

An International Lunar Resource Prospecting Campaign - ILRPC

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What's Next for Lunar Resources?

- Lunar resources that could be useful for sustaining humans on the Moon (and potentially for export off-Moon) have been known to exist for years.
- Understanding them and their use in enabling science, human exploration, and a vibrant cislunar economy remains rudimentary at best.
- We define the critical next step for understanding lunar resources that could build science, exploration, and commercial synergies.

Legal Implications^{4,5}

The Moon Agreement (MA)⁴ & the Outer Space Treaty (OST)⁵ have been interpreted as severely restricting use of lunar resources.

MA, Article 11, para 3: *Neither the surface nor the subsurface of the Moon, nor any part thereof or natural resources in place, shall become property of any State, international intergovernmental or nongovernmental organization, national organization or nongovernmental entity or of any natural person.*

MA, Article 11, para 5: *States Parties to this Agreement hereby undertake to establish an international regime, including appropriate procedures, to govern the exploitation of the natural resources of the Moon as such exploitation is about to become feasible.*

OST, Article I: *The exploration and use of outer space, including the Moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries.*

OST Article II: *Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use, occupation, or by any other means.*

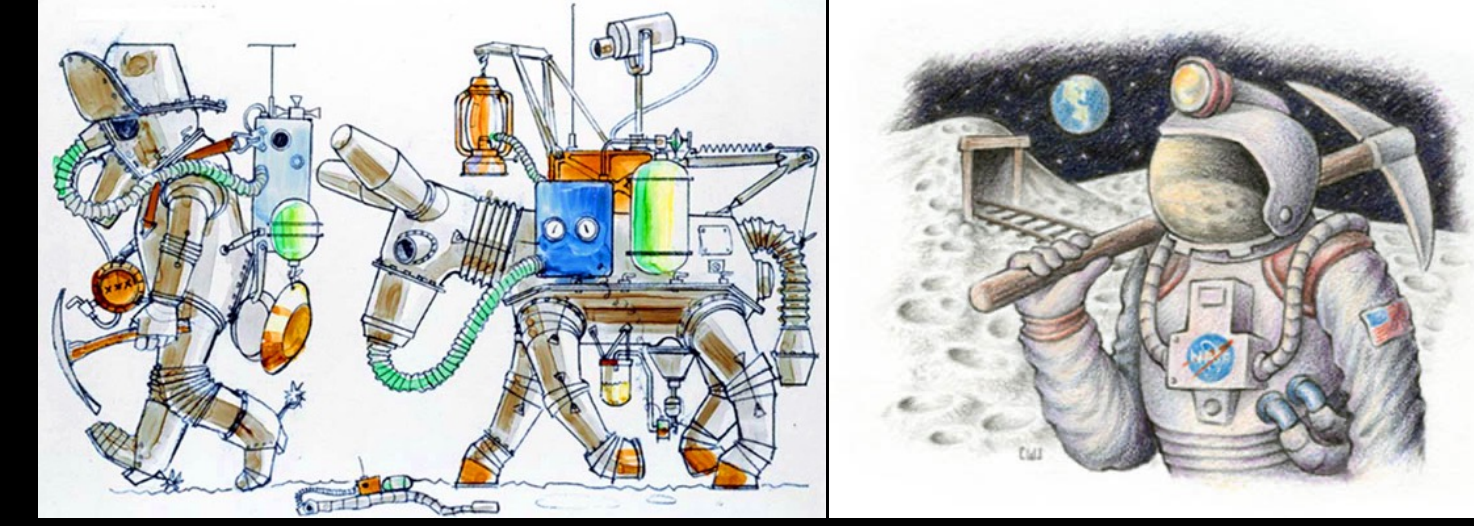
OST, Article III: *States Parties to the Treaty shall carry on activities in the exploration & use of outer space, including the Moon & other celestial bodies..., in the interest of maintaining international peace & security and promoting international co-operation and understanding". An International Lunar Resource Prospecting Campaign would therefore be compliant with the Outer Space Treaty.*

The United States is a signatory of the OST but NOT the MA

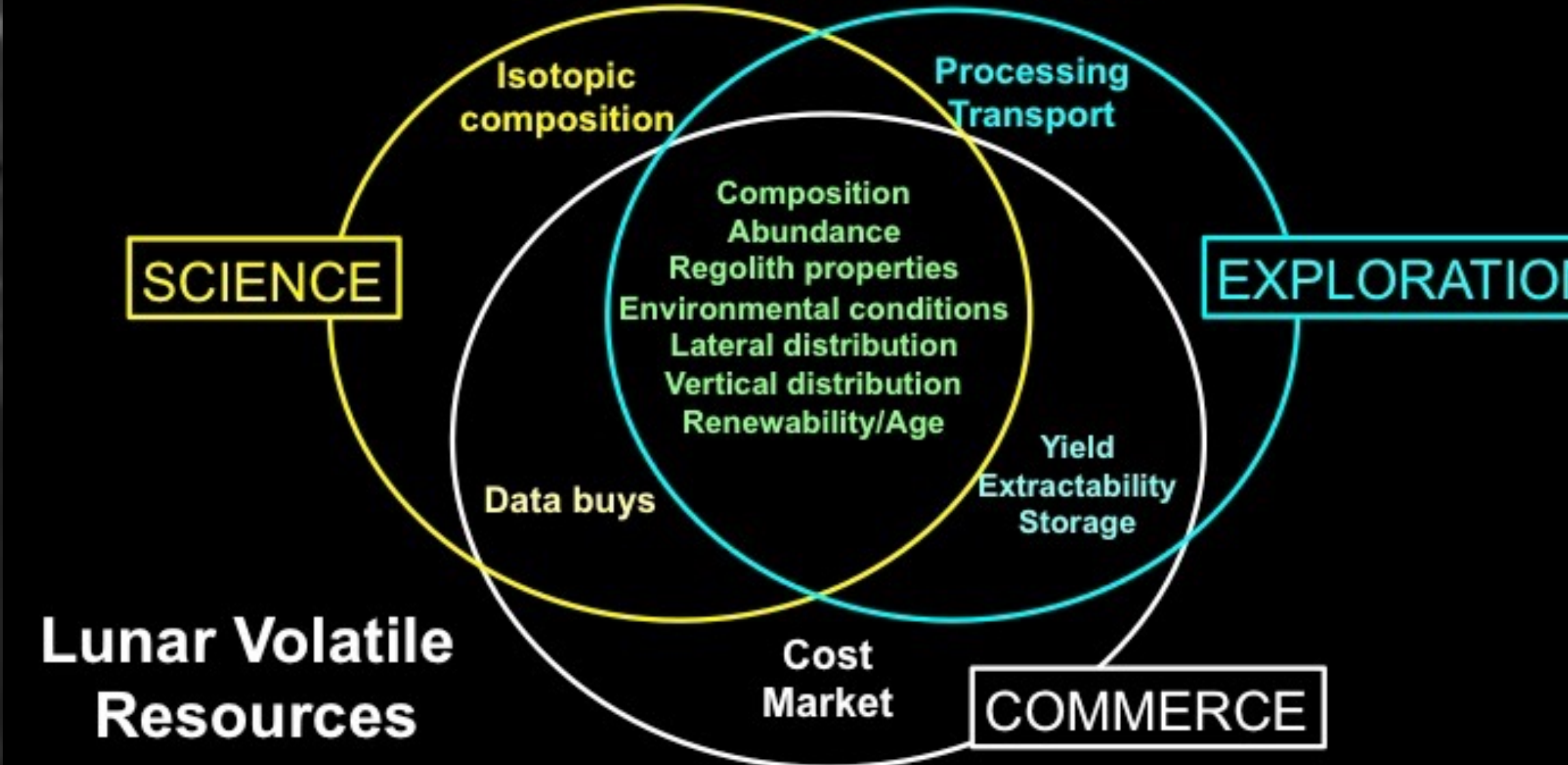
References. 1. USGS. (1980) Principles of a Resource/Reserve Classification For Minerals. Geological Survey Circular 831, 12 pp. Sowers G. (2016) Space Policy 37, 103-109. [3] Sowers G. (2018) Space Journal #3(17), 8-13. 4. United Nations (1979) Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/intromoon-agreement.html>. 5. United Nations (1966) Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>. 6. NASA (2020) The Artemis Accords: Principles for a Safe, Peaceful, and Prosperous Future, <https://www.nasa.gov/specials/artemis-accords/index.html>. 7. Lunar Exploration Analysis Group -International Space Exploration Coordination Group/Volatiles Special Action Team 2 (2017) <https://www.lpi.usra.edu/leag/reports/V-SAT-2-Final-Report.pdf>.

Exploring Lunar Resources Informs

- **Science**
- **Exploration**
- **Commerce**



Science Enables Exploration & Exploration Enables Science. Both Enable Commerce.

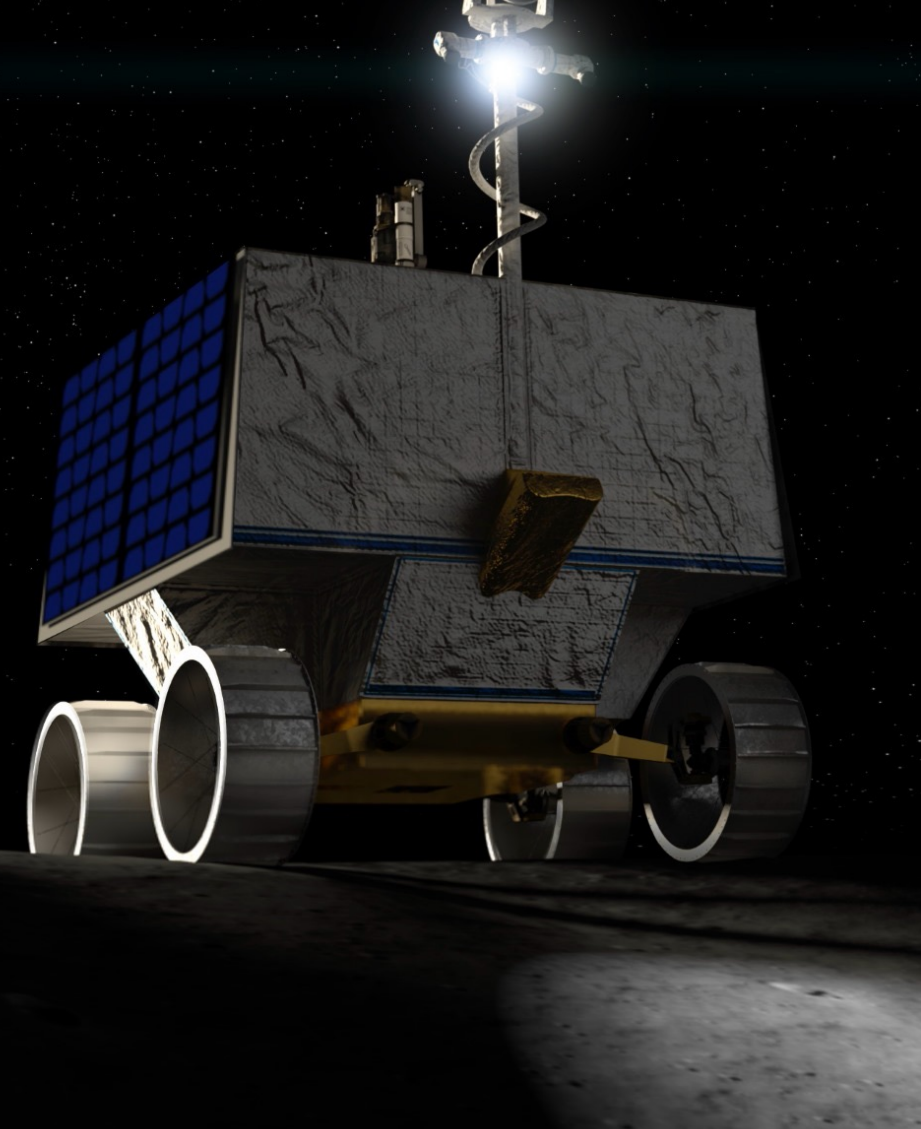


Artemis Accords⁶

Establishes a common vision for the governance of civil exploration/use of outer space (including resources) to advance the Artemis Program. The signatories:

- note that the utilization of space resources can benefit human kind by providing critical support for safe & sustainable operations;
- emphasize that extraction & utilization of space resources be executed to comply with the OST & in support of safe & sustainable space activities;
- commit to informing the Secretary-General of the United Nations as well as the public and the international scientific community of their space resource extraction activities in accordance with the OST;
- intend to use their experience under the Accords to contribute to multilateral efforts to further develop international practices and rules applicable to the extraction and utilization of space resources, including through ongoing efforts at the COPUOS.

VIPER



An Important Lesson in Semantics¹

- **Resource:** a concentration of naturally occurring solid, liquid, or gaseous materials in or on the crust in such form that economic extraction of a commodity is regarded as feasible.
- **Reserve:** That portion of an identified resource from which a usable mineral or energy commodity can be economically and legally extracted at the time of determination.
- The term "resource" in a lunar context has been used interchangeably with "reserve", which has caused confusion.

Resources ≠ Reserves

- The reserve definition implies that the resource can be extracted, refined, transported, and used at a profit (i.e., the value of the products is more than the cost of acquiring the products).
- This has not been achieved for any lunar resource because only the United Launch Alliance has placed a value on lunar-derived water (for rocket fuel) at \$500/kg^{2,3}.
- At this time, a true market value for any lunar resources has not been established so their economic potential cannot be evaluated.

Is a New Definition of "Reserve" Required for the Moon?

An International Lunar Resource Prospecting Campaign

Precedent: LEAG-ISECG-SAT⁷. Ad hoc coordination of different missions to the South Pole.

Cooperation between nations leads to an enduring exploration program – competition does not (ISS vs. Apollo). This promotes international diplomacy.

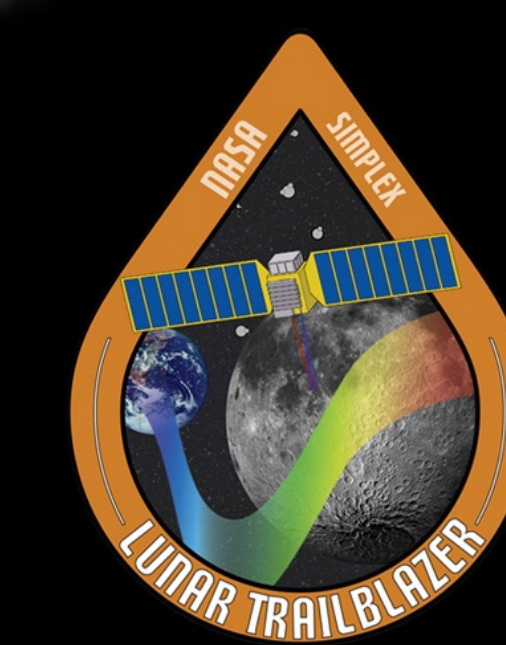
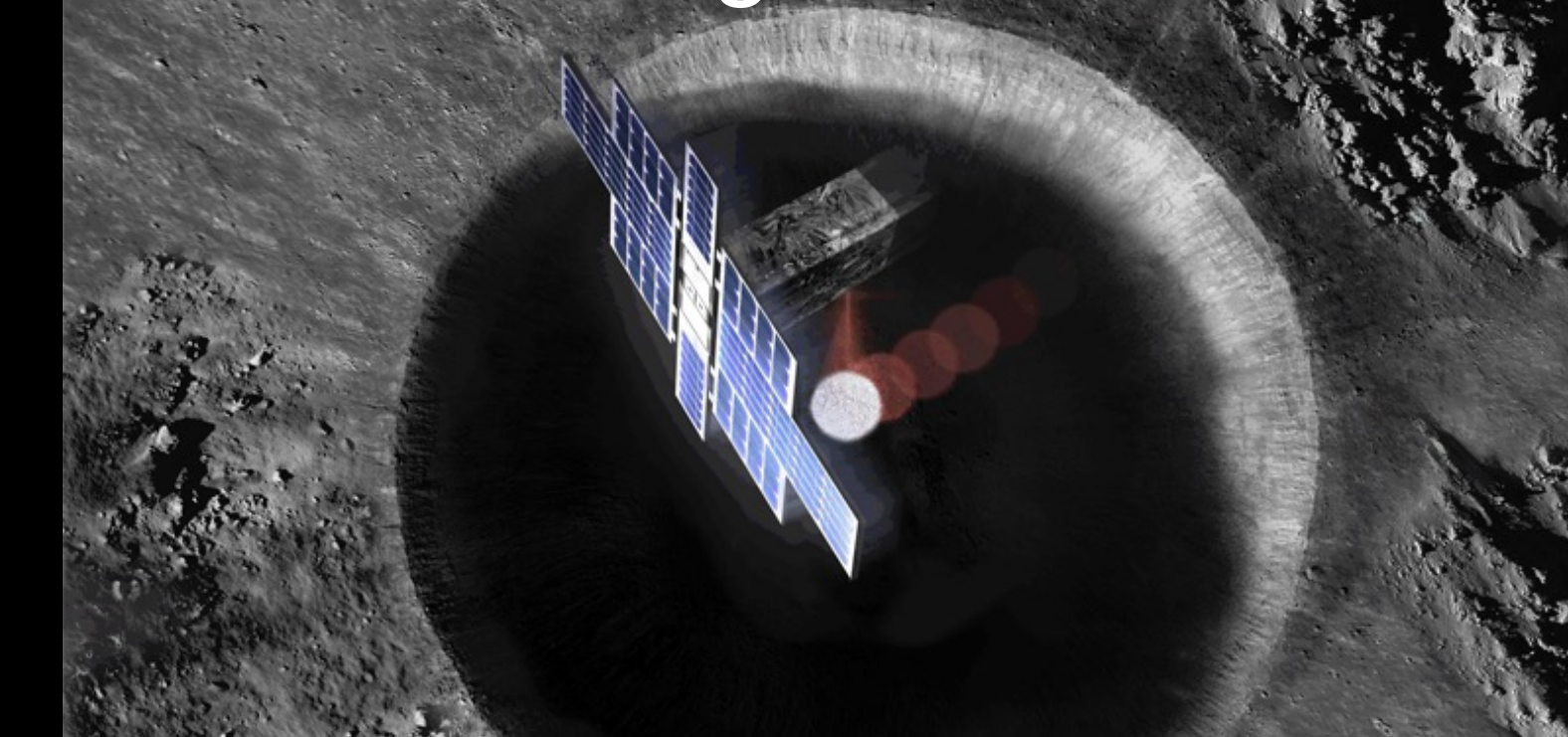
An ILRPC allows countries to participate in this exploration, regardless of economic status.

By sharing data obtained from this campaign (which will inform science, exploration, and commerce), commercial companies (& space agencies) will understand the reserve potential of lunar resources, such that a true market value can be determined and the reserve potential fully evaluated into the future.

Requires organization, integration, and coordination at the highest level - Artemis needs to become a Program and have a position above the directorates at the Administrator/Deputy Administrator level to avoid stagnation – and lead the ILRPC possibly through the Artemis Accords.

This approach would allow lunar resources to be, for the first time, considered as essential for establishing a permanent human presence on the Moon and kick-starting the cislunar economy that would benefit society here on Earth, AND be in compliance with the OST.

Lunar Flashlight



Lunar TrailBlazer

