



# Lunar Exploration Initiative

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Briefing Topic:

## Lunar Surface Conditions

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# Surface Temperatures

- Surface temperatures were measured with thermocouples at the Apollo 5 and 17 sites, where heat flow measurements were also made
- Surface temperatures were measured using Earth-based techniques
- These results were used to estimate temperatures at several locations on the Moon by the Lunar Colony Study Group:

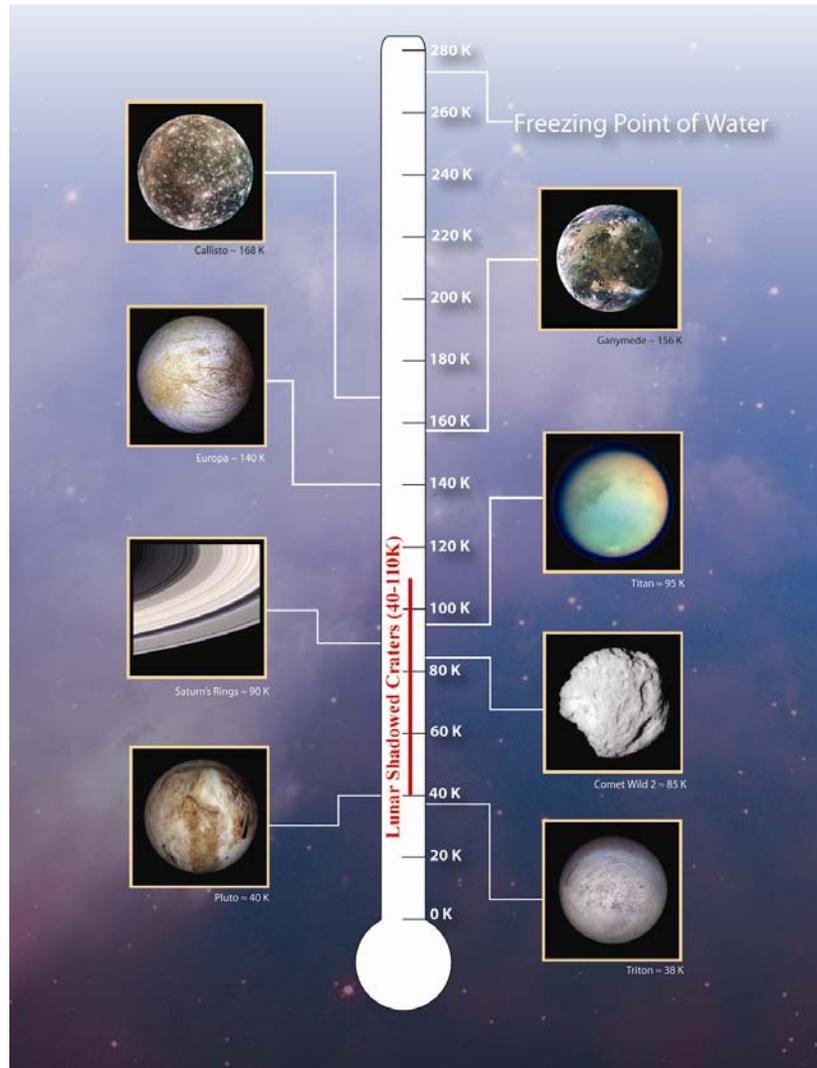
|               | Shadowed<br>Polar<br>Craters | Other<br>Polar<br>Areas | Nearside<br>Equatorial | Farside<br>Equatorial | Limb<br>Equatorial | Typical<br>Mid-<br>Latitudes |
|---------------|------------------------------|-------------------------|------------------------|-----------------------|--------------------|------------------------------|
| Average T     | 40 K(?)                      | 220 K                   | 254 K                  | 256 K*                | 255 K              | 200<T<255K                   |
| Monthly Range | none                         | ± 10 K**                | ± 140 K                | ± 140 K               | ± 140 K            | ± 110 K                      |

\* The farside is closer to the Sun at noon, so it gets ~1% more solar energy than nearside

\*\* There is, however, several weeks each year where  $T < 200$  K

DH72 + HVF (VRHOM) 91 T3.2

# Polar Temperatures



- Temperatures in shadowed craters are estimated to be as low as 40K.
- Water ice may be stable up to 110K
- These temperatures are similar to those on Titan, Triton, comets, and in Saturn's rings.

VPW 99; K 05

# Visibility

- Distances are hard to evaluate (objects are farther away than they appear)
- Most shadows visible from orbit (e.g., shadows in crater floors) are not visible on surface, so locating one's position and the positions of target features is difficult
- A lot of the lunar topography is beneath the intercrater surface and, thus, not visible from afar
- Shadows that are visible are best seen when viewing orthogonal to sunlight
- Contrast of lunar surface material is “washed-out” when moving away from Sun
- Colors appear to change with Sun angle; the same area can appear light gray, dark gray, or brown
- The Sun is very bright

# Dust

- **Silt-sized, generally 40 to 100 microns in size (and 10-20% less than 20 microns in size)**
- **Very sharp**
- **Electrostatically-charged by passing sunlight (UV)**
- **Adheres to painted and metallic surfaces with a strength of  $1 \times 10^4$  and  $2$  to  $3 \times 10^3$  dynes/cm<sup>2</sup>, respectively. Also adheres to fabrics, where irregular dust particles get tangled with fabric surfaces and cause wear**
- **See briefing titled “Parameters of Lunar Soils” for additional information**

# Ionizing Radiation

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- Refer to the briefing titled “Ionizing Radiation on the Moon”





# Other Parameters

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- **Gravity**
- **Length of day (and night, with implications for T and solar-charging)**
- **Micrometeorite impacts**
- **Exploration-generated “atmospheres” can contaminate the lunar surface environment**