

## **Nature and Origin of Lunar Light Plains**

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Light Plains are a unique form of highland terrain on the Moon: They are exceptionally smooth, in most cases darker than the surrounding terrae, but brighter than maria. Their lower crater density implies younger ages than those of the anorthositic highland crust. Light Plains make up ~5% of lunar highland terrain.

The origin and nature of Lunar Light Plains are controversial. Before Apollo, a volcanic origin was widely accepted for these smooth surface units. Returned samples—highly brecciated rocks—from the Cayley Formation at the Apollo 16 landing site changed that view: An origin related to the Imbrium or Orientale impact event seemed to be plausible; a mechanism called ballistic erosion and sedimentation has been proposed for the deposition of large quantities of local material stirred up by impacting basin ejecta to form smooth surfaces. Absolute age determinations with calibrated crater-frequency distributions on plains of the central and north-polar nearside highlands, on the other hand, show that some Light Plains are definitely younger than the Orientale impact, the last basin-forming event at ~3.84 Ga. Our observation of Light Plains clearly younger than the Orientale event excludes an origin related alone to ejecta deposition from basin-forming impacts.

Additional candidate processes we will discuss, include: dusting of (cryptomaria?) surfaces from large post-Imbrium impact craters; seismic shaking; forms of non-mare volcanism. Multispectral and gamma-ray data from orbit have been used to obtain information on the surface composition, strengthening the case for a non-uniform origin of Light Plains.