Regolith - a geologic term coined in 1897 from Greek words meaning a mantle or blanket of rock.

- **Lunar Regolith** - Unsorted collection of lunar particles of all sizes, ranging from boulders bigger than your house to submicroscopic bits invisible to an optical microscope.

- **Regolith particles** - fragments of larger particles, shattered by impact. In some cases, regolith particles are fused agglomerations of other particles, heated and partially melted together by impacts.

- **Lunar Soil** - lunar regolith particles smaller than one centimeter.

- **Lunar Dust** - *newly defined* as lunar regolith particles 10 μm and smaller.

No matter what we call it, we have to manage it!
"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
Apollo 17 Technical Debrief

"A common sense, layered, engineering design defense can solve any apparent problem with dust during long-term human activity and habitation in the lunar environment."

Jack Schmitt
Ames Research Center
February 2, 2004
Pervasive, Lunar Regolith is … *

- Surface Obscuration During Descent
- Lunar Module Descent Engine Regolith Transport
- Lunar Module Contamination in Space
- Contamination during Transfer between the LM and CSM
- Command Module Contamination
- Mechanisms for Lunar Module Contamination
- External Environmental Lunar Dust Effects
- Space Suits and Seals
- Human Exposure
- Operations - Crew Efficiency

* Derived from NASA/TP-2006-21726, “The Apollo Experience: Lessons Learned for Constellation Lunar Dust Management”
Lunar Regolith Management Strategy

- Solid Operational Concepts and Engineering Design will lead to a dramatic improvement in managing lunar dust, e.g.,
  - Airlock
  - Improved Seals
  - Abrasion Resistant Materials
  - Cleaning Procedures, etc.

- Targeted Technologies, defined by CxP Risk Management Plan and Technology Insertion Strategy, will fill reliability and performance requirements gaps, e.g.,
  - Cabin Air Management
  - Automated Cleaning Technologies
Primary Objectives
We Want to Hear From You!

- Learn Your Best Practices and Standards for Managing Dust
- Learn Your Capabilities and Technologies for Managing Dust
- Learn Your Testing Strategies to Ensure Proper Operation in Dusty Environments
Secondary Objectives

- Establish Potential Partnerships
- Identify Interested Participants for the Community of Practice
Capability Needs

- Site Preparation – Roads, landing site, construction materials, radiation shielding
  - In-situ microwave sintering
  - Waste recycling
  - Temporary mats
  - Fixative or adhesives
  - Vibration

- Hard and soft goods surface coatings
  - Coatings that attract and/or repel dust
  - Abrasion resistant coatings
  - Strippable coatings
  - Easy don and doff over-garments

- Compressed gas extraction
  - Storage
  - Re-use
  - Cleaning systems
Capability Needs (Continued)

- Automated cleaning systems
  - Electrostatic
  - Magnetic
  - Vacuum
  - HEPA Filtration
  - Self cleaning connectors

- Manual cleaning systems
  - Non-abrasive brushes that remove very small particles
  - Magnetic and or electrostatic wand

- Crew and equipment translation systems
  - Pressurized articulating jet ways
  - Vacuum transfer
Thank You