

NEW CRYOGENIC METHOD FOR COMBINING LUNAR REGOLITH SIMULANT AND FROZEN VOLATILES TO GENERATE ICY LUNAR SIMULATED REGOLITH

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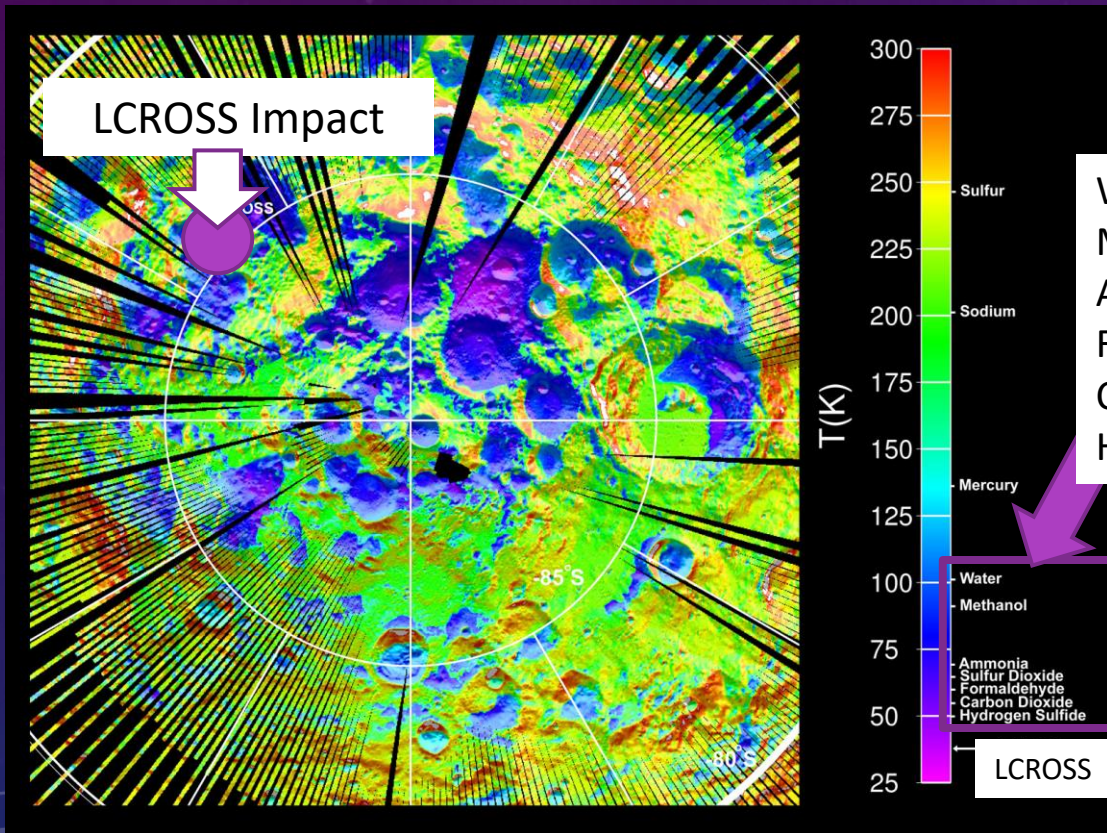
ABSTRACT 2457

LET'S BRING THE MOON TO US...

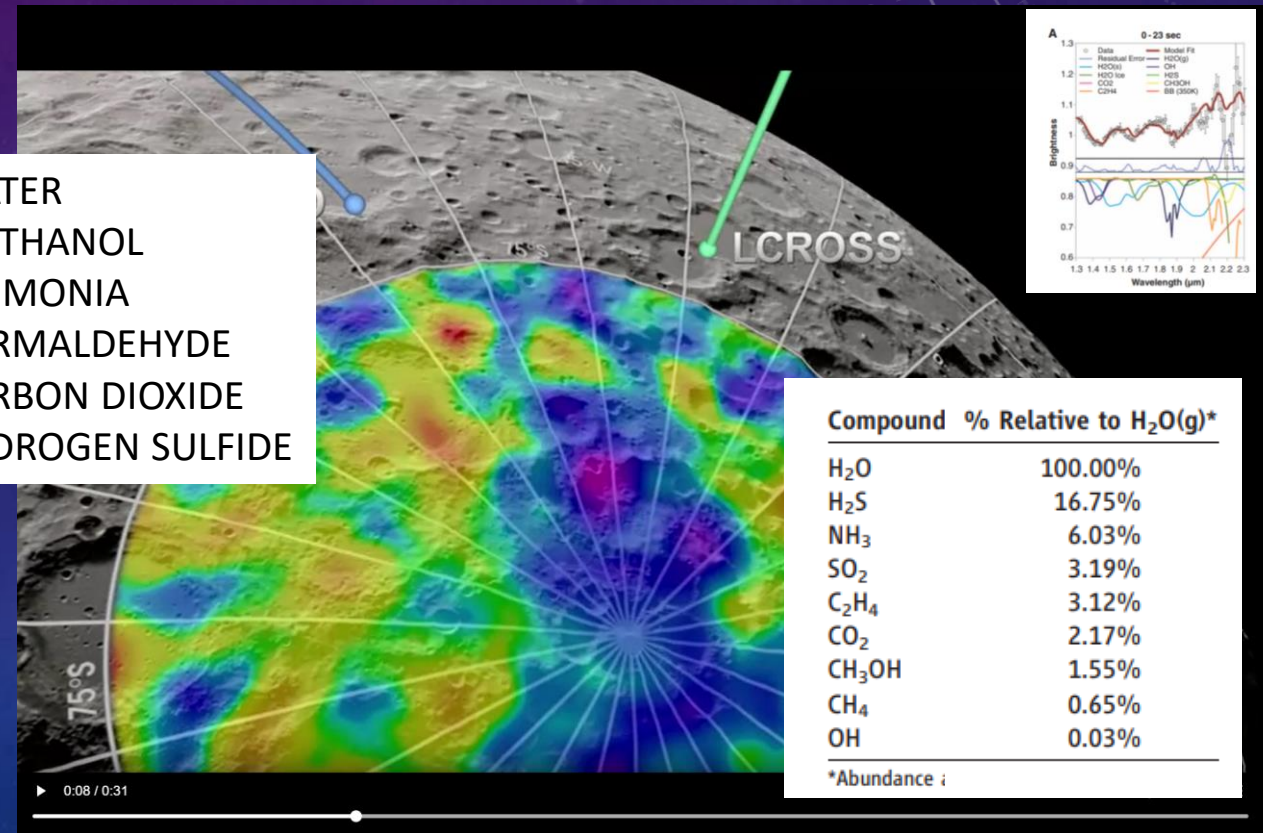
“The laws of chemistry are independent of location.”

– Ernest K. Lewis

BACKGROUND LCROSS VOLATILES AND ARTEMIS



<https://www.nasa.gov/missions/artemis/one-great-moon-hack-ten-years-later-qa-with-nasa-lunar-scientist-tony-colaprete/>



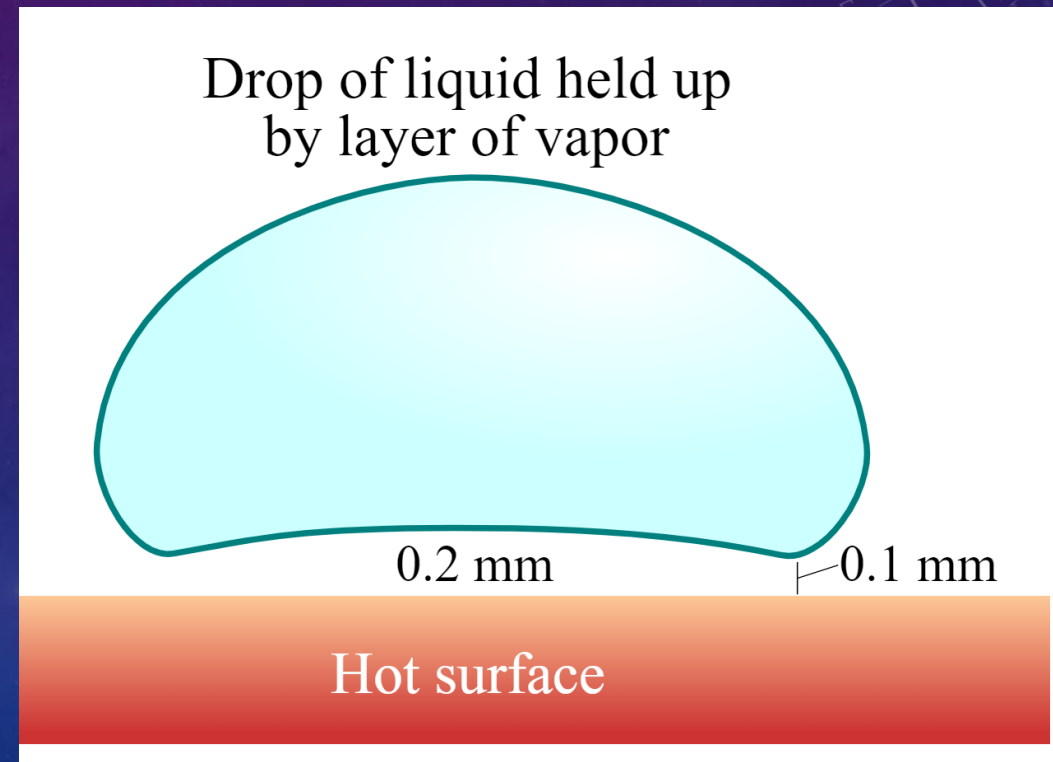
<https://www.chem.uci.edu/~unicorn/old/H2A/handouts/PDFs/LCROSSPaper.pdf>

INITIAL SETUPS EVOLUTION



OVERVIEW OF CHALLENGE FOR ADVANCED CURATION

- Artemis sample return and curation methods will require ability to handle materials at extremely cold temperatures.
- NASA JSC Curation PEARL is working towards developing methods and procedures for testing these materials.
- Our current handling capability is below -80 degrees C
- Time and handling is the biggest challenge because of temperature differences if not mitigated.



https://en.wikipedia.org/wiki/Leidenfrost_effect

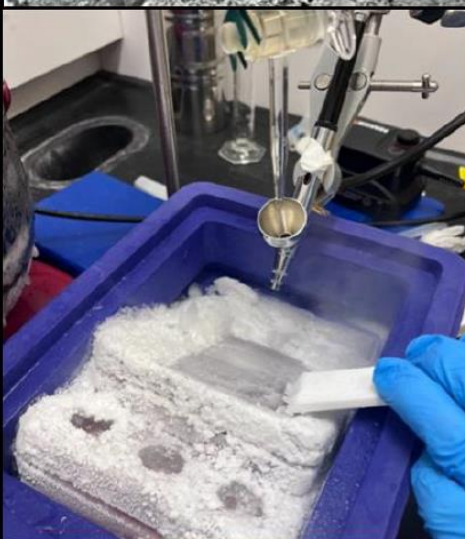
EVOLUTION OF CONDENSATION/DEPOSITION METHOD



Icy Regolith Simulant



Setup for Cryo-snow capture



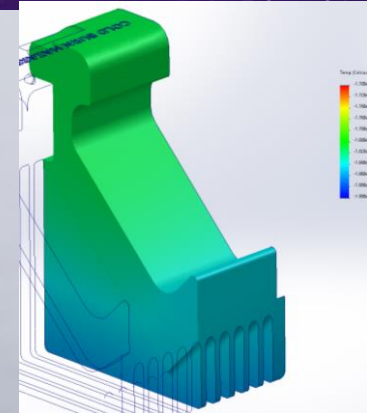
Angled Prototype Spray Block



Samples ready for analysis



- NASA Cryo Sprayblock System
- Rapid heat transfer for instant freezing of lunar volatiles



EXPERIMENTAL SETUP

- Designing a method that is approachable by a standard lab and skill set.
- Several containers for keeping low temps.
- Standard mixer
- LN2 for cooling simulant
- Temperature Probes to monitor temperature.
- Figure from our pre-publication



ICE CRYSTAL WATER FORMATION



SIMULANT PICTURES

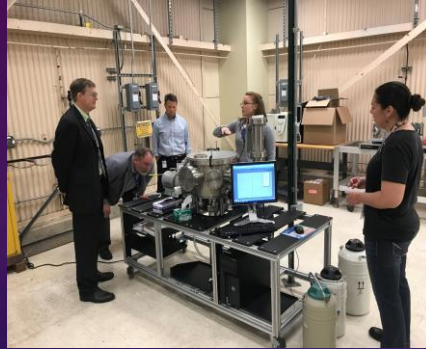


PEARL HISTORY OVERVIEW

SIGNIFICANT SUPPORT FROM ARES CURATION XI DEPARTMENT



ERNEST K LEWIS
STARTS PEARL FACILITY
Innovator of the Year
2017-2019
1 People (ARES Deputy
Chief and myself)
LPSC Abstracts



INITIAL PROJECTS
and FUNDING
JSC IRAD (3 Years)
2019-2020
3 People
Funding, Adv.
Curation,
submitted LPSC



SIMULANT
PRODUCTION &
ANALYSIS, IRAD
2021-2022
4 People
SMD, Adv.
Curation
SSERVI, HQ



CHEMISTRY
INSTRUMENTS
INSTALL
2022-2023
5 People
Papers in progress,
Funding, LPSC, HQ
Proposals, SSERVI



PEARL Adv. Curation Facility,
Simulant production, Moon,
Mars, Adv. Curation Products
2023-CURRENT
6 People
Papers, Grants, Abstracts, ARES
Community and JSC
collaborative support.

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- PEARL Group
 - Christopher L. Harris
 - Cecilia L. Amick
 - Saunab Ghosh
 - Kimberly Allums-Spencer
 - Jeremy Boyce
- Thank you for your time!

CONTACT INFO:

If you want me to review your cold simulant processes, and

If I can provide input (this depends upon several things).

Then contact me at:

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PEARL PRINCIPAL SCIENTIST

