NASA’s GRAIL Mission

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NASA’s **Gravity Recovery and Interior Laboratory (GRAIL) mission** has revealed **notable contrasts** between the **Moon’s near side** and **far side** due to **temperature variations, crust thickness**, and **ancient volcanic activity**.

- **GRAIL** used twin spacecraft, **Ebb and Flow**, to study the Moon's **internal structure** in detail and to produce the **highest-resolution gravity map of the moon** by mapping lunar gravitational variations.
- **Key Findings of GRAIL Mission:**
  - **Tidal Locking**: The **Moon's rotation** period **equals its orbit period**, so **one side** always faces **Earth** and the other **permanently hidden.**
  - **Temperature Difference:** The Moon’s **near side** (facing Earth) is **warmer**, **softer**, and was once **partly molten**, while the **far side** (hidden from Earth) is **colder** with a **thicker crust** that blocks **magma eruptions**.
  - **Volcanic History:** The Moon’s **near side** features **dark lava plains (maria)**, while the **far side** has a **thicker crust** with **fewer lava flows.**
  - **Thermal Asymmetry:** It estimated a **temperature difference** of **100–200°C** between hemispheres. It found that the Moon’s **crust** is more **porous** and **thinner** than previously believed.
- The phenomenon helps explain the Moon's **Janus-faced appearance** i.e., **one side bright and heavily cratered,** the **other dark and smooth**.

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