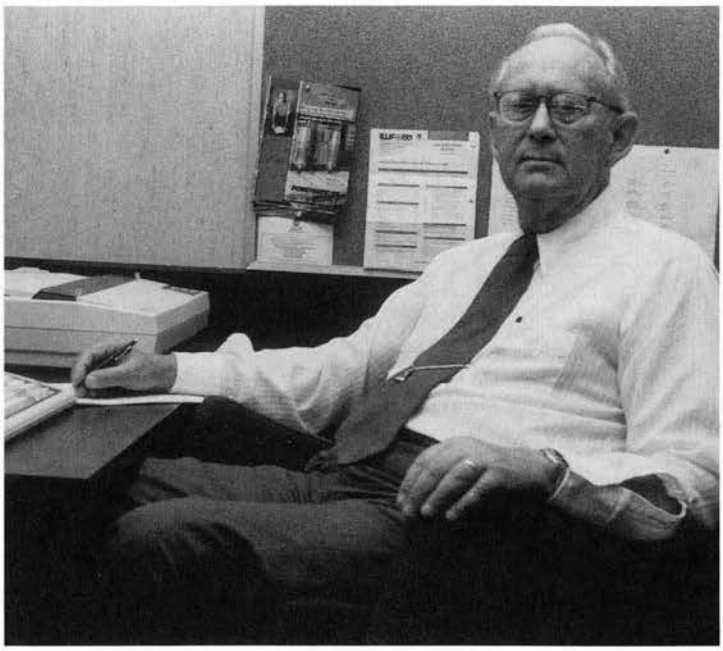
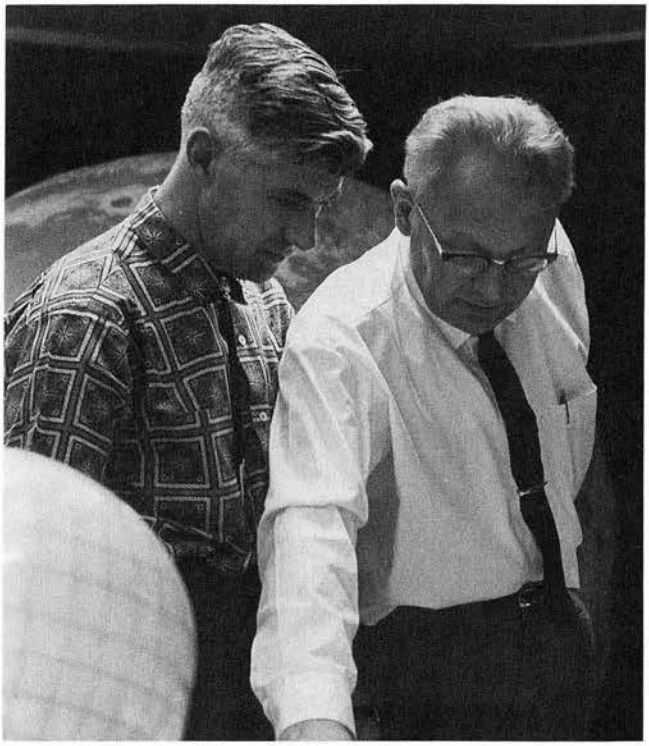
G. K. Gilbert.

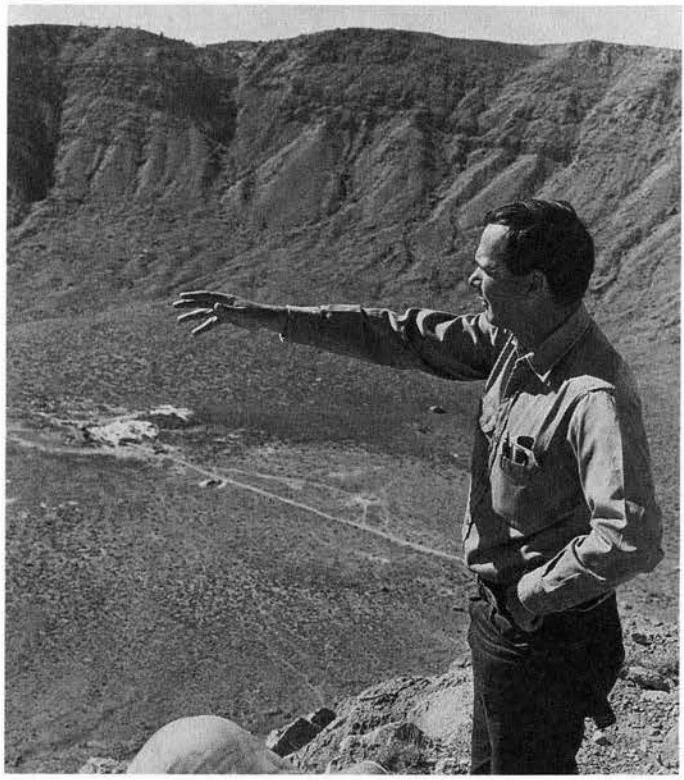


Ralph B. Baldwin. Courtesy of Pamela Baldwin.

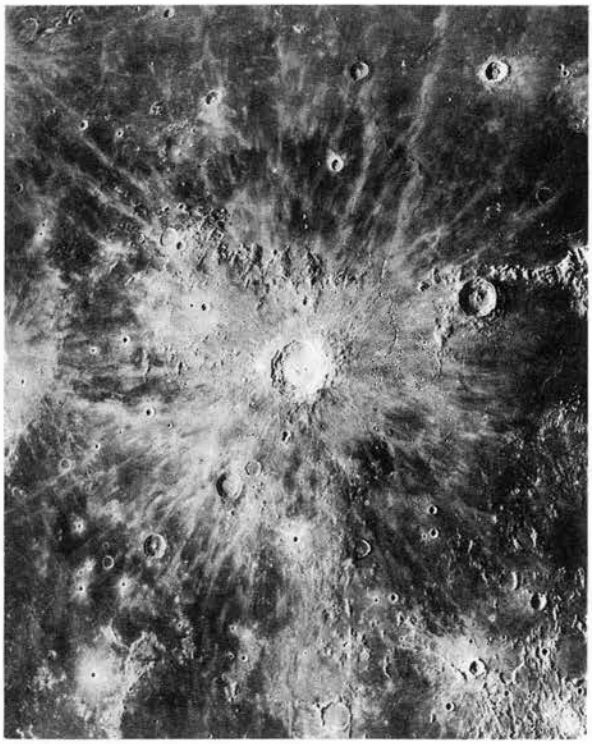
Gene Simmons, Harold Urey, John O'Keefe, Thomas Gold, Eugene Shoemaker, and University of Chicago chemist Edward Anders (*left to right*) at a 1970 press conference. NASA photo, courtesy of James Arnold.



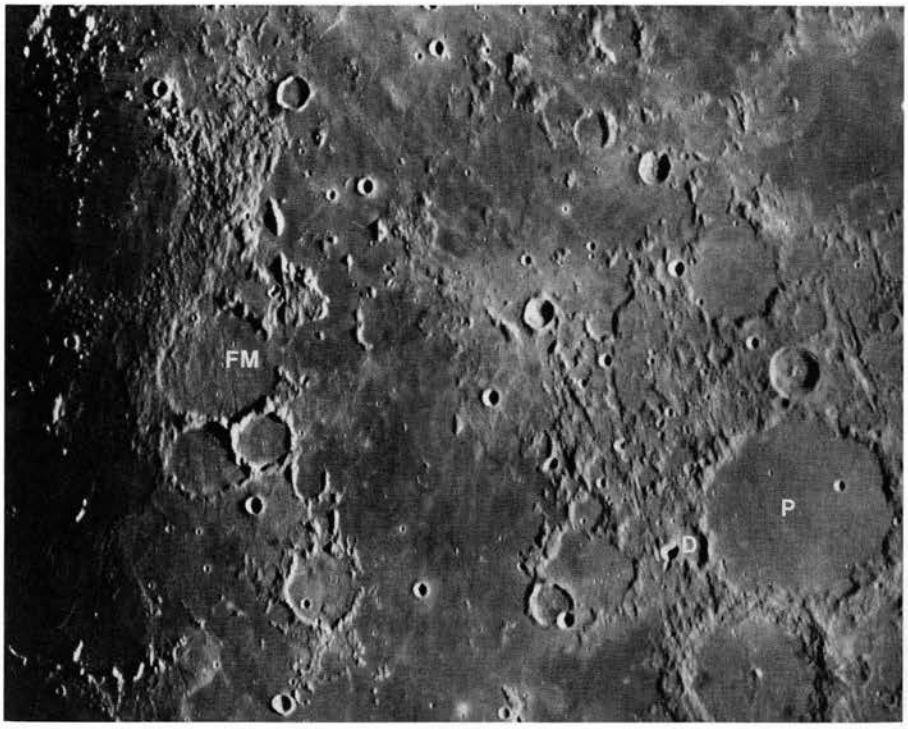
Ewen Whitaker and Gerard Kuiper (*right*) during the Ranger 6 mission in 1964. JPL photo, courtesy of Whitaker.

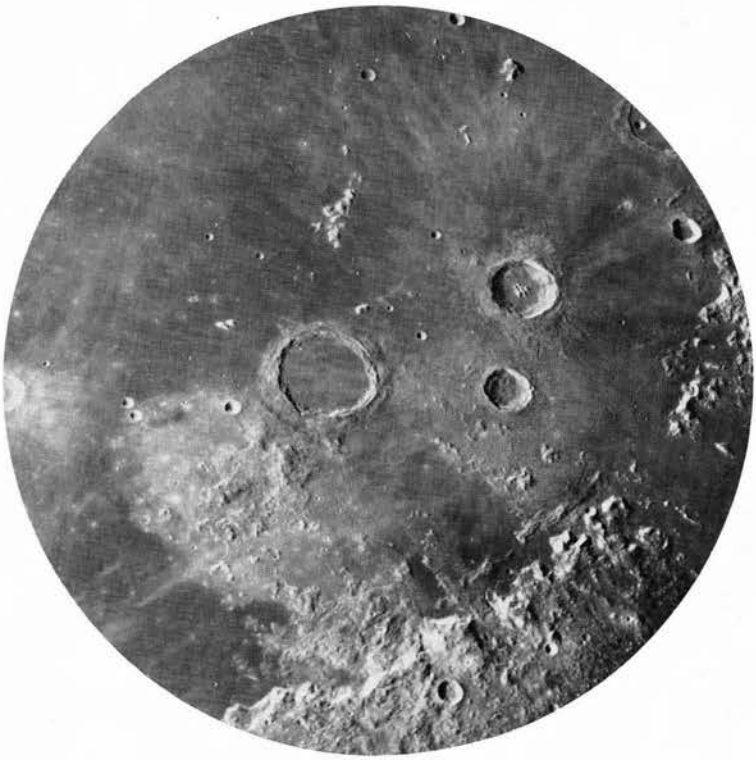


Eugene Shoemaker at Meteor Crater in 1965. USGS photo, courtesy of Shoemaker.



Key photo centered on Copernicus (95 km, 10° N, 20° W) on which Eugene Shoemaker based his early geologic mapping and studies of Copernicus secondary-impact craters. Rima Stadius, a chain of secondaries long thought by most experts to be endogenic, runs roughly north-south to right (east) of Copernicus. Telescopic photo of exceptional quality, taken by Francis Pease with 100-inch Mount Wilson reflector on 15 September 1929.

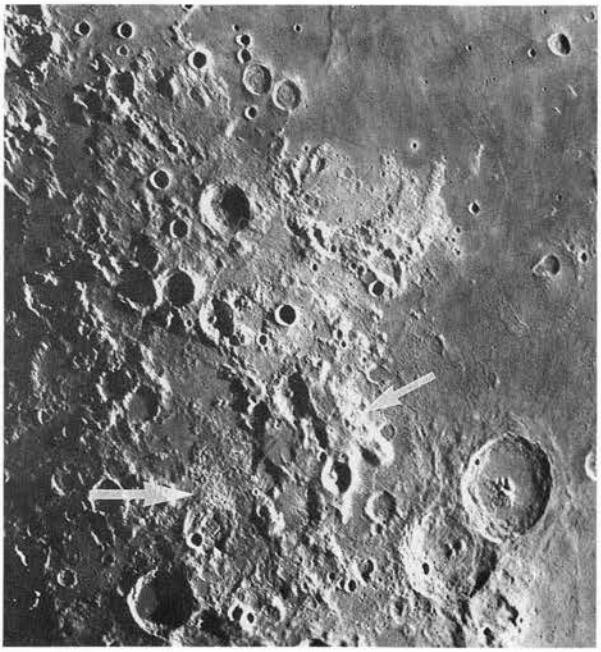




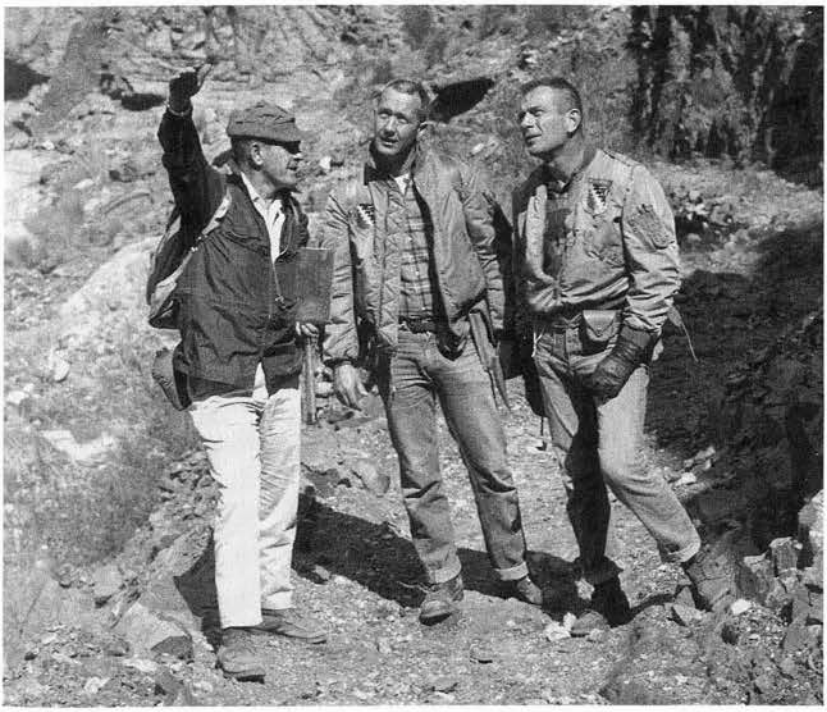
Mare-filled Archimedes (*left*, 83 km, 30° N, 4° W) and postmare Aristillus (*above*) and Autolycus (*below*), in an excellent telescopic photo that reveals critical stratigraphic relations and also led ultimately to the choice of the Apollo 15 landing site (between meandering Hadley Rille and the rugged Apennine Mountains at lower right). The plains deposit on the Apennine Bench, between Archimedes and the Apennines, is younger than the Apennines (part of the Imbrium impact-basin rim) but older than Archimedes and the volcanic mare. Taken in 1962 by George Herbig with the 120-inch reflector of Lick Observatory.

Features of the south-central near side that have figured prominently in lunar thinking, including Imbrium sculpture at Ptolemaeus (P, 153 km, 9° S, 2° W); hummocky Fra Mauro Formation its type area north of crater Fra Mauro (FM, 95 km, 6° S, 17° W); and Davy Rille, the chain of small craters extending left (west) of the irregular double crater Davy G (D). The Frau Mauro Formation became the site of an Apollo landing, and the Davy chain nearly did. Catalina Observatory (LPL) photo.

USGS geologist Al Chidester, Gemini astronaut Ed White, and Mercury astronauts Alan Shepard, Wally Schirra, and Gordon Cooper (*left to right*) during geology training at Sunset Crater volcanic region near Flagstaff, Arizona, May 1964. NASA photo.

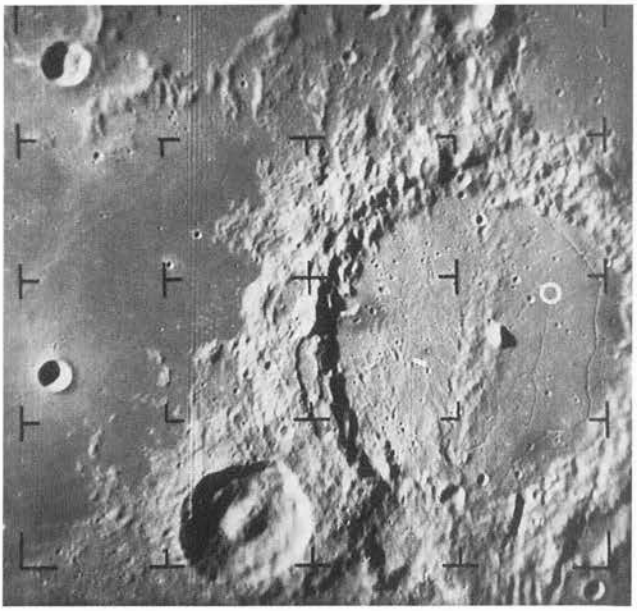


Features that attracted a visit by Apollo 16: hummocks near crater Descartes (48 km, 12° S, 16° E; left arrow) and a ring section of Nectaris basin known as Kant Plateau (right arrow). Catalina Observatory (LPL) photo.



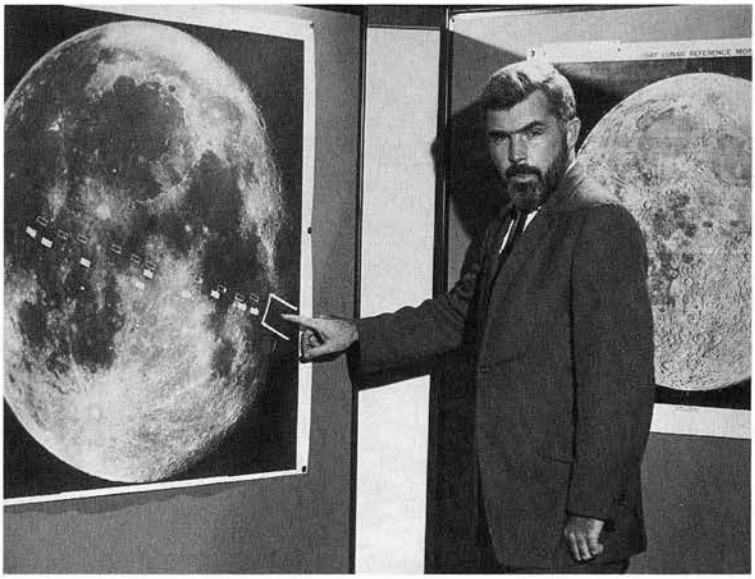
USGS geologist Dale Jackson and astronauts Jim McDivitt and Deke Slayton (*left to right*) during geology training in the Grand Canyon, 12–13 March 1964. NASA photo.

Astronauts at Philmont Boy Scout Ranch, New Mexico, June 1964, wearing the ranch's jackets. As they posed, they realized their resemblance to a glee club and spontaneously hummed a note to establish pitch. From left to right, Pete Conrad, Buzz Aldrin, Dick Gordon, Ted Freeman, Charlie Bassett, Walt Cunningham, Neil Armstrong, Donn Eisele, Rusty Schweickart, Jim Lovell, Mike Collins, Elliot See (*front*), Gene Cernan (*back*), Ed White, Roger Chaffee, Gordon Cooper (*front*), C. C. Williams (*back*), Bill Anders, Dave Scott, Alan Bean. NASA photo.



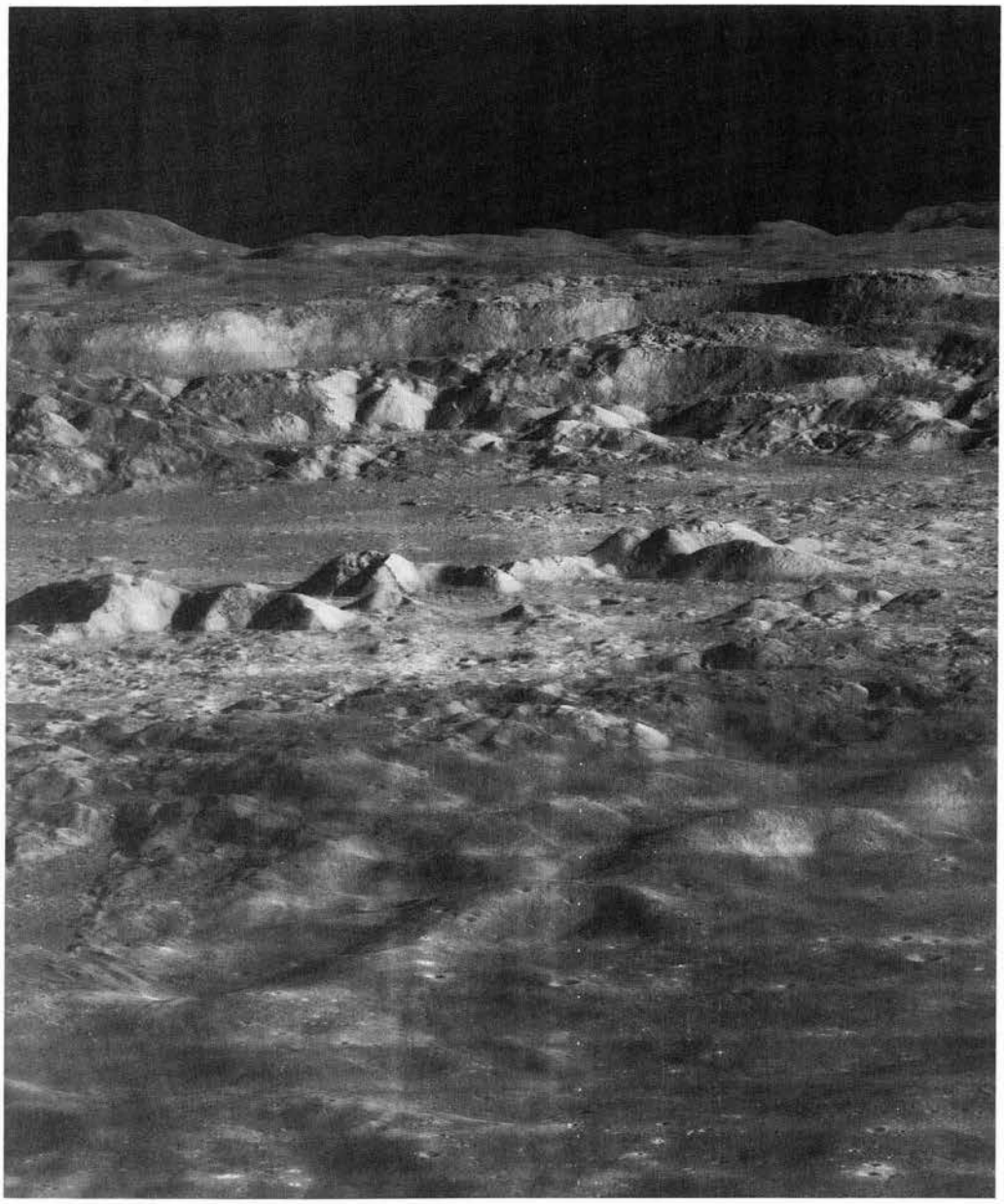
Crater Alphonsus (119 km, 13° S, 3° W), the target of Ranger 9 (impact point in circle) because of its dark-halo craters, narrow rilles, and suspected volcanic emissions from its central peak. A-camera photo taken 3 minutes before impact from 426 km above the surface. Photo by JPL.

USGS mosaic of 212 Surveyor 7 photos showing rubbly rim of Tycho northeast of spacecraft. The large block casting a long shadow is about 60 cm across. NASA photo.

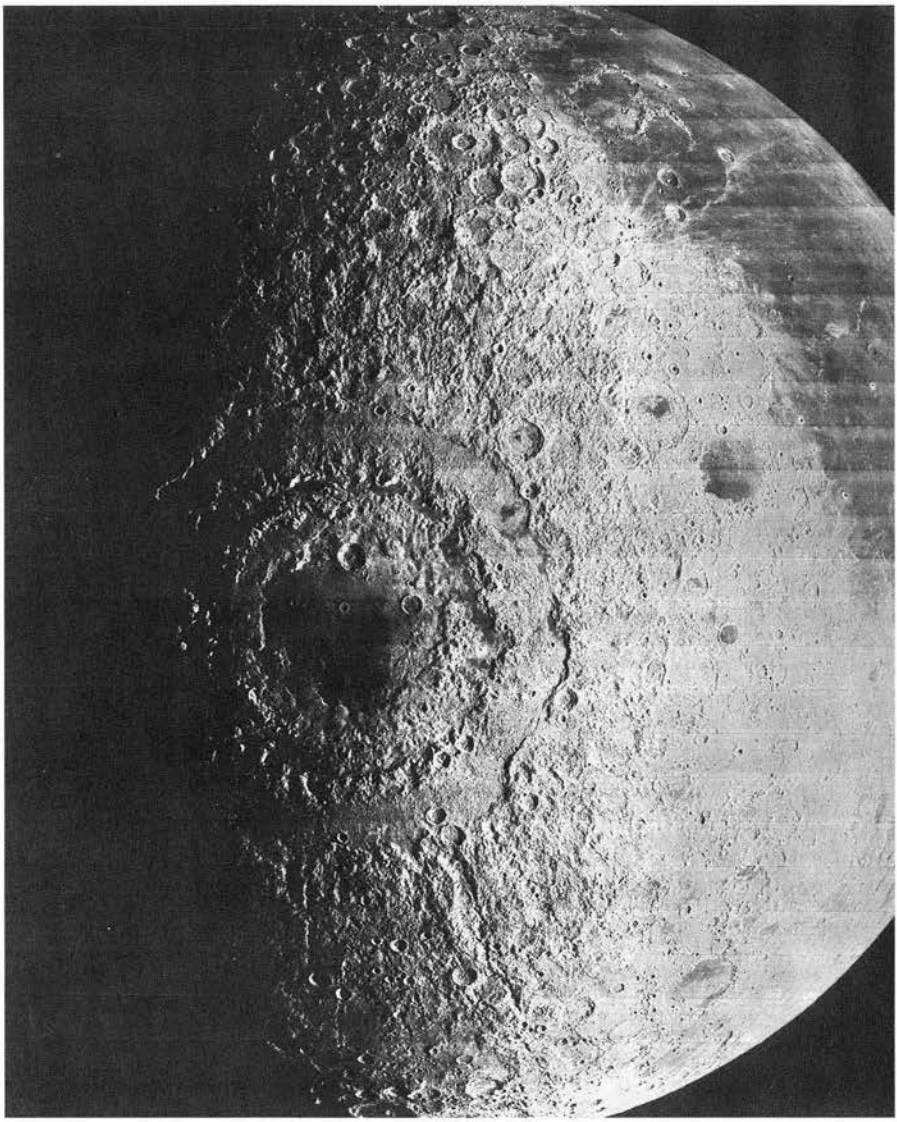


Jack McCauley pointing out Lunar Orbiter Mission B plan (solid white rectangles) on 16 August 1966 during the Orbiter 1 mission. The Orbiter 1 sites are shown in open rectangles on the near-full-moon photo Jack is pointing at and on the ACIC Lunar Earthside Mosaic behind him. USGS photo, courtesy of McCauley.

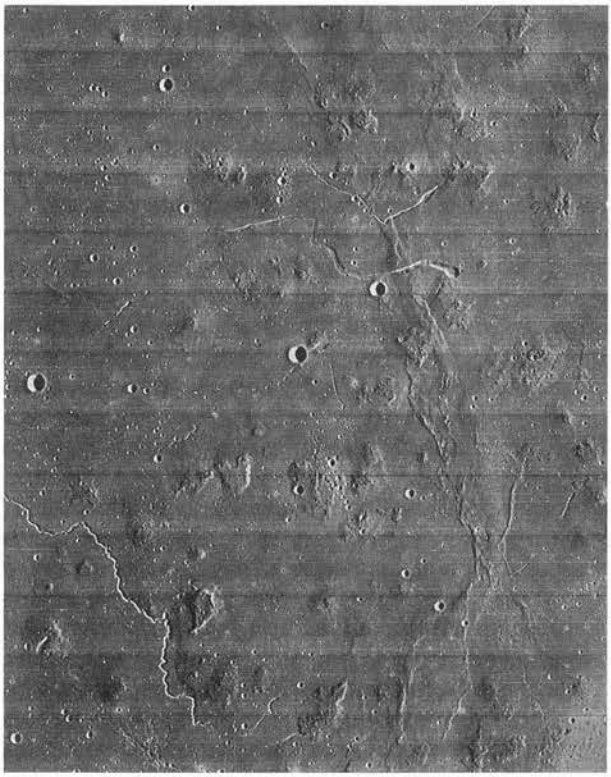
Schröter's Valley (Vallis Schröteri), probably formed by flowing lava. Orbiter photos revealed a small meandering rille inside the larger, telescopically visible rille (compare frontispiece, 25° N, 50° W). Cobra Head, at lower right, is heavily pitted by secondary-impact craters of the crater Aristarchus, just out of picture. Orbiter 5 frame M-204, August 1967.



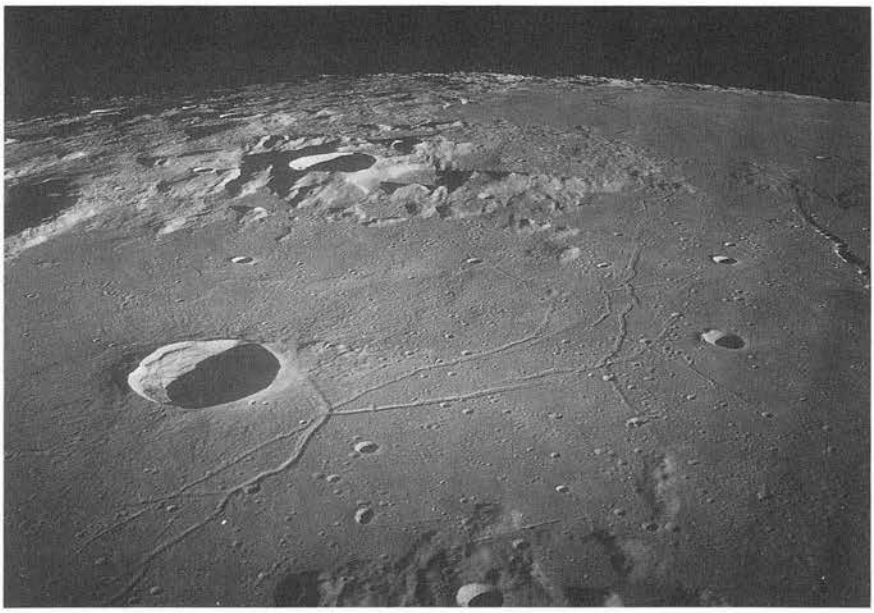
Oblique view of Copernicus shot by Orbiter 2 from a point 46 km above the surface and 240 km south of Copernicus, giving an entirely new low-angle close-up perspective on the Moon that got it dubbed the "Picture of the Century" by the news media. The distinct ledges on the crater's central peak were interpreted by hot-Moon advocates as igneous dikes and by impact advocates as parts of the subcrater stratigraphy uplifted during peak rebound. Orbiter 2 frame H-164, 23 November 1966.



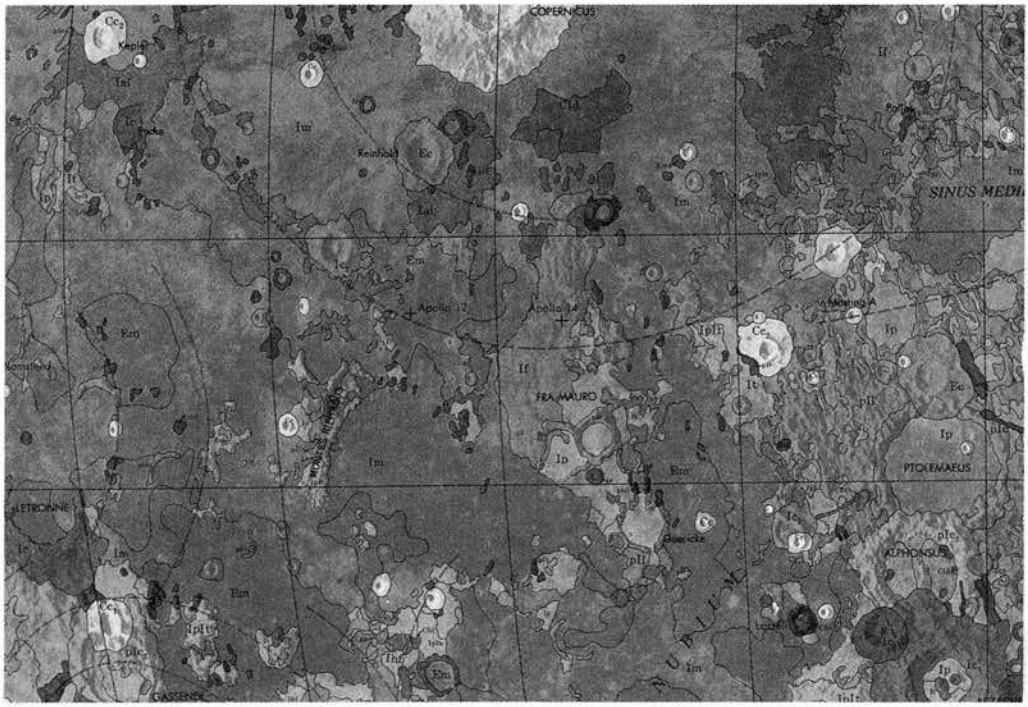
Multiringed Orientale impact basin, 930 km across the outer (Cordillera) rings, centered at 20° S, 95° W, on the Moon's west limb. Taken on 25 May 1967 by Orbiter 4 (frame M-187) at the end of its mission.



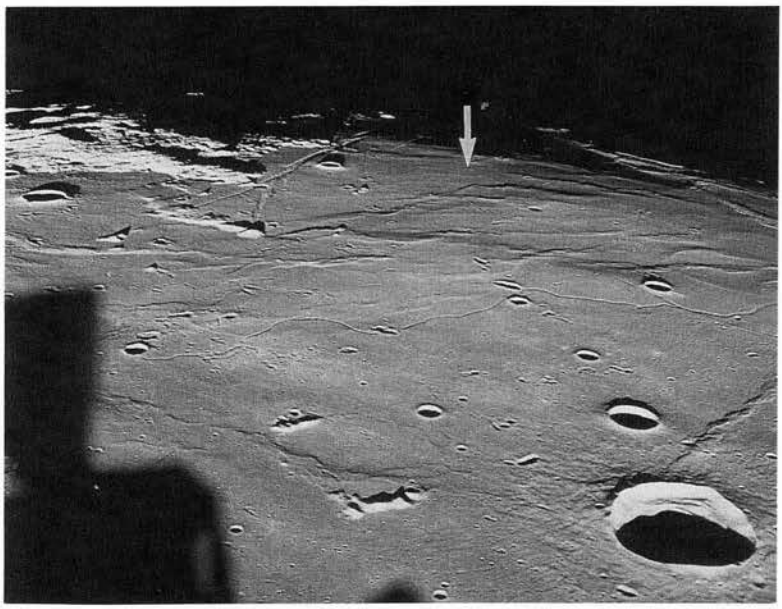
The volcanic Marius Hills (15° N, 55° W), commonly considered for a late Apollo landing. This Orbiter 4 scene (frame H-157, May 1967) is 110 km across.



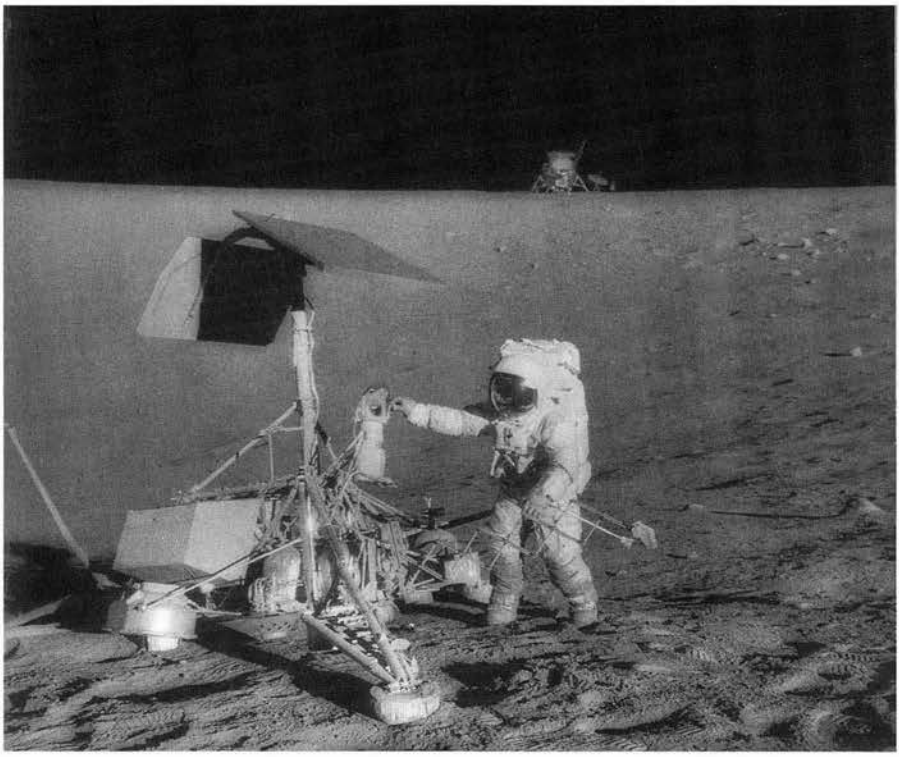
Crater Triesnecker (26 km, 4° N, 3.5° E) and the Triesnecker Rilles as seen from the low-flying Apollo 10 command module in May 1969. Part of Hyginus Rille, an important alternative site for a late manned landing, at right edge. NASA photo AS10-32-4816.



Part of *Geologic Map of the Near Side of the Moon* by Don E. Wilhelms and John F. McCauley (1971), centered on the Fra Mauro peninsula and Apollo 12 and 14 landing sites. USGS map I-703.



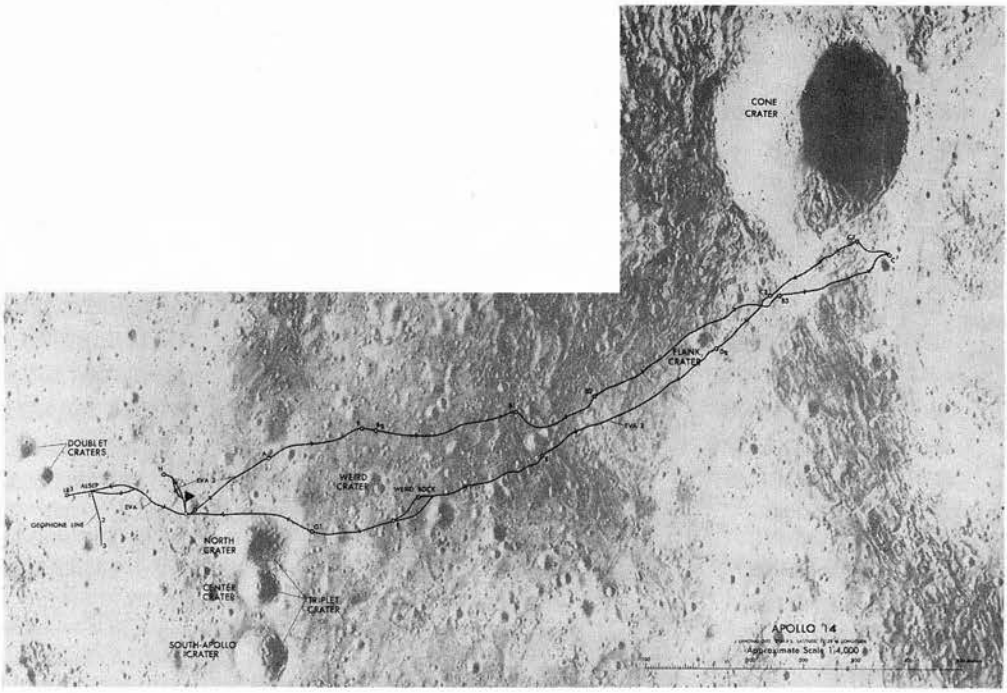
Approaching Tranquillity Base (arrow) in the Apollo 11 lunar module *Eagle*, 20 July 1969. The foreground shadow partly obscuring the view is one of the LM's thrusters. NASA photo AS11-37-5437.



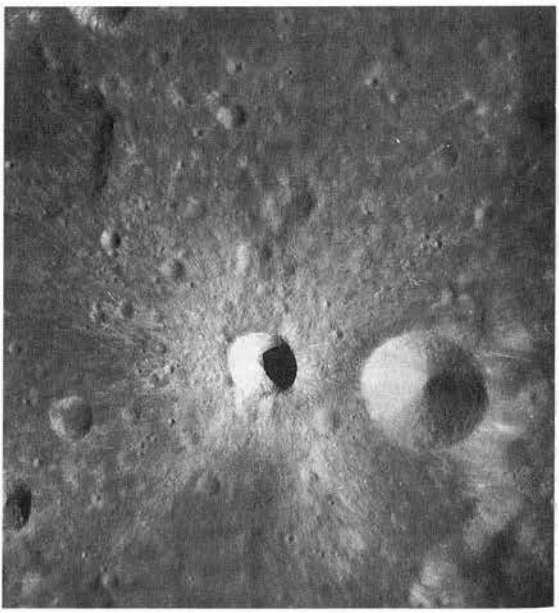
Alan Bean inspecting Surveyor 3, which landed 31 months before his Apollo 12 lunar module (background) did. NASA photo AS12-48-7133.

Crater Kepler (32 km, 8° N, 38° W). NASA photo AS12-52-7745, taken obliquely with a Hasselblad camera out of the window of the Apollo 12 command module in November 1969.

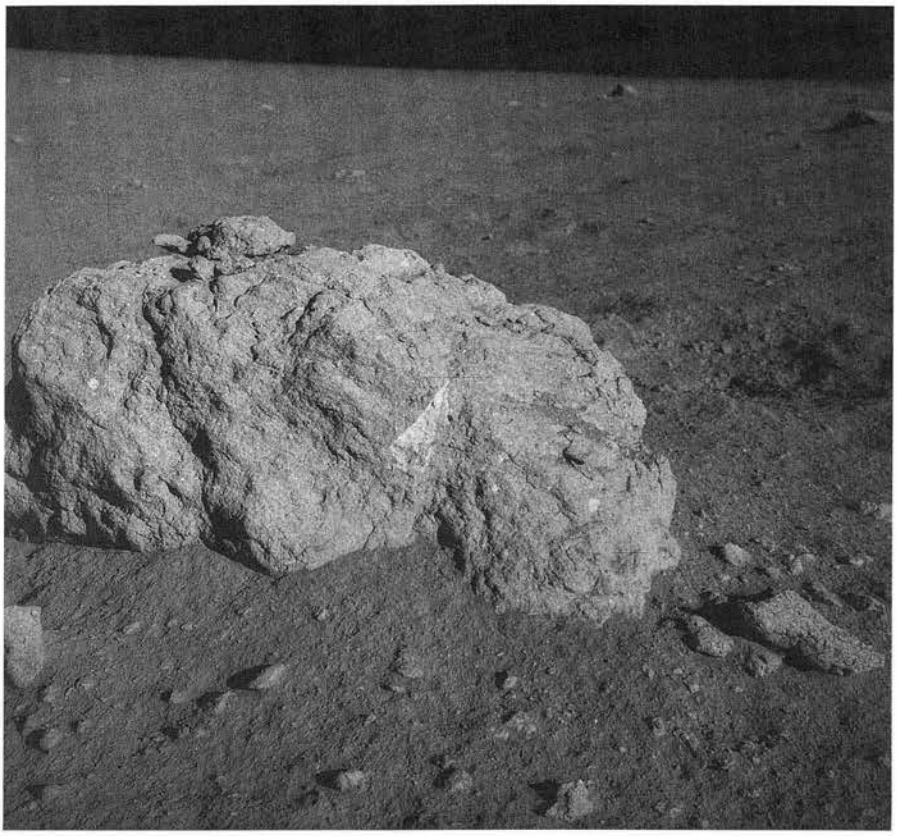
Crater Marius (41 km, 12° N, 51° W) and Marius Hills. NASA photo AS12-52-7757, taken obliquely with a Hasselblad camera out of the window of the Apollo 12 command module in November 1969.



Map of Apollo 14 traverses. Flag marks landing point (5 February 1971). Prepared by USGS, produced by Defense Mapping Agency (1:4,000 scale refers to original).



Young bright-rayed crater Censorinus, 3.5 km across, on northern Nectaris basin rim south of Mare Tranquillitatis (0.4° S, 32.7° E). A much-considered early Apollo landing northeast of the crater proper could have sampled ejecta derived from as deep as 1 km. The larger, more degraded, older crater is Censorinus A. NASA photo AS10-28-4040, May 1969.



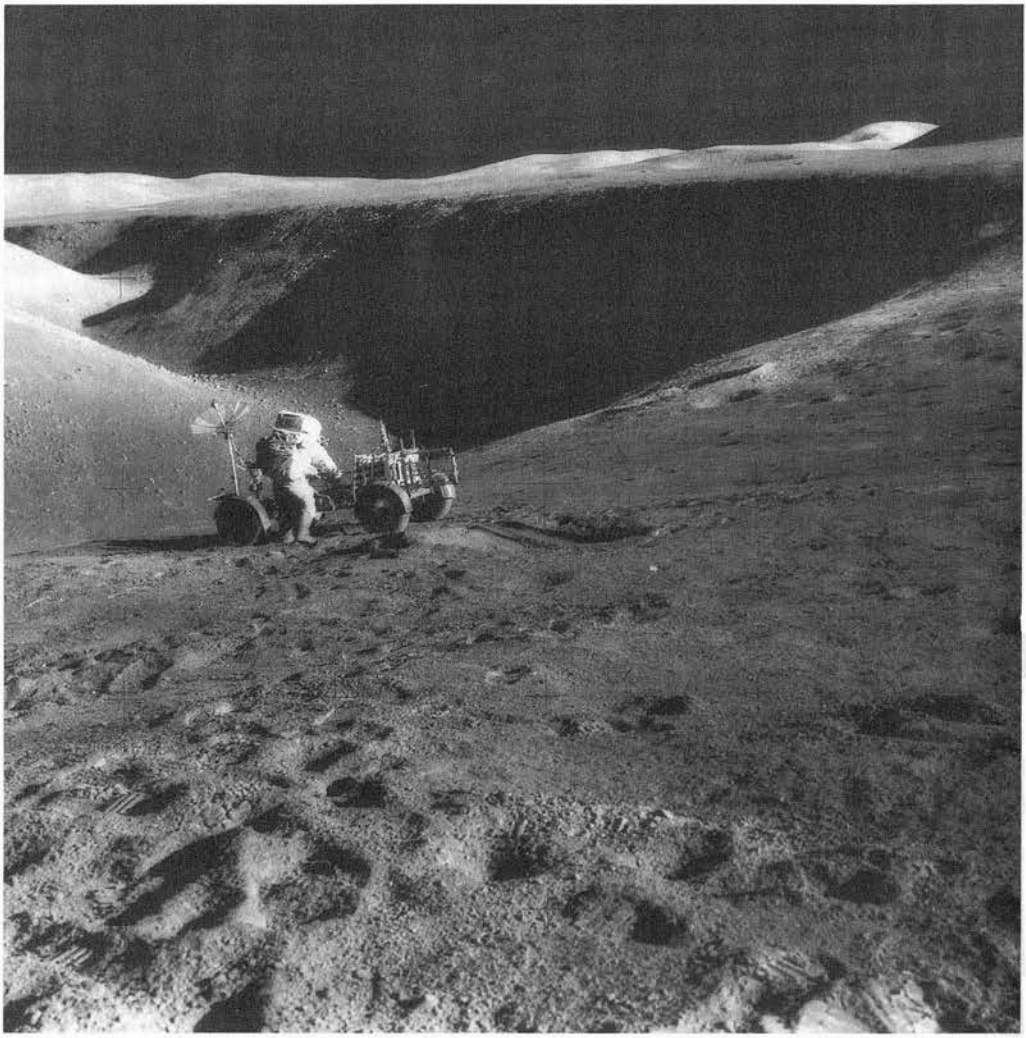
Well-named "Turtle Rock" impact breccia at Apollo 14 Station H. Inclusions or clasts in a matrix (light in dark here) are characteristic of breccias. NASA photo AS14-68-9475.

Geology team leader Gordon Swann (*right*) adjusting the backpack of Apollo 15 astronaut Dave Scott during geology training at the Cinder Lake crater field near Flagstaff, Arizona, late 1970. NASA photo.

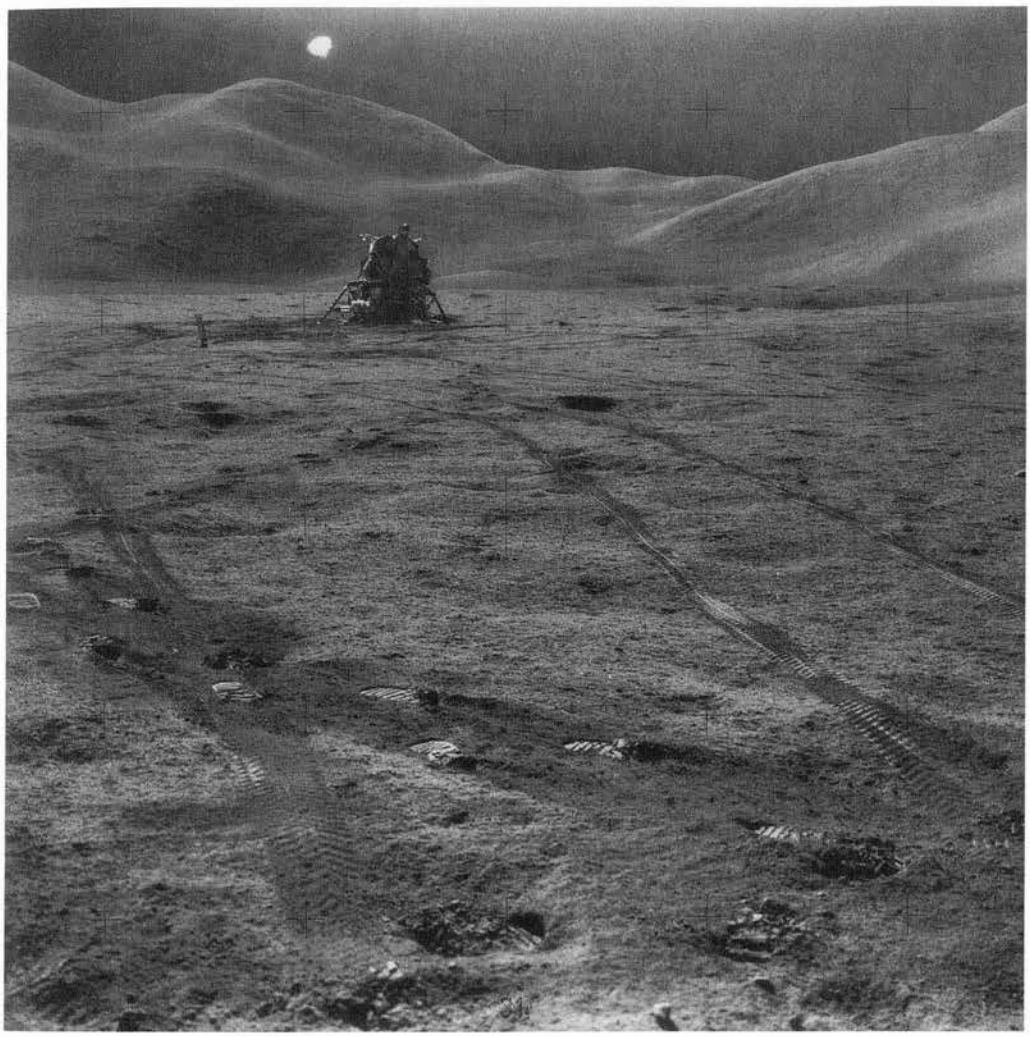
Photomap of Apollo 15 landing site region showing main feature names, traverses, and sampling stations. Defense Mapping Agency.

Davy Rille, once a leading candidate for the Apollo 15 landing, in an Apollo 14 photo (AS14- 73-10103) taken in February 1971. Large foreground crater is Davy G (16 km, 10.4° S, 5.1° W).

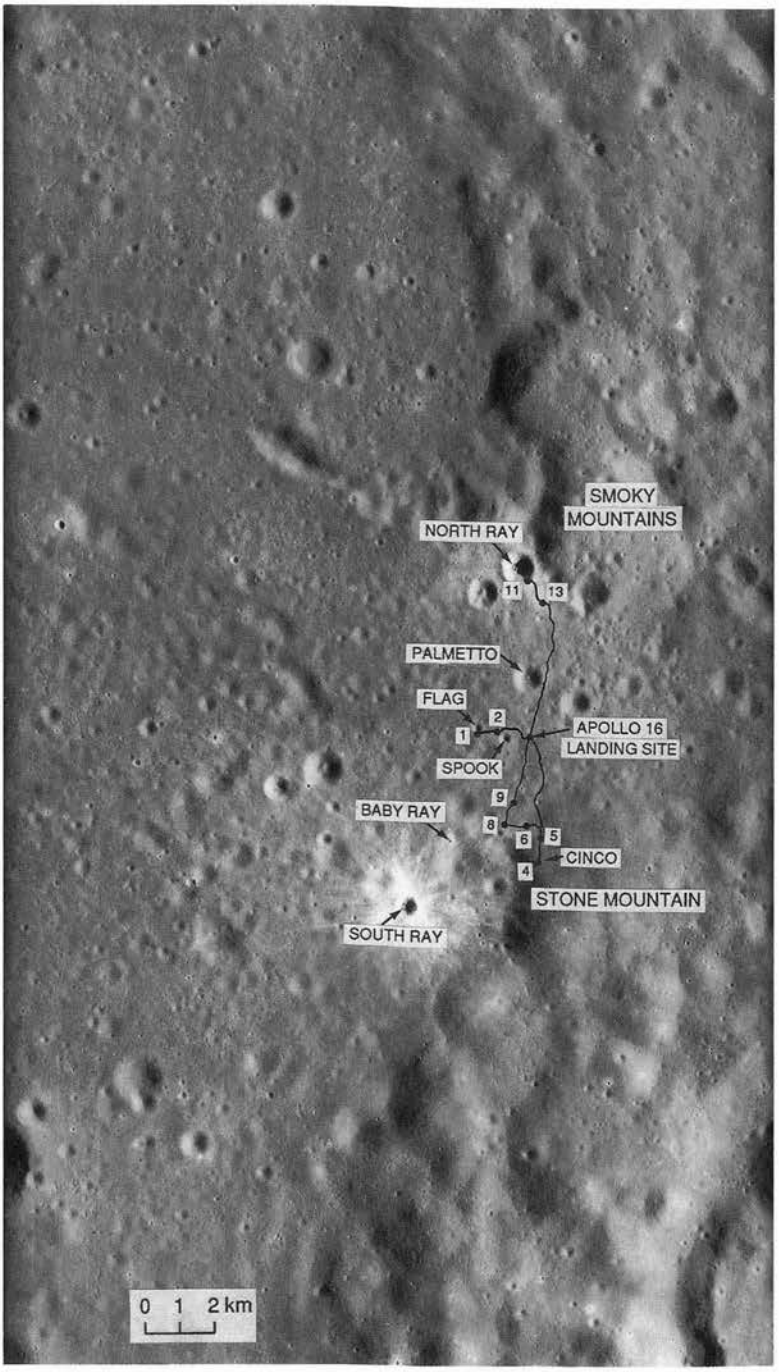
Apollo 15 prime and backup crews training at 3,700-m elevation in Silverton Caldera, San Juan Mountains, Colorado, July 1970. Lee Silver (with Tim Hait's hat) was showing them volcanic stratigraphy and deposits created by downslope movement of rubble (visible on mountains in background). From left to right, Dick Gordon, Jim Irwin (*front*), Jack Schmitt (*behind*), Dave Scott, Silver, Hait. Photo taken by mission scientist Joe Allen, courtesy of Silver.



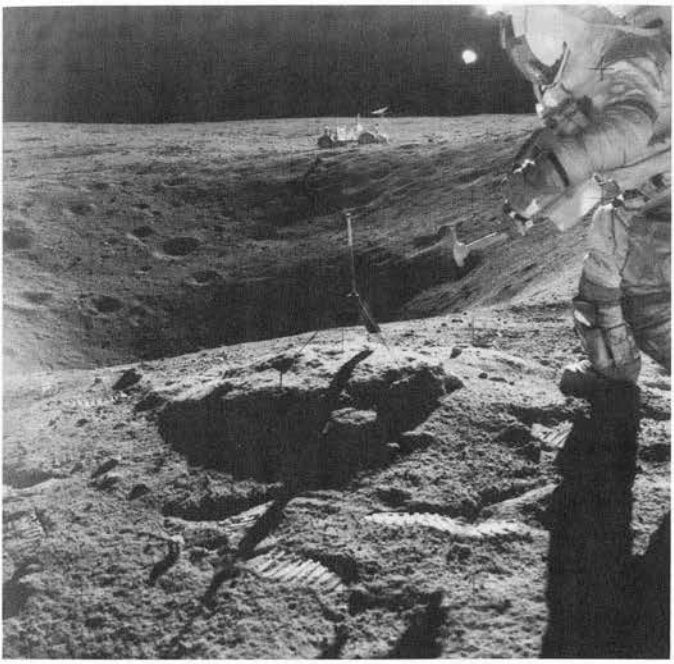
Astronaut Dave Scott and Apollo 15 rover (LRV) at edge of Hadley Rille, 31 July 1971. NASA photo AS15-85-11451.



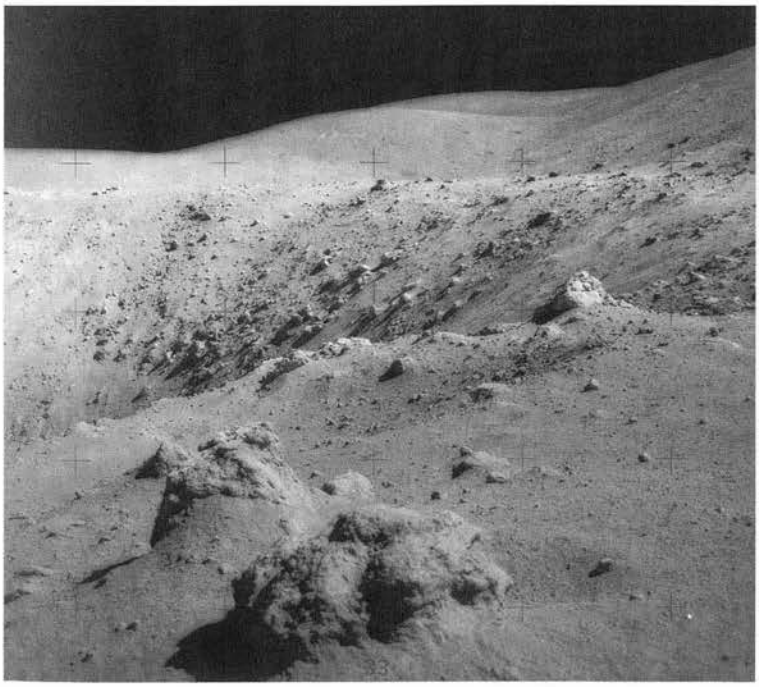
Leaning *Falcon* and rover tracks against background of Apennine Mountains at end of second Apollo 15 EVA, 1 August 1971. NASA photo AS15-92-12430.



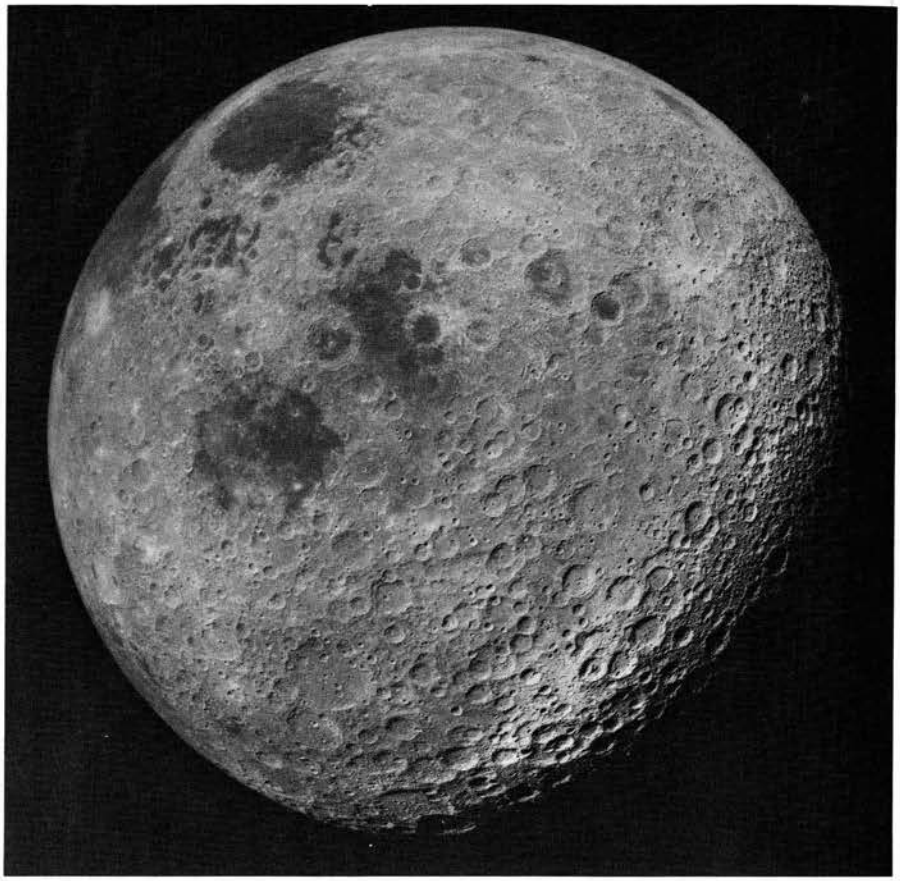
Main Apollo 16 feature names, traverses, and sampling stations. Apollo 16 pan photo, April 1972.



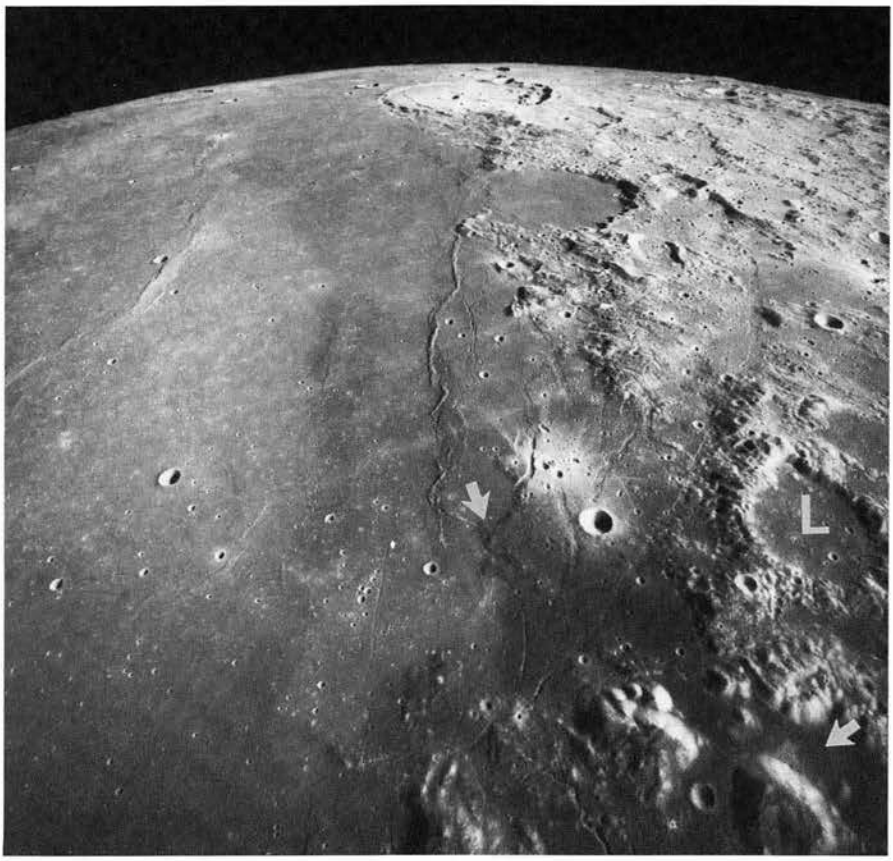
Astronaut John Young and the lunar rover (LRV) at Apollo 16 Station 1, 21 April 1972. NASA photo AS16-109-17804.



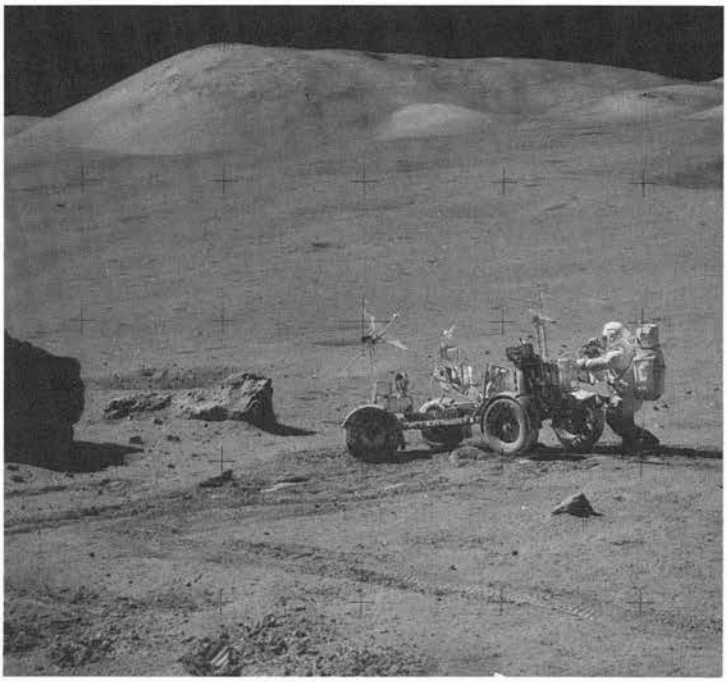
Rocky rim and interior of North Ray crater as seen by the Apollo 16 astronauts in April 1972. Smoky Mountain and its furrows (swales) are in the background. NASA photo AS16-106-17305.



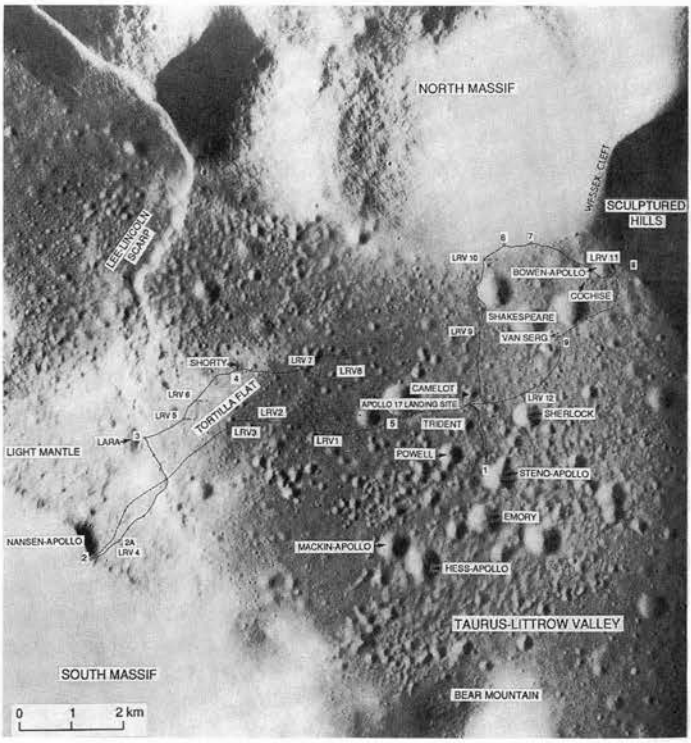
View centered on Moon's far side taken on 25 April 1972 by Apollo 16 mapping camera after transearth injection.



Eastern Mare Serenitatis and Serenitatis basin rim including crater Littrow (L, 31 km, 21.5° N, 31.5° E) and Apollo 17 landing site (lower arrow; 11 December 1972). Upper arrow indicates old candidate Littrow landing site at 21.8° N, 29° E, a leading candidate for Apollo 14 until the Apollo 13 accident; a walking mission proceeding from the indicated point could have sampled the mare, the mare ridge (left of the arrow), and the dark mantle (right of arrow). Apollo 17 mapping photo 940, December 1972.

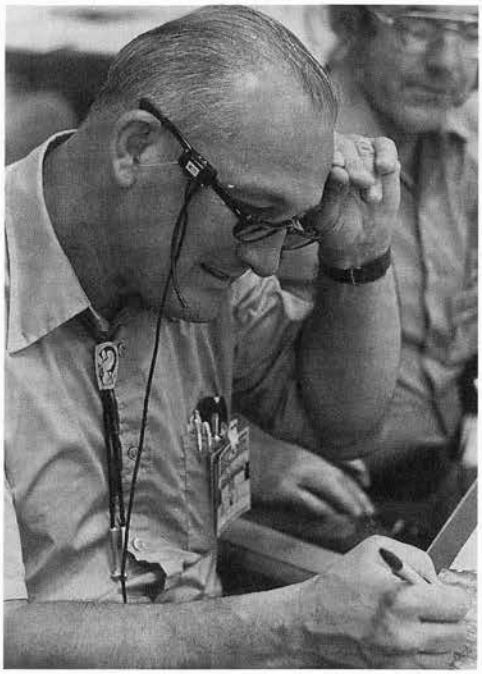


Jack Schmitt and rover at Apollo 17 Station 6, 14 December 1972. NASA photo AS17-141-21598.

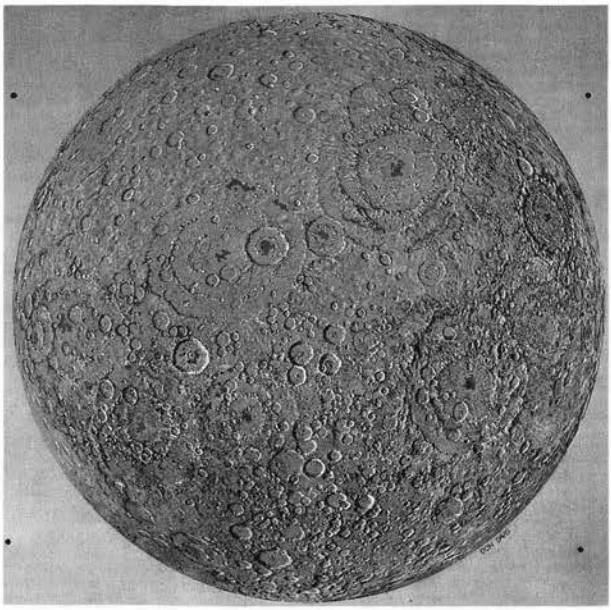


Photomap of Taurus-Littrow Valley showing main Apollo 17 feature names, traverses, and sampling stations. Defense Mapping Agency.

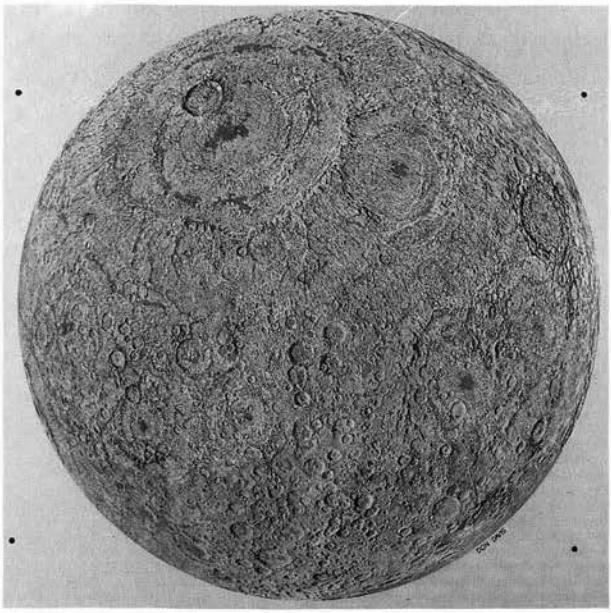
Former chiefs of the USGS's Branch of Astrogeology or Astrogeologic Studies in branch chief's office in Flagstaff, late 1980. From left to right, Larry Soderblom, Mike Carr, Jack McCauley, Hal Masursky, Gene Shoemaker. USGS photo.



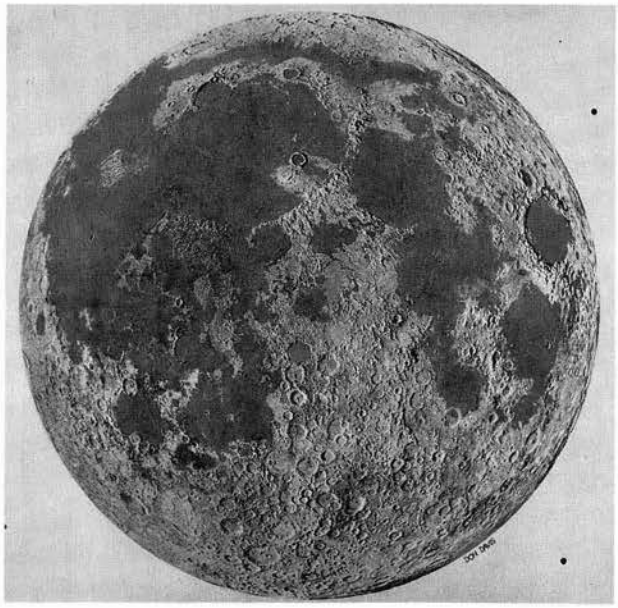
Bill Muehlberger (*foreground*) and Dale Jackson in the Apollo 17 back room. NASA photo S-72-37415.



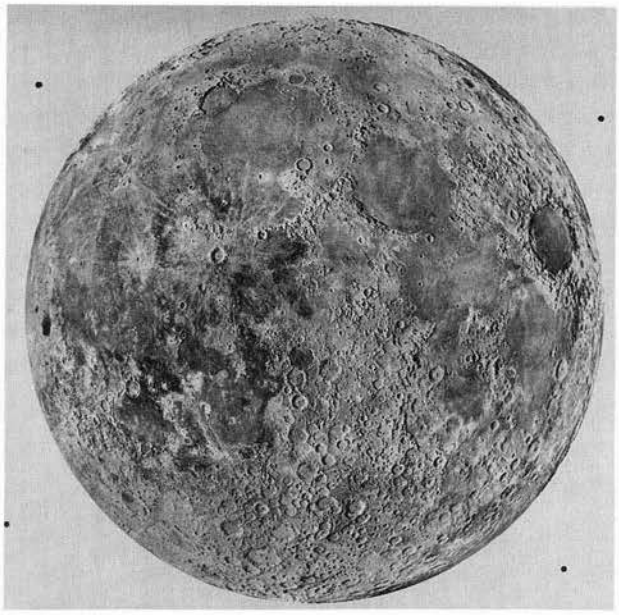
(A) Nectarian time about 3.86 aeons ago, after an impact created the Serenitatis basin (upper right) but before the Imbrium impact.



(B) End of Early Imbrian time, about 3.8 aeons ago, after formation of both the Imbrium basin (upper left quadrant) and Orientale basin (lower left limb).



(C) End of Imbrian Period, about 3.2 aeons ago, after maria reached most of their present extent but at least 2 aeons before mare volcanism ceased.



(D) Present Moon.

Reconstructions of four stages in lunar history. Prepared by Donald E. Davis under the guidance of the author. Davis drew stage A in the late 1970s; B, C, and D were published by Wilhelms and Davis (1971; copyright Academic Press) and have been reproduced often. D is ACIC's Lunar Earthside Mosaic (frontispiece).

Apollo 17 rover and Station 2 boulders, 12 December 1972. North Massif (left) and Sculptured Hills (right) are in the background. NASA photo AS17-138-21039.