

Challenges for Sustainable Lunar Exploration

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United Nations Committee on the Peaceful Uses of Outer Space
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MOONKIND™



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our human heritage.

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ForAllMoonkind.org



www.forallmoonkind.org

For All Moonkind is a non-profit organization that seeks to **protect and preserve human history and heritage** in outer space.

Our **entirely volunteer team** of space lawyers and policymakers are working to develop reasonable and practical protocols that will balance development and preservation and include systems to select, manage and study relevant sites.

In so doing, we seek to **promote the exploration, development and utilization of space and its resources** in a **sustainable** and successful manner.

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The LTS Guidelines define the sustainability of outer space activities as the ***ability to maintain the conduct of space activities indefinitely into the future*** in a manner that realizes the objectives of ***equitable access to the benefits*** of the exploration and use of outer space for peaceful purposes, in order to **meet the needs of present generations** while **preserving the outer space environment for future generations.**

UN Doc. A/74/20

UN Doc. A/AC.105/C.1/L.366

The COPUOS must urgently develop frameworks for international cooperation in the exploration, exploitation and utilization of the Moon.

Zero Draft of the Pact for the Future



What Challenges to Sustainability on the Moon?

- Already we see multiple use case scenarios for our lunar neighbor. And while many have described the Moon as Earth's eighth continent, the fact of the matter is that the Moon is finite, it's environment poses unique challenges to those who wish to do science, extract resources or simply visit our closest neighbor.
- Balancing:
 - Resource Utilization
 - Needs of Astronomy and Science
 - Sites of Historic Interest
 - Mitigation of effects of lunar ejecta



LAVERAN

Wiechert A

Wiechert E

WIECHERT

Wiechert J

Wiechert U

Wiechert P

SHACKLETON

FAUSTINI

SHOEMAKER

HAWORTH

AMUNDSEN

SCOTT

https://www.unoosa.org/res/oosadoc/data/document/s/2024/aac_105c_12024crp/aac_105c_12024crp_14_0.html/AC105_C1_2024_CRP14E.pdf

Photo Credit: NASA



<https://www.theatlantic.com/technology/archive/2014/05/a-now-were-putting-ads-on-the-moon/370958/>

Lunar Burial?

- On July 31, 1999, some of the ashes of Eugene Shoemaker were carried to the Moon by the Lunar Prospector space probe.

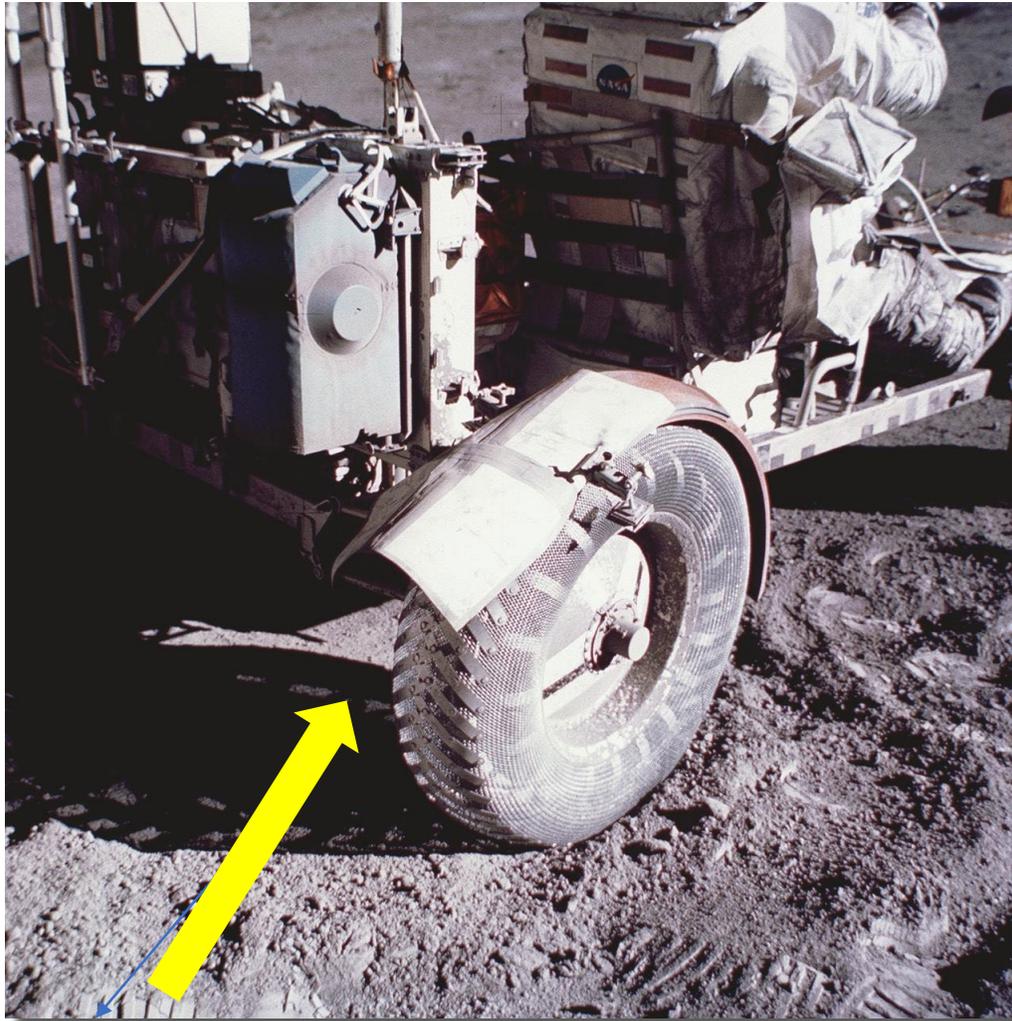


Committee on Space Research

- Moon (without organic inventory) is a Category 1
 - Category I includes any mission to a target body which is not of direct interest for understanding the process of chemical evolution or the origin of life. No protection of such bodies is warranted, and no planetary protection requirements are imposed by this policy.

Committee on Space Research

- Moon (with organic inventory) is a Category 2
 - Category II missions comprise all types of missions to those target bodies where there is significant interest relative to the process of chemical evolution and the origin of life, but where there is only a remote chance that contamination carried by a spacecraft could compromise future investigations.
 - The requirements are for simple documentation only. Preparation of a short planetary protection plan is required for these flight projects primarily to outline intended or potential impact targets, brief Pre- and Postlaunch analyses detailing impact strategies, and a Post-encounter and End-of-Mission Report which will provide the location of impact if such an event occurs.



Stiff plasticized maps were taped together and fastened by clamps to patch a broken fender of the Apollo 17 Lunar Roving Vehicle (LRV).

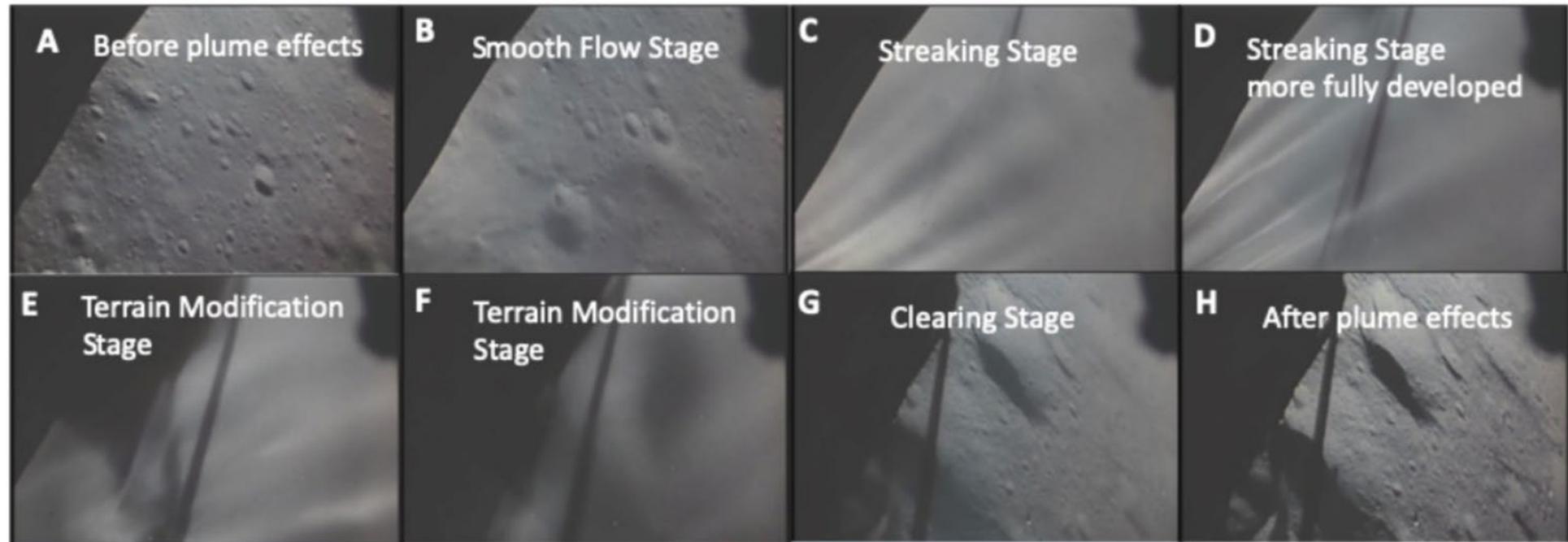
"I think dust is probably one of our greatest inhibitors to a nominal operation on the Moon. I think we can overcome other physiological or physical or mechanical problems except dust."

Gene Cernan



Lunar regolith is the **layer of unconsolidated rocks, pebbles, and dust** that exists on the lunar bedrock. The particles are sharp and angular in nature, resulting in a much more abrasive material than their terrestrial counterparts

Regolith **is also adhesive**, both mechanically and electrostatically. **Mechanical adhesion** occurs because of the barbed shapes of the grains of dust. **Electrostatic adhesion** is caused by the charging of objects by various sources, such as solar wind plasma and photoionization.



Stages of rocket exhaust ejecta beneath an Apollo Lunar Module. In smooth and streaking flow stages, ejecta is mainly in a sheet **1-3 degrees above horizontal**, although some individual streaks are at higher angles. In terrain modification stage much of the ejecta is lofted into higher angles **exceeding 15 degrees**.

Credit: Metzger, P., Smith, J., Lane, J., Phenomenology of soil erosion due to rocket exhaust on the Moon and the Mauna Kea lunar test site. Journal of Geophysical Research: Planets 116, no. E, 2011.

Outer Space Treaty, Article IX

In the exploration and use of outer space, including the Moon and other celestial bodies, States Parties to the Treaty . . . shall conduct all their activities . . . with **due regard** to the corresponding interests of all other States Parties to the Treaty.

...

If a State Party to the Treaty has reason to believe that an activity or experiment planned by it or its nationals in outer space, . . . **would cause potentially harmful interference** with activities of other States Parties . . . it shall undertake appropriate international consultations before proceeding with any such activity or experiment.



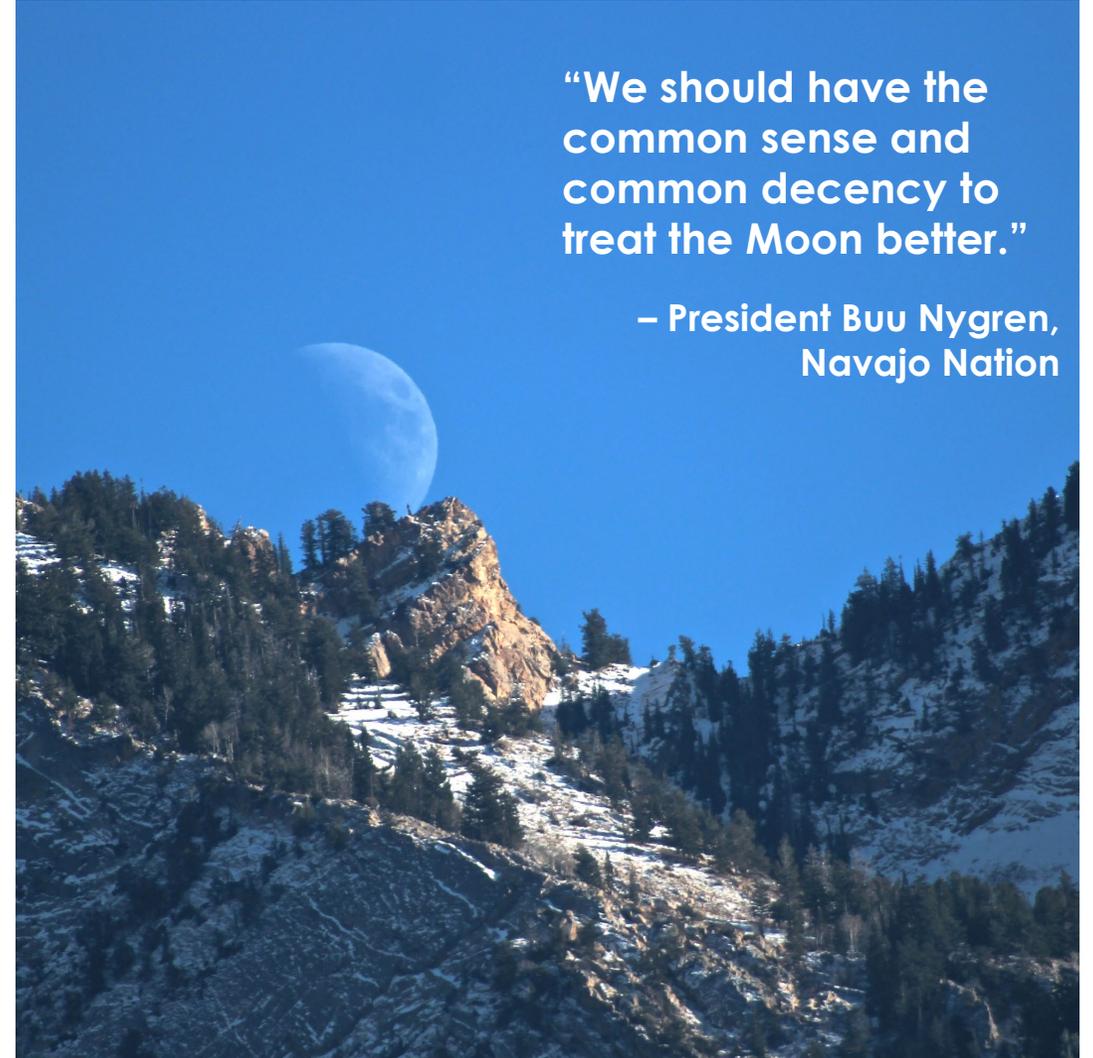
An Indigenous Perspective

The Navajo Nation has opposed sending human remains to the Moon since the late 1990s.

Like many Indigenous communities, the Navajo people feel **the Moon is sacred** and wants to limit lunar expeditions to purely scientific missions that preserve the Moon's natural environment.

According to the United Nations Declaration on the Rights of Indigenous Peoples, governments should work with indigenous communities to **“obtain their free, prior and informed consent”** before adopting a policy that may affect them.

The Navajo Nation has repeatedly stated that **no one owns the Moon**, but our actions there affect everyone. This means **indigenous peoples need to have a seat at the table** when decisions are being made that will govern mankind's future activities there.

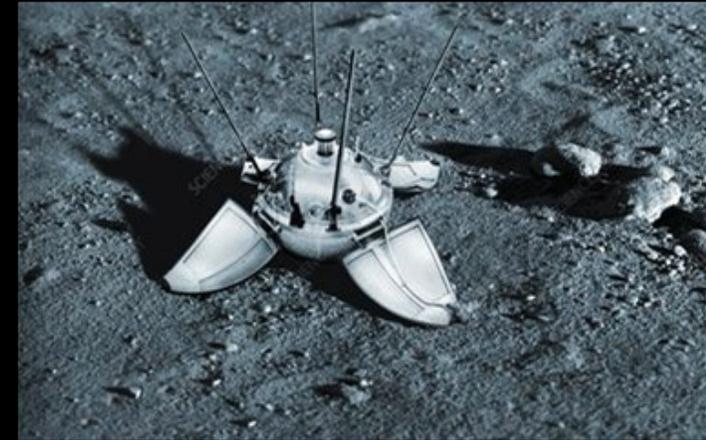
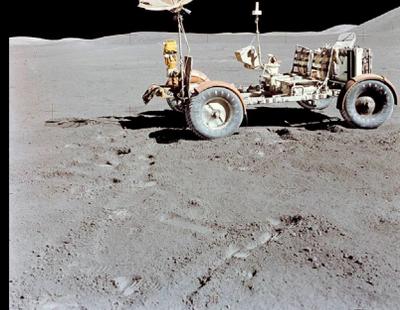
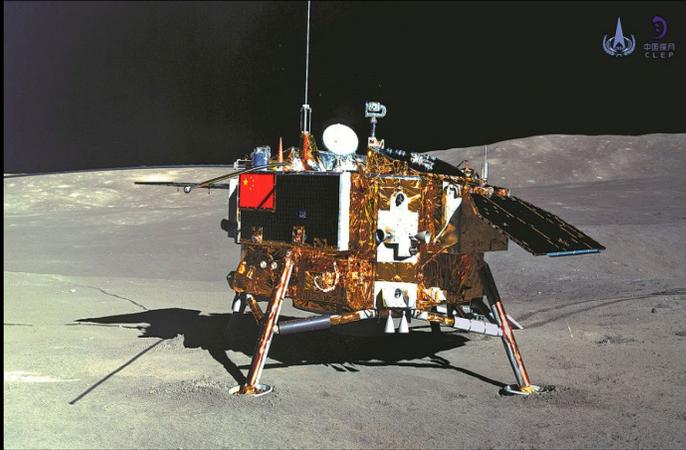


“We should have the common sense and common decency to treat the Moon better.”

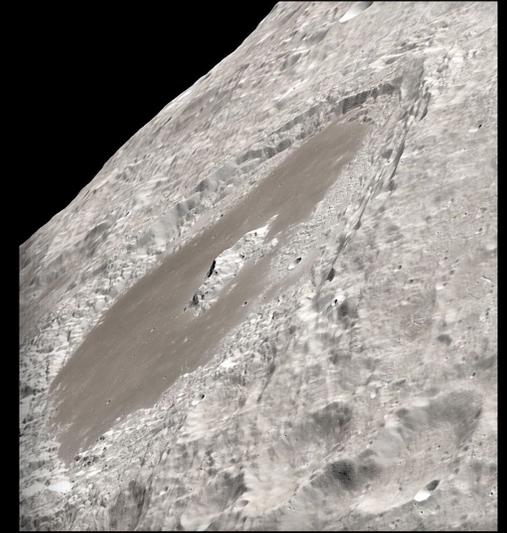
**– President Buu Nygren,
Navajo Nation**

For All Moonkind urges this Committee to commence consideration of lunar governance in a comprehensive, flexible and inclusive manner. In our view, the best way to start is to embrace a concept for space that has already been accepted by virtually every nation on Earth: the preservation of natural and cultural heritage.

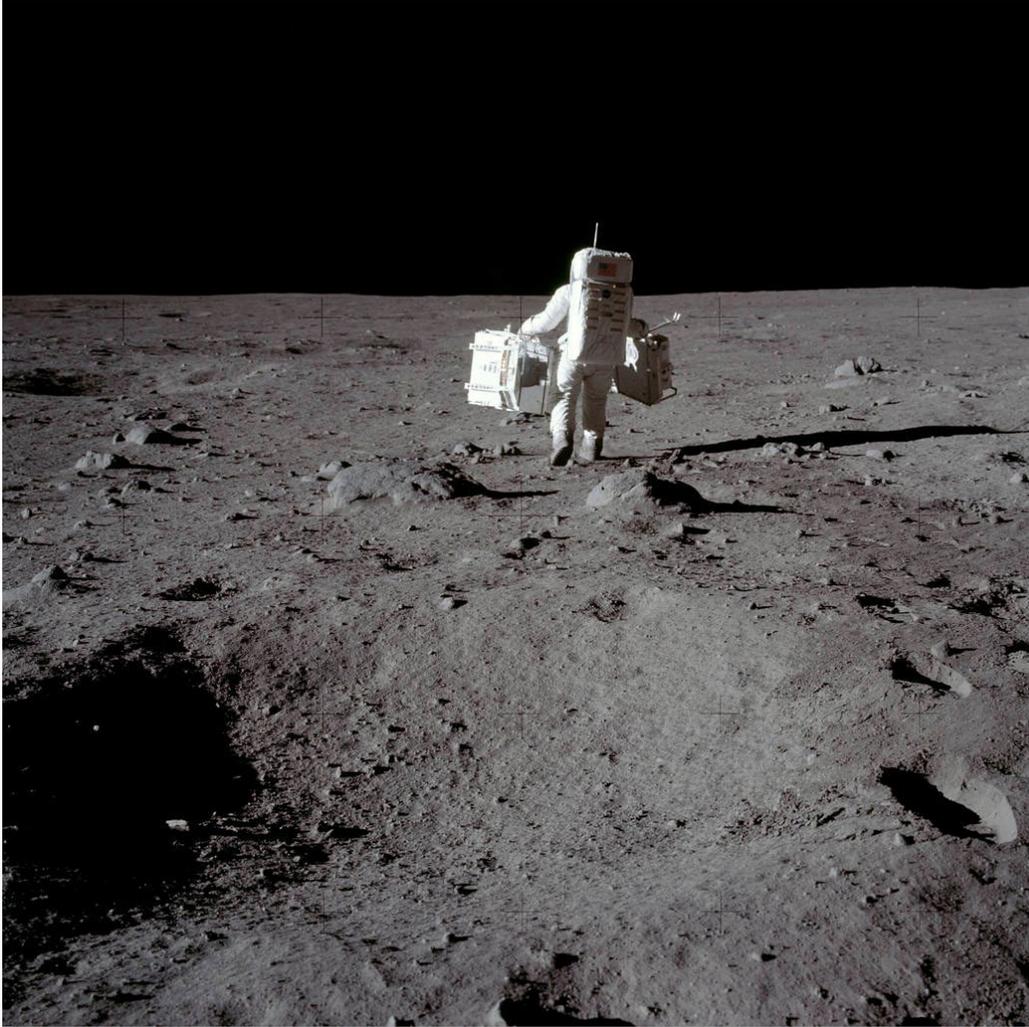




Terrestrially, the nations of the world have proved unanimous support of the protection of human heritage “which are of outstanding universal value” through the World Heritage Convention. Surely, there is no heritage more universal than lunar landing sites on the Moon, which represent both **milestones in human evolution** and development as well as the **culmination** of the work of humans **throughout the world and throughout history**.



Similarly, the nations of the world have proved unanimous support of the protection of natural sites which boast “superlative natural phenomena” or are of “outstanding universal value from the point of view of science.” **These photos of the Moon, as desolate as they are, certainly demonstrate “superlative natural phenomena. And an absence of radio interference makes part of the Moon ideal for astronomical observations, in other words, for science.**



Due regard obligates the international community to find and agree to a balance. And international Law requires that all voices are heard in achieving that balance.

It is vital that we begin to consider how to act sustainably on the Moon. As a starting point we must:

- Recognize natural and cultural heritage on the lunar surface;
- Harness the past to move forward in the spirit of kinship to the future; and
- assure that all voices are heard so that humanity may truly work together with unified, rather than cross purposes.

**With thanks to
the Navajo
Nation for
contributing to
this presentation.**

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