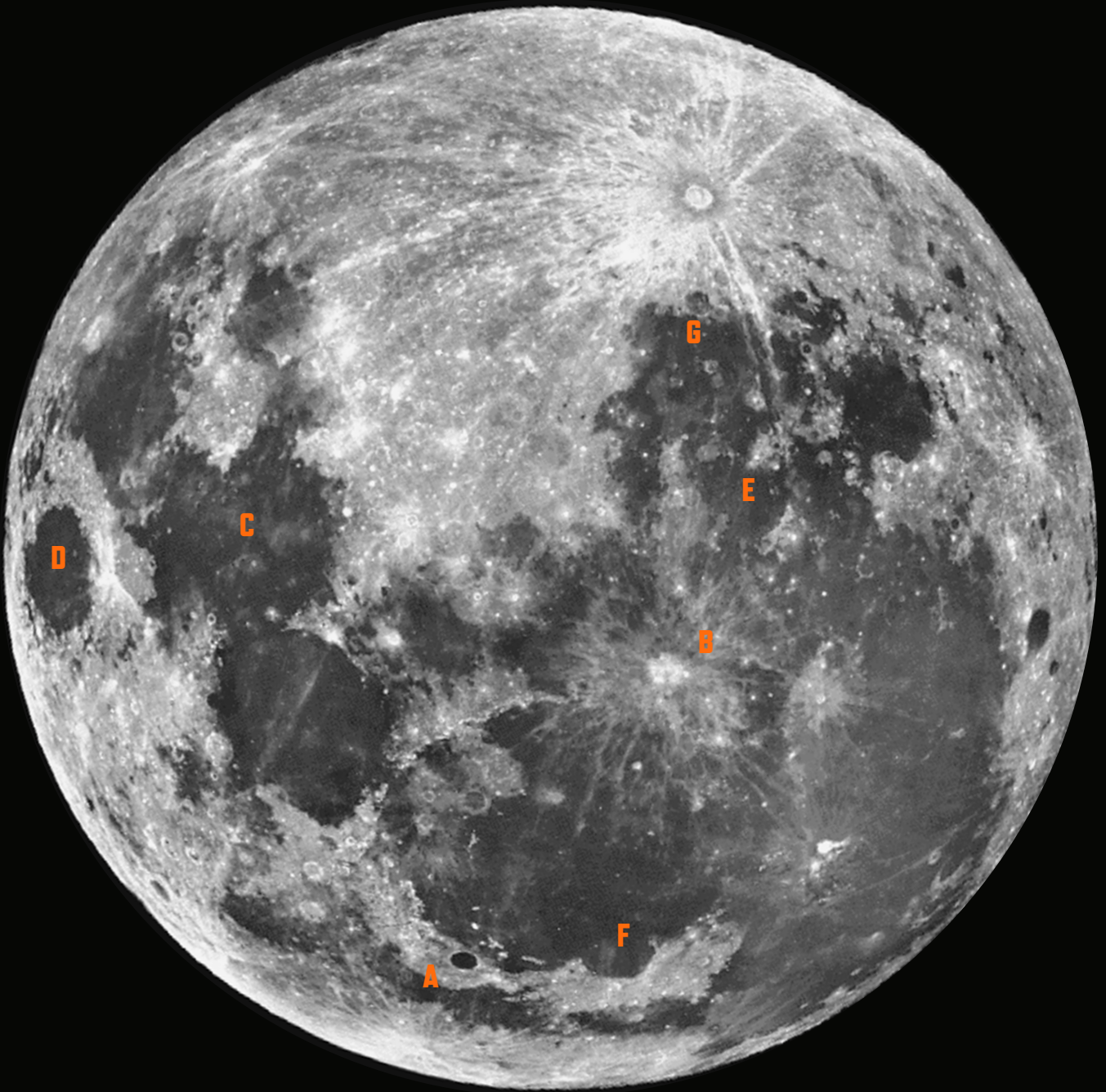
MOON MAP



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MOON MAP



A is Mare Frigoris (Sea of Cold)

B is Copernicus Crater

C is Mare Tranquillitatis (Sea of Tranquility)

D is Mare Crisium (Sea of Crises)

E is Mare Cognitum (Known Sea)

F is Sinus Iridum, a crater

G is Mare Nubium (Sea of Clouds)

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FOLLOW-UP QUESTIONS

1. How does studying the surface of the Earth help us understand the surface of the Moon?

2. Astronauts who have walked on the Moon had to have training from geologists. Why do you think this was important? (Perhaps do some research on the Internet to learn about the experiments they conducted.)

3. During your observations you will have seen large craters created by asteroids colliding with the Moon in the past. The Earth must have also had collisions like these. Why are the craters harder to find on Earth, but easy to find on the Moon? Give three reasons.

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FURTHER RESOURCES

Interactive web interace exploring the Moon:

'The Moon', Euopean Space Agency, <https://lunarexploration.esa.int/intro>.

The Moon's geology

'Mars and Moon geology: past, present and future', *Cosmos Magazine*,

<https://cosmosmagazine.com/space/mars-and-moon-geology-past-present-and-future/> (19 March 2021).

Geology of the Moon video:

'NASA Now: Geology: Structure of the Moon', YouTube (6:48 mins),

<https://youtu.be/jWtLYScfKRO> (15 May 2013).

Moon rocks video:

'NASA Opens Moon Rock Samples Sealed Since Apollo Missions', YouTube (4:23 mins),

https://www.youtube.com/watch?v=0laBq_4Xjfo (27 June 2019).

Similarities of the Moon and Earths video:

'Where Did The Moon Come From? - Do We Really Need the Moon?', YouTube (3:06 mins),

<https://www.youtube.com/watch?v=c0FCE4H0Dro> (2 Feb 2011).

All websites accessed 8/3/2022.

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IMAGE REFERENCES

Mares (seas), page 1, By NASA (image by Lunar Reconnaissance Orbiter) - JMARS, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=38055133>

Mountains, page 1, By James Stuby based on NASA image - Reprocessed Lunar Orbiter 4 image cropped in GIMP. The original image is in the public domain because it is a work of the U.S. Government (NASA). Immediate source: Lunar and Planetary Institute, Lunar Orbiter Photo Gallery Lunar Orbiter 4, image 122, h2 [1], CC0, <https://commons.wikimedia.org/w/index.php?curid=47555110>

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Wrinkle ridge, page 3, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=526501>

Graben, page 3, NASA

Graben diagram, page 3, By Horst_graben.jpg: U.S. Geological Survey derivative work: Gregors (talk) 11:17, 7 June 2011 (UTC) - Horst_graben.jpg, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=15432947>

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Ray, page 5, By NASA - PILOT, Planetary Image Locator Tool, USGS Astrogeology Science Center, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=88309488>

Moon, Lick Observatory