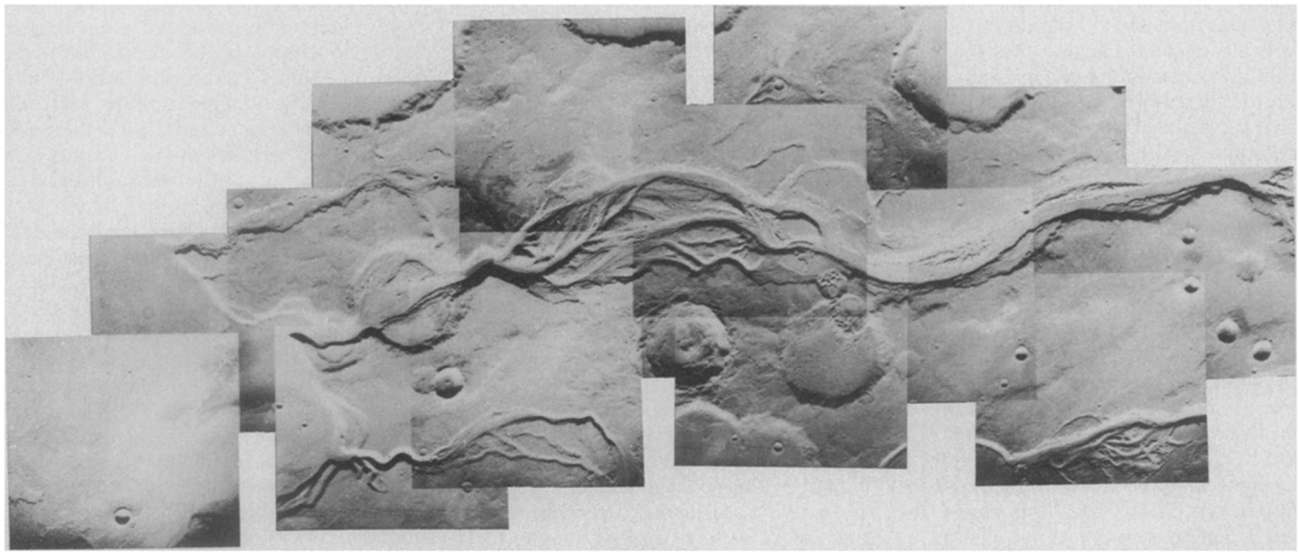
Mars album 10

Some spectacular final views from the Viking 1 orbiter

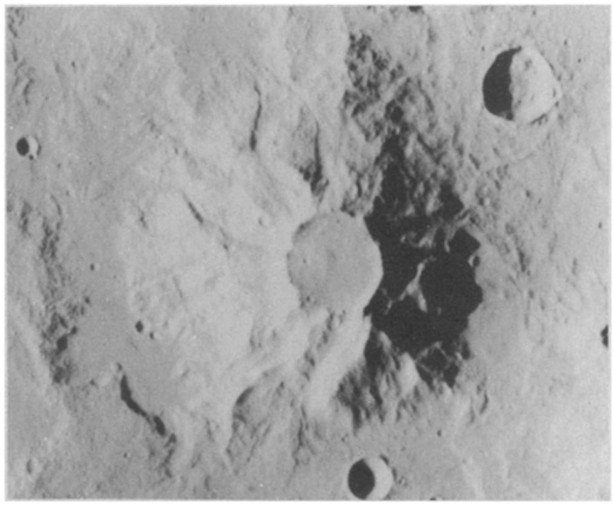
By JONATHAN EBERHART

The two Viking spacecraft that took up orbit around Mars in the summer of 1976 together took more than 50,000 photographs of the planet (besides dispatching a pair of landing craft for direct studies of the surface). Orbiter 2 was the first to expire, although it had far exceeded its planned lifetime when it ceased operations in July 1978. Orbiter 1 then carried on for another two years, until it was finally turned off in August 1980 for lack of steering gas.

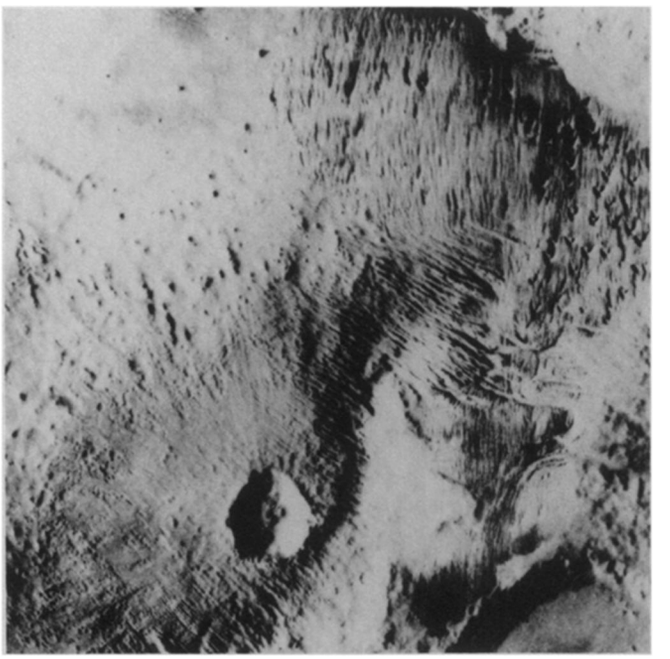
So vast is the Viking Mars gallery that processing of Orbiter 1's photos was only recently completed at Jet Propulsion Laboratory in Pasadena, which was also the mission's control center. The images shown here were taken in May and June of 1980.



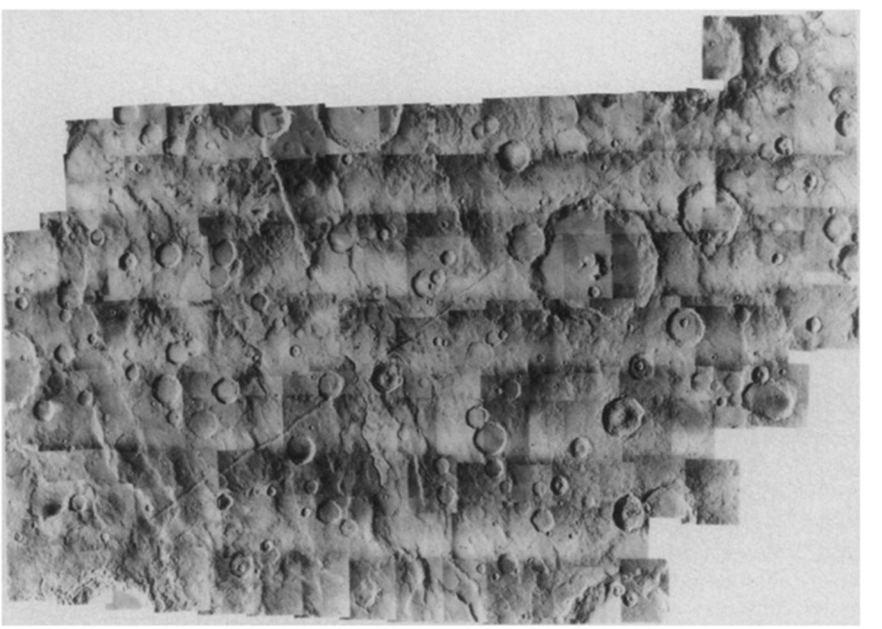
This network of braided channels in the Mangala Vallis region, just south of the Martian equator, is a classic example of the features believed by some researchers to have been formed by flowing, liquid water in the planet's ancient past. In one proposed scenario, the water might have flowed only briefly, freed from permafrost in a catastrophic flood due to localized heating, and afterward refroze or evaporated in the low atmospheric pressure. Other scientists suggest that Mars might once have had a thicker, warmer atmosphere capable of sustaining liquid water for extended periods of time.



Towering 2 kilometers above the heavily cratered terrain of Aeolis quadrangle is this ancient volcano, some 30 km in diameter with a central caldera 8 km across. Lava has filled in the crater almost to the brim, in places spilling over the top to create the radial channels that score the volcano's flanks. It has been estimated that volcanic activity, from vents and fractures as well as peaks, may have reshaped as much as two-thirds of the face of Mars.

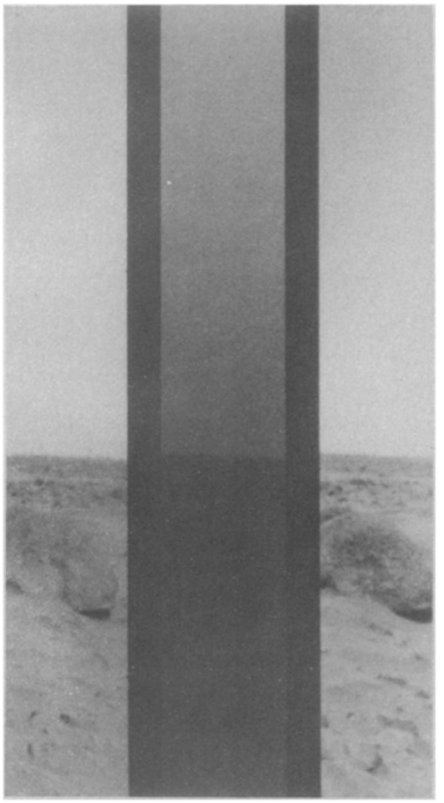


As lava and water have helped make over the Martian surface, so has wind, sometimes abetted by the erosive power of dust and despite the thinness of the atmosphere. The planet abounds with testimonials to the wind's sculptural diversity, such as these deeply etched ridges and grooves in Memnonia. The differently aligned families of grooves suggest to some researchers that the direction of the region's predominant winds changed episodically rather than randomly over the planet's history, apparently staying long enough on a given course to heavily score the terrain. The small pits (actually as much as 2 kilometers long) at upper right center may have formed initially as a pattern of crescent-shaped dunes (barchans) of soft, clay-like material that was later covered by a harder layer, after which the original substance was blown away to leave a cluster of dune "fossils." On earth, similar features called "fuljis" can be found in the Great Nafud Desert of Saudi Arabia.



The ground between two parallel tension-faults in the Memnonia quadrangle dropped to create the 1,000-kilometer-long depressed trough, or graben, angling from lower left to upper right across this mosaic of more than 100 photographs. Low ridges, apparently caused by compressive stresses, run approximately perpendicular to the graben, as do channels and other features. The large crater tangent to the graben is named Burton, about 115 km across.

The surviving Viking: Dustwatch

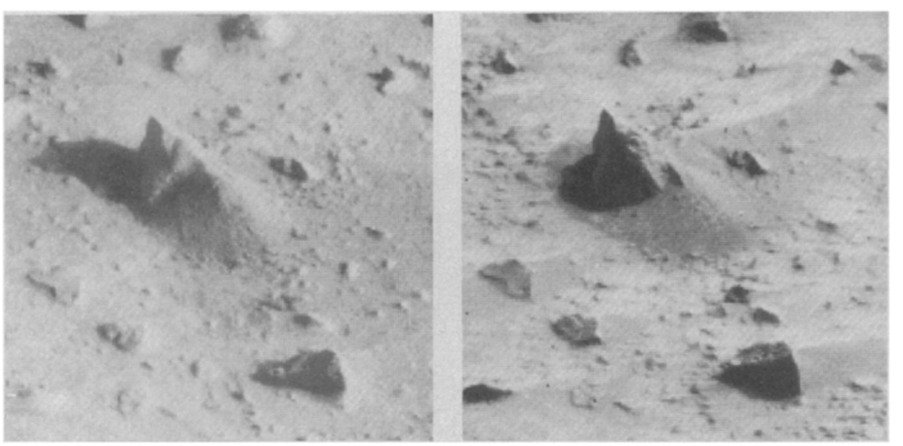


Though Viking Orbiter 1 is no longer functioning, the landing craft that it transported from earth is still at work in the Chryse Planitia region of the Martian surface. Lander 1 is programmed to operate automatically into 1994, providing photos and meteorological data as scientists look for signs of changes during what could be as long as 18 years on the planet.

The sequence at left reveals the changing brightness of the sky before, during and after one of the famous Martian dust storms. Frames were taken at about five-week intervals on May 7, June 14 and July 22 of 1981. According to Stephen Wall of JPL, the change in brightness is roughly the equivalent of "putting on a pair of sunglasses, or one f-stop on a camera." The storm is presumably not a global one (such as was blanketing the planet when the Mariner 9 spacecraft arrived there in late 1971), says Wall, since the global storms appear to be concentrated in the Martian winter. The event shown took place in spring, about a month before the vernal equinox.

Previous Mars albums in Science News

July 31, 1976, p. 76
Aug. 28, 1976, p. 140
Oct. 2, 1976, p. 216
Nov. 20, 1976, p. 330
Dec. 18, 1976, p. 405
March 19, 1977, p. 186
Sept. 24, 1977, p. 205
Jan. 21, 1978, p. 42
Aug. 9, 1980, p. 89



"The most direct evidence yet" of "stripping" by the Martian winds was discovered about two weeks ago in a review of lander 1 photos by Henry J. Moore of the U.S. Geological Survey. These two images show a small pile (about 5 cm high) of Martian "soil," deliberately deposited against a rock by the lander's sampling arm in July 1977 to see if the wind would change it over time. The first frame, taken in Feb. 1979, shows the pile still unaltered. The second, however, from July 1981, shows the top of the pile to have been removed, with some of it perhaps redistributed down the flanks. No later photo of the unmodified pile has yet been identified to help narrow down the time of the slumping, but photos of several other unaltered piles suggest that the event may have taken place between January and July of 1981. This would have been during the Martian winter, when dust storms have been identified in the past. It is unclear, however, whether such stripping represents a common surface process, since the cohesion between the soil particles might have been weakened when they were first picked up by the sampling arm. Other signs of movement in the lander photos have included brightness changes, new dust deposits and redistribution of the fine surface material tossed into the lander's footpads during the landing.