

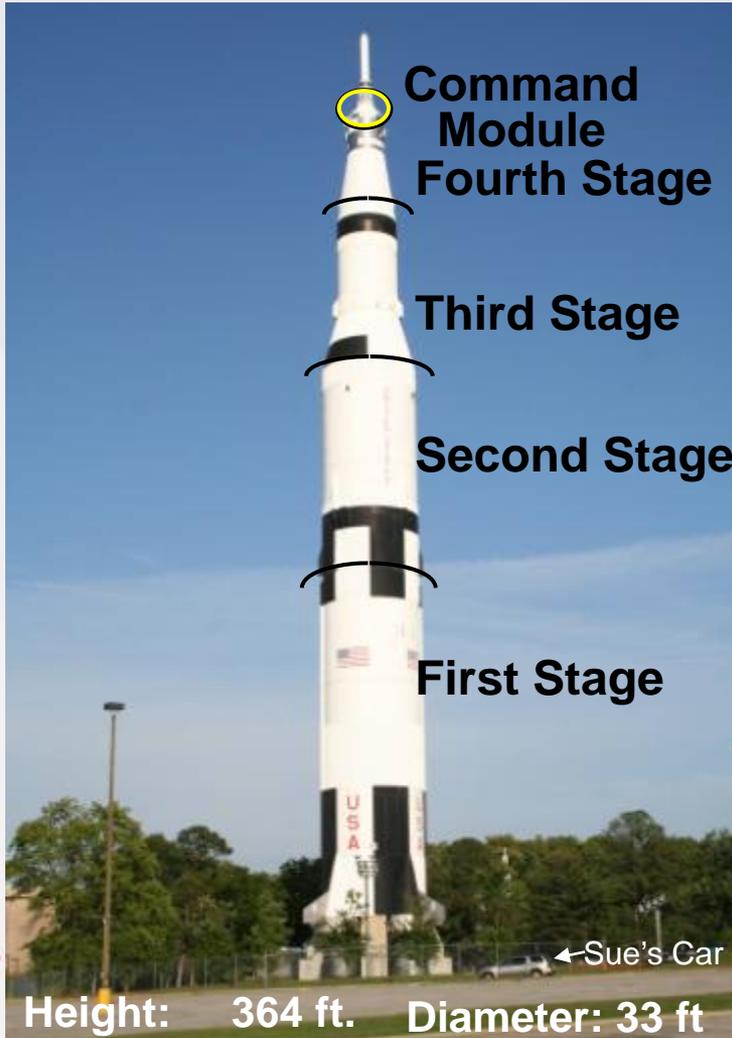


Beneficiation in Lunar Work TIM sponsored by Montana Tech

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Saturn V



Height: 364 ft. Diameter: 33 ft

	Weight (lbs.)	Altitude (miles)	Velocity (mph)
Command Module	12,807		
Service Module	54,064		
Lunar Module	32,299		
Third Stage	265,000	239,000	24,500
Trans Lunar Burn Orbital Burn		115	17,500
Second Stage	1,037,000	114	15,300
First Stage	4,881,000	38	6,000
	<u>6,600,000</u>		



Natural Feedstock Characteristics

- Are always variable in all 3 spatial dimensions
- Commonly contain deleterious components
- Commonly have low concentrations of desired fractions

For these three reasons it is standard industrial practice to beneficiate feedstocks. This is true across all industries which transform raw materials into standardized units.

Benefits:

- Simplify subsequent processes
- Improve efficiency
- Improve overall quality



Lunar Resources

On the Moon there are three natural resources:

- Vacuum
- Radiation
- Regolith

To utilize lunar regolith it is reasonable to presume some beneficiation of the regolith (ground rock) resource will be desirable if not essential.

As on Earth, this will require fundamental understanding of the physics and chemistry of the relevant processes, which are **exceeding complex** in detail.



(Lunar vs. Simulants) and Engineering

Any lunar geologist can easily recognize a sample as being terrestrial versus non-terrestrial. There are a sizeable number of features that make this possible.

Corollary: There is no single terrestrial rock that is a close match for lunar materials.

For use as a simulant the question of sensitivity of engineering to test article accuracy must be addressed. How close is close?



Beneficiation of Terrestrial Feedstocks

Suppression of Mineral Contaminates (e.g. hydrous phases, quartz)

Manipulate mineral composition by

- altering natural compositions (Na level of plagioclase)

- relative abundances (ortho- vs. clino-pyroxene)

Reproducibility

Cost



Thus, simulant production can benefit from beneficiation of the input feedstocks.

Beneficiation of geologic feedstocks is the subject of extractive metallurgy.

Clearly, NASA has two discrete interests pertaining to the science and technology of extractive metallurgy.

