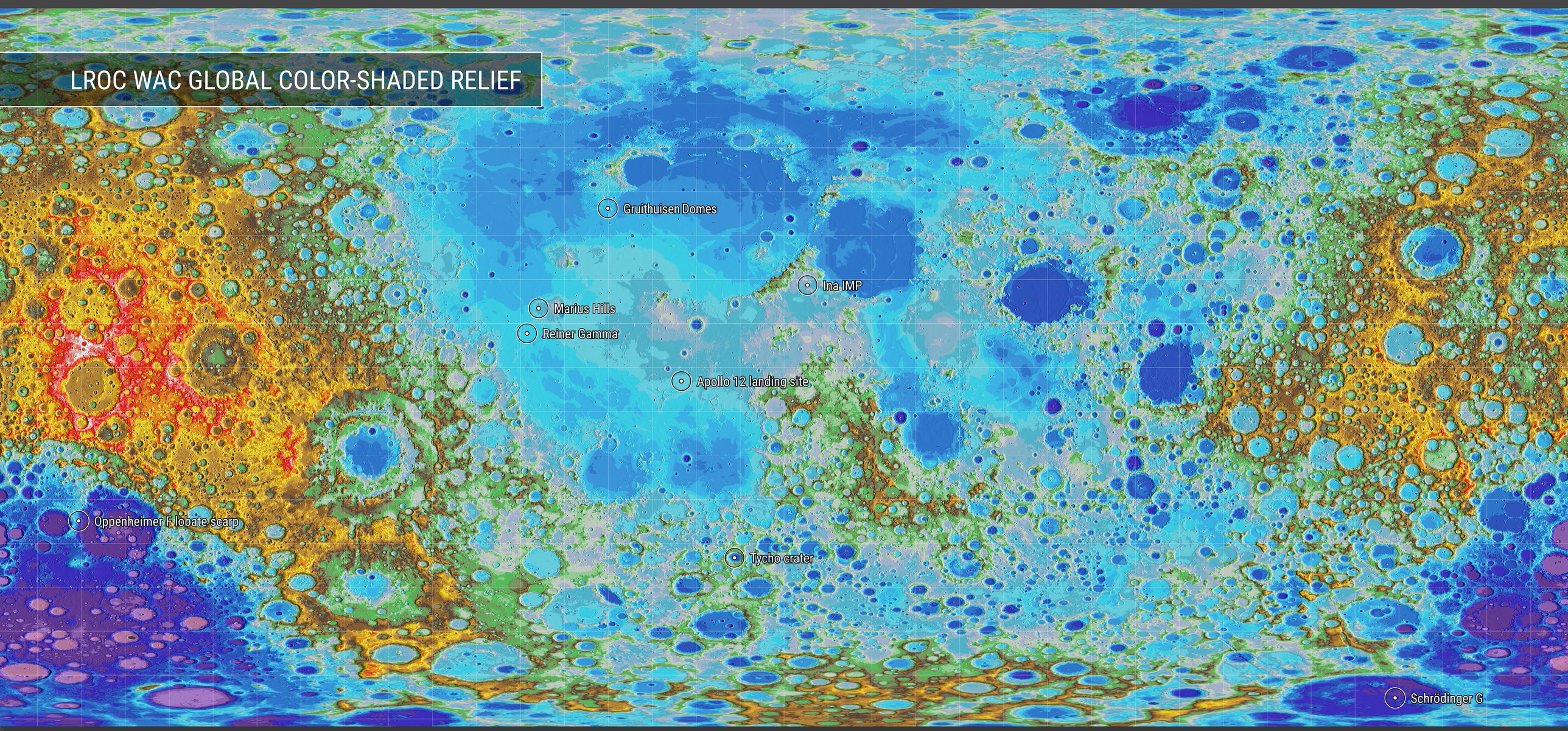
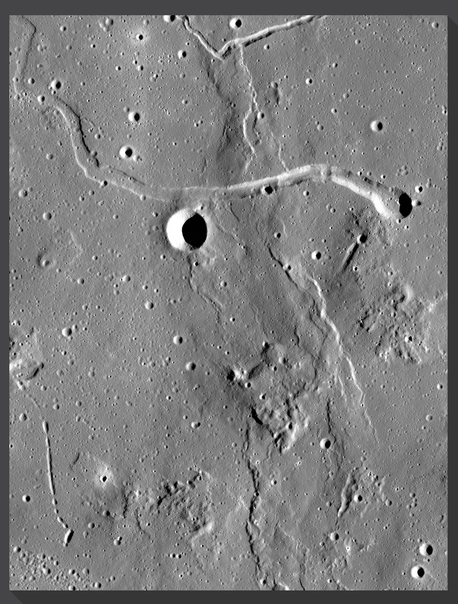
LROC DISCOVERIES

WHAT WE'VE LEARNED SO FAR



The Lunar Reconnaissance Orbiter Camera's many years of operations have given us a few extraordinary surprises, made us question some of what we thought we knew, and led to fascinating new perspectives on scientific puzzles, both new and old. The NACs' ability to image small features has led to exciting discoveries about the structure of young craters, the complexity of lunar volcanic processes, and other detailed geologic findings. NAC images have even revealed new types of features, like small pits formed in impact melt deposits, that weren't previously suspected to exist. WAC data have provided the first global ultraviolet/visible light map of the Moon, the first map showing the variation in photometric properties across the surface, and many other map products. These maps have led to a new understanding of space weathering, the composition of lunar soils, and lighting conditions near the poles, among many other things.

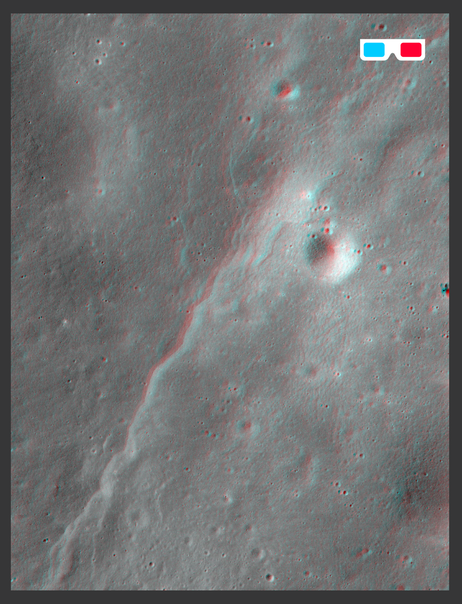
Some of the most exciting discoveries concern recent changes to the lunar surface. LROC scientists have determined that the Moon is still shrinking as it cools thanks to LROC images of many small, very young thrust faults. The LROC Team has also identified over 50 small, young volcanic features, which may have erupted in the last 100 million years. In lunar geologic terms, this is very recent, and more than a billion years after the Moon was previously thought to have had its last volcanic eruption. And repeat imaging under the same lighting conditions has helped locate hundreds of new craters formed while LROC was in orbit — 30% more than expected! These are just a few of the many new lunar insights achieved using LROC data.



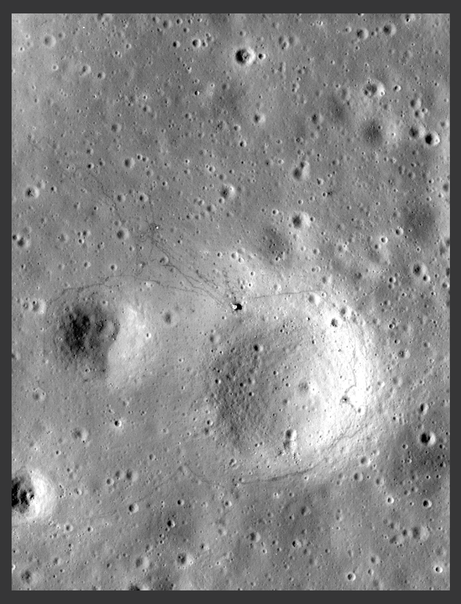
NAC mosaic of the *Marius Hills*, a diverse region of volcanic morphologies on the lunar nearside.



Oblique view of the central peak of *Tycho* crater.



NAC Anaglyph of *Oppenheimer F* lobate scarp in the South Pole–Aitken basin on the far side of the Moon.



Apollo 12 landing site with noticeable tracks and equipment left behind (Lunar Module decent stage at center).



South pole time-weighted illumination map. White areas receive almost endless light while black gets little to no light.

Fun fact: Lunar research doesn't just help scientists understand more about the Moon, it also leads to information and discoveries about the entire solar system!

SPACE EXPLORATION RESOURCES

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LUNAR QUESTIONS

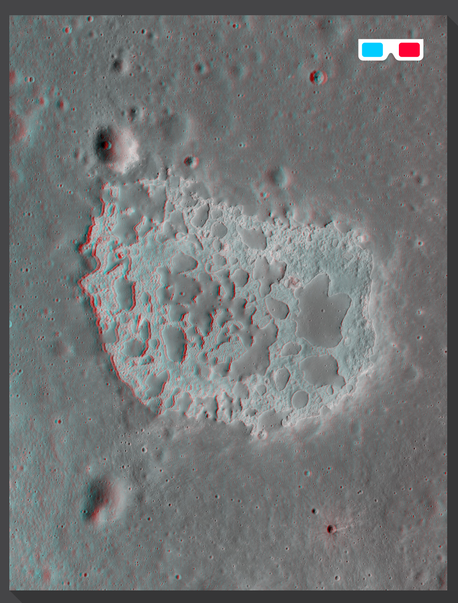
LROC CONTINUES TO EXPLORE THE MOON



Every few years, the Lunar Reconnaissance Orbiter (LRO) mission enters a new *phase*. Scientists from each instrument collaborate on new scientific questions, and work together, targeting new images and conducting research — often further exploring discoveries from prior mission phases. A question currently under investigation is how the surface of the Moon is modified. How fast do materials exposed by new impacts change? How do properties of the lunar surface affect features like lunar swirls? What does the current impact rate teach us about determining ages using crater density? How does seismic activity change the surface, and is the Moon tectonically active now?

LROC continues to investigate the most beautifully enigmatic features on the Moon — like swirl formations and irregular mare patches (IMPs). LROC also endeavors to help form a greater picture of how the Moon changed over time by investigating volcanic features and materials excavated by impacts. Likewise, further imaging and research will help provide a deeper understanding of how impacts melt the lunar surface and how that molten rock was spread around by the largest ancient impacts.

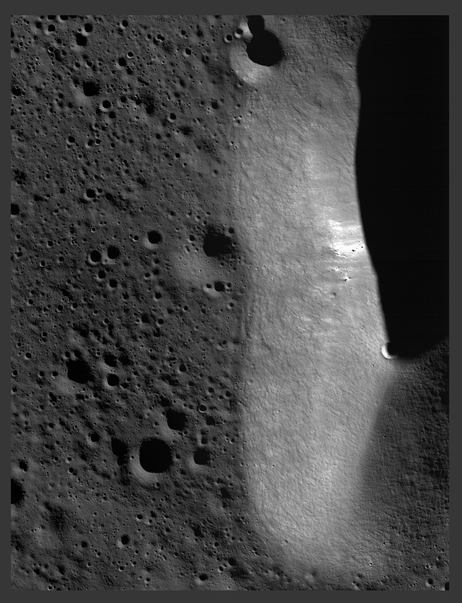
Additionally, scientists and future exploration engineers are particularly interested in volatiles at the south pole and their distribution. Using long-exposure NAC images, LROC can look for any visible evidence of ice in permanently shadowed regions (PSRs). By taking similar images of areas away from the pole, scientists can identify any differences between these images and PSRs. The high-heritage ShadowCam instrument, based on the LROC NAC, will be pivotal to providing detailed PSR coverage.



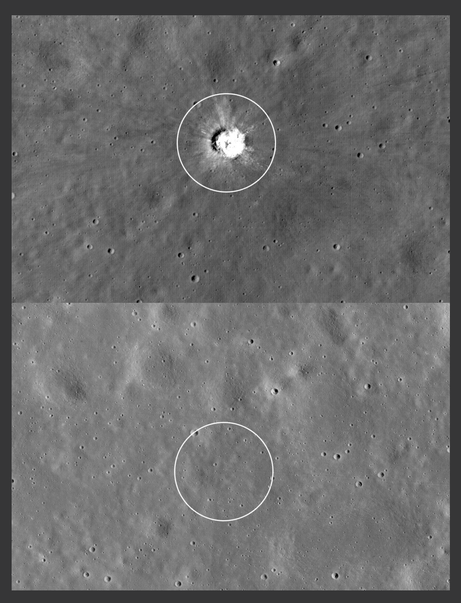
The young *Ina* irregular mare patch (IMP), but how young?



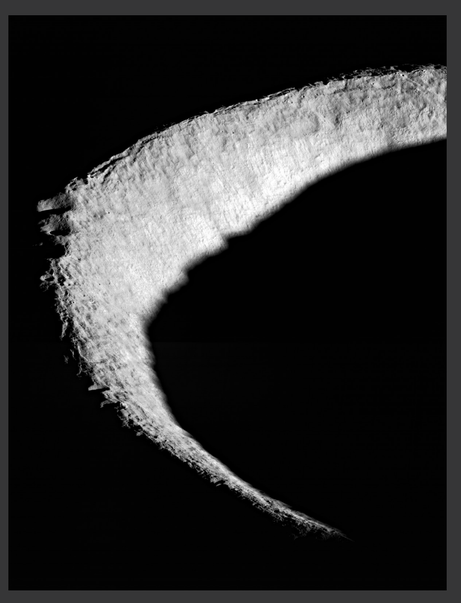
The mysterious, geologically unique *Gruithuisen Domes*.



Do pyroclastic deposits like *Schrödinger G* hold any keys?



Can fresh impacts, shown here, excavate clues to lunar aging?



Can we acquire volatiles from PSRs like *Shackleton* crater?

Fun fact: Lunar samples and data from future missions, like *Artemis,* could provide key details to many unanswered questions about the Moon, and Earth.

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