

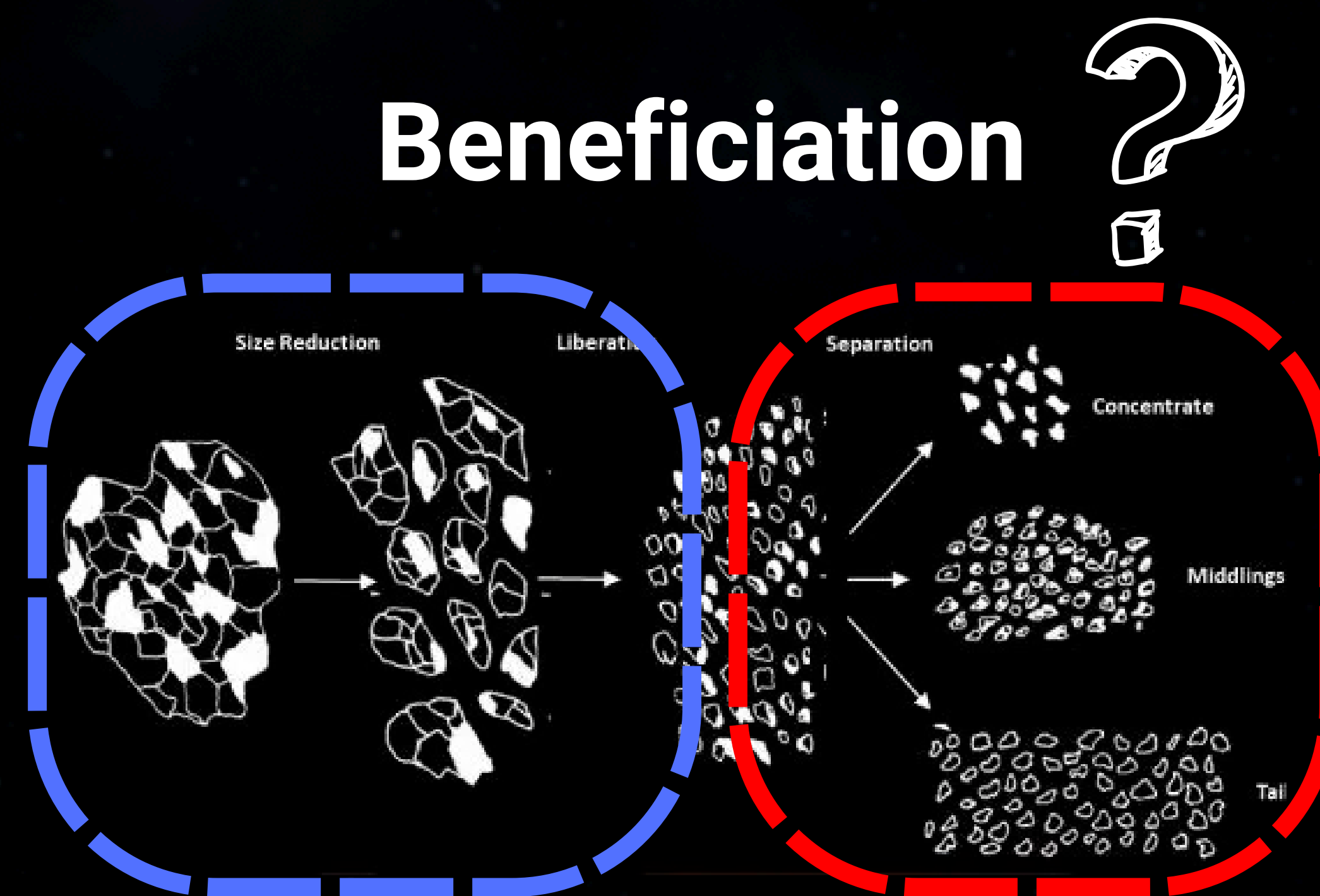


Lunar Beneficiation Test Bed (LBTB) Proposal

Purpose of Test Bed

- Validate lunar beneficiation technology in a real lunar surface environment
- Address science questions in order to support lunar mining development
- Advance industrial scale ISRU capabilities for lunar surface
- Provide technical path to industrial scale mining on the Moon

Beneficiation

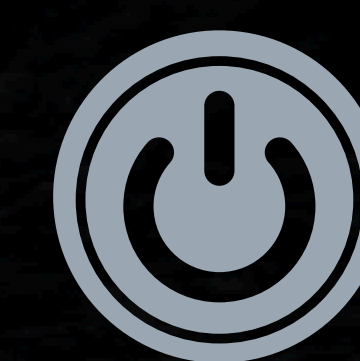


(Wills, 1991) "ore beneficiation ...follows mining and prepares the ore for extraction of the valuable metal..."

Beneficiation here and over there

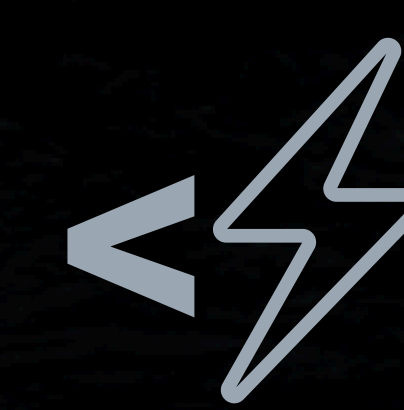
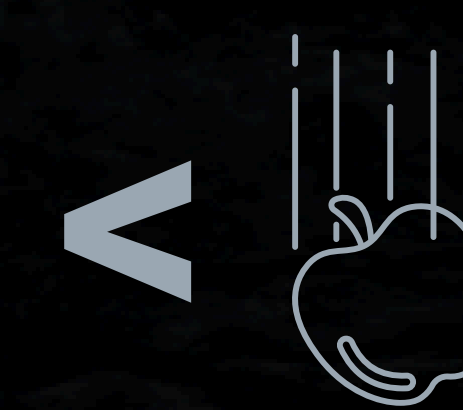
Terrestrial methods:

Electrostatic and Magnetic Separation
Flotation
Gravity Concentration (density)
Hydrodynamic Concentration
Mechanical Screening
(Dermont et al, 2008)



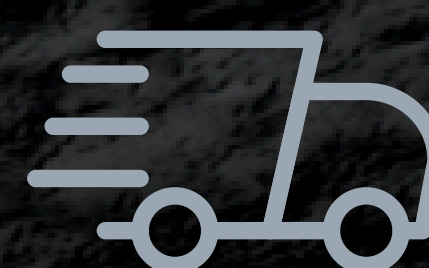
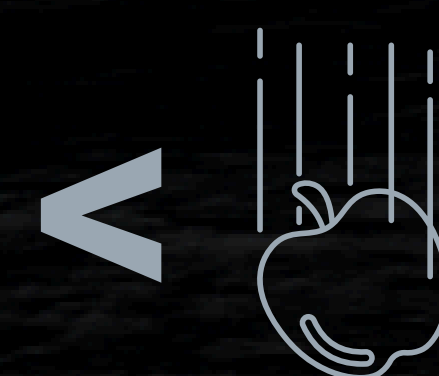
Lunar methods:

Electrostatic Separation
(Quinn et al, 2012)
Magnetic Separation
(Berggren et al, 2011)
Gravity & Mechanical Screening
(Dreyer et al, 2012)
Challenging on the Moon:



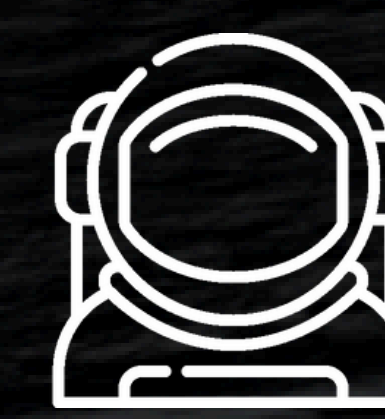
Science Questions

- What is the effect of Lunar gravity on regolith flowability?
- What are the charge properties of regolith dust and how can charge be manipulated in a controlled manner for optimized electrostatic separator operations?
- What are the effects of dust-dust and dust- surface adhesion on size separation?
- What are the effects of regolith size distribution, composition and petrography on beneficiation methods, including electrostatic, magnetic, and enhanced gravity?
- What is the expected range of lofted dust transport from different methods of beneficiation?
- How does dust affect and degrade materials over time and repeated exposure?
- How well do dust mitigation techniques work on various surfaces?



The Lunar Beneficiation Test Bed

Provides iterative in-situ development; long term exposure to regolith for durability testing



Will:

- Operate payloads
- Record data
- Evaluate efficacy
- Optimize configurations

Test Bed Payloads

- Dust Detector
- Microscope
- Dust Mitigation Device
- Centrifugal Sifter Separator
- Electron Beam Separator
- Particle Comp Analyzer
- Particle Size Analyzer

Use Cases

Lunar Construction
Additive Manufacturing
"Traditional" mining (Anorthosite, Ilmenite, Rare Earth Elements (REEs), and water ice)

