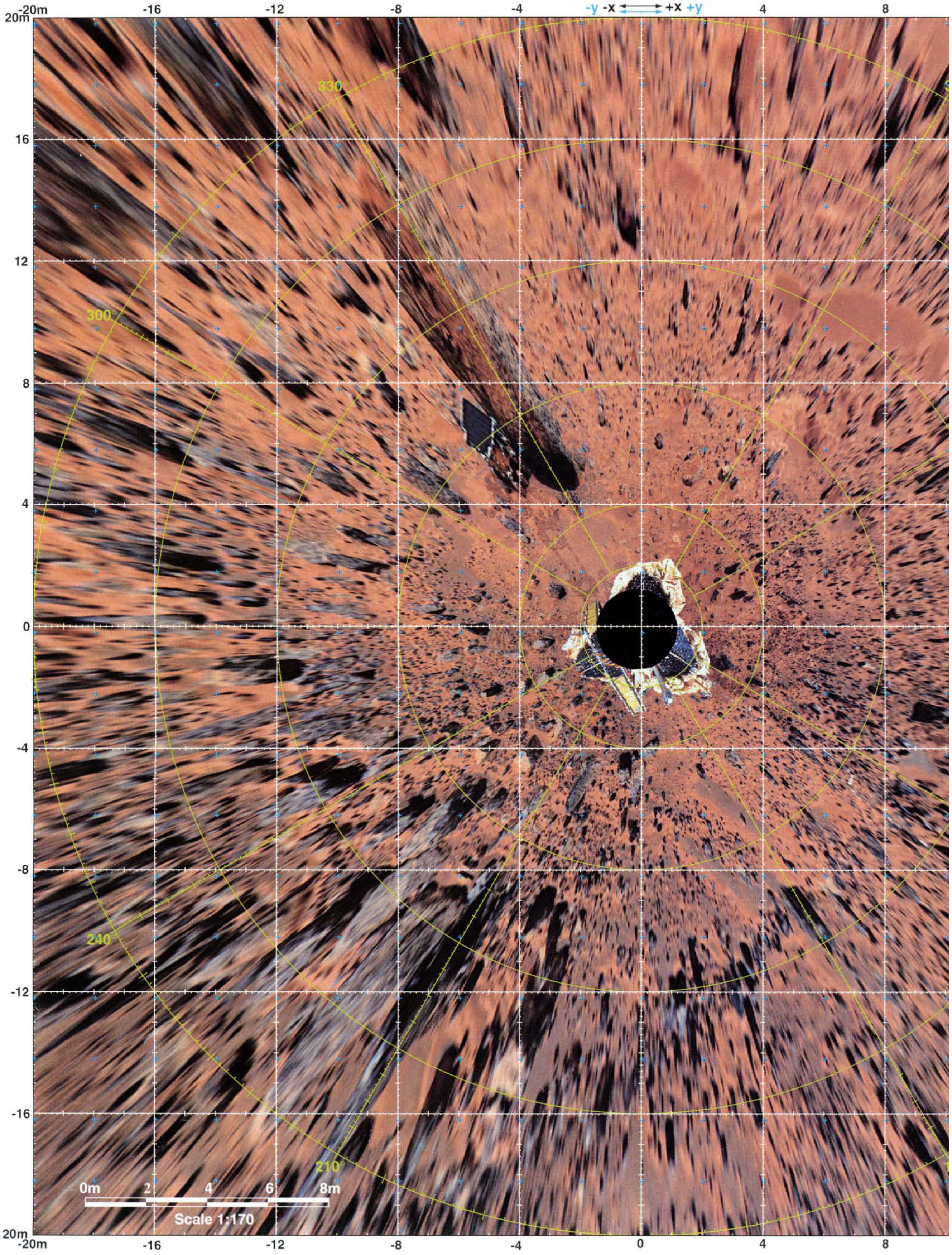
Plate 2



-20m
-16
-12
-8
-4
-y -x
+x +y
4
8
20m
16
12
8
4
0
-4
-8
-12
-16
20m
330°
300°
240°
210°
0m
2
4
6
8m
Scale 1:170

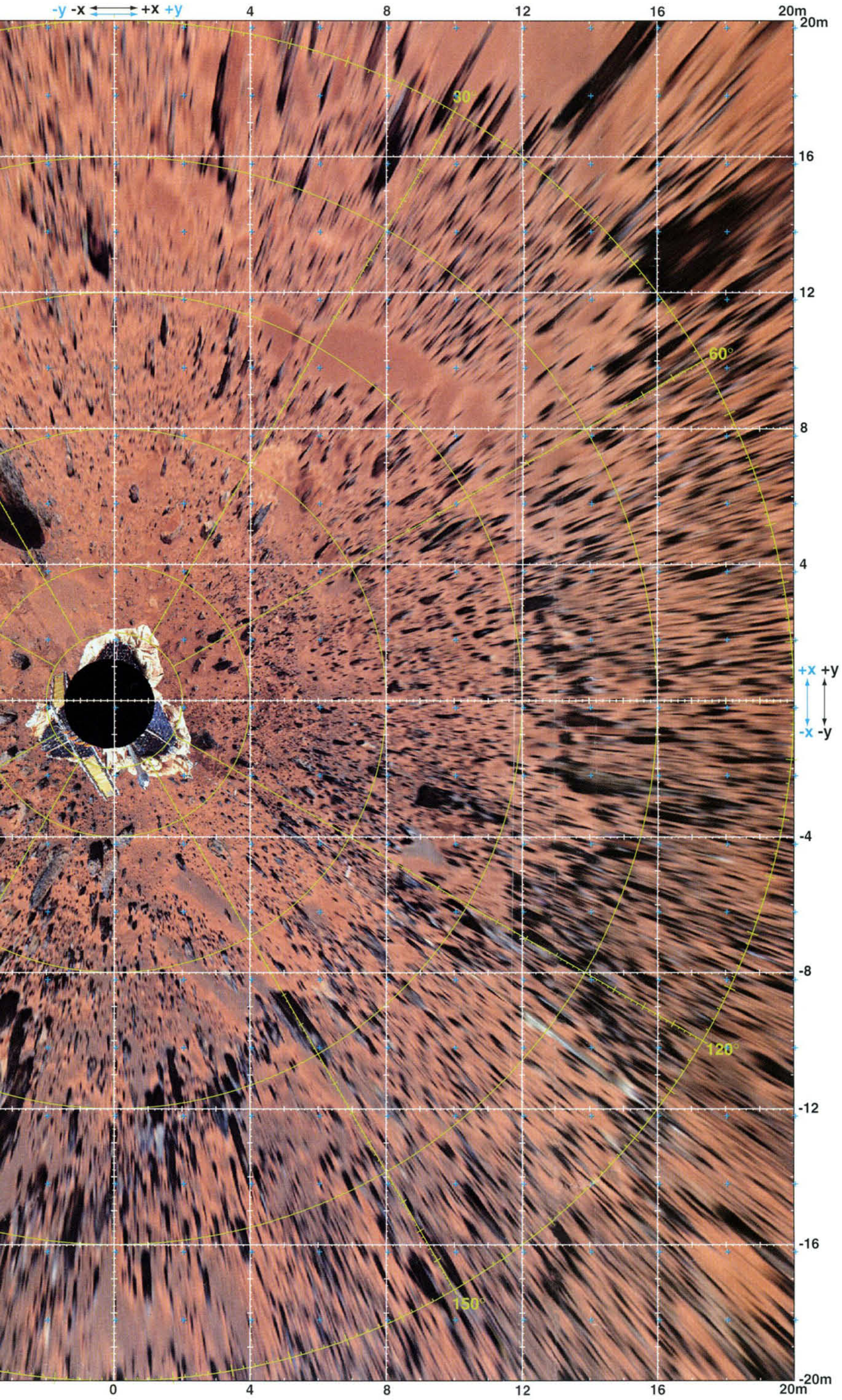


Plate 3. Overhead view of the a
the Pathfinder lander illustratin
traverse. Red rectangles are r
the end of sols 1-30. Locations
ics experiments, wheel abrasi
and APXS measurements are
numbers refer to APXS measu
cussed in the paper by Rieder
Coordinates are given in the L

The photorealistic, interacti
sional virtual reality (VR) terra
created from IMP images us
package developed for Pathfin
et al. as a participating scie
matching features in the left a
an automated machine vision
duced dense range maps of
which were projected into a th
model as a connected polygo
tance and angle measuremen
on features viewed in the
mouse-driven three-dimension
point-and-click interface. The V
corporates graphical represent
der and rover and the sequenc
cations at which rover data we
rover moved, graphical mode
were added for each positio
uniquely determined using s
the rover taken by the IMP. Ima
rover were projected into the r
mensional "billboards" to show
spective of these images.

P

Plate 4. Topographic map of the landing site, to a distance of 60 m from the lander in the LSC coordinate system. The lander is shown schematically in the center; 2.5-m radius circle (black) centered on the camera was not mapped. Gentle relief [root mean square (rms) elevation variation 0.5 m; rms adirectional slope 4°] and organization of topography into northwest and northeast-trending ridges about 20 m apart are apparent. Roughly 30% of the illustrated area is hidden from the camera behind these ridges. Contours (0.2 m interval) and color coding of elevations were generated from a digital terrain model, which was interpolated by kriging from approximately 700 measured points. Angular and parallax point coordinates were measured manually on a large (5 m length) anaglyphic uncontrolled mosaic (similar to Plate 1B but without least-squares adjustment of image orientations) and used
to calculate Cartesian (LSC) c
were minimized by referencin
quadratically with range. Give
range, and ~10 m at 60 m rang
prove the range precision. Sys
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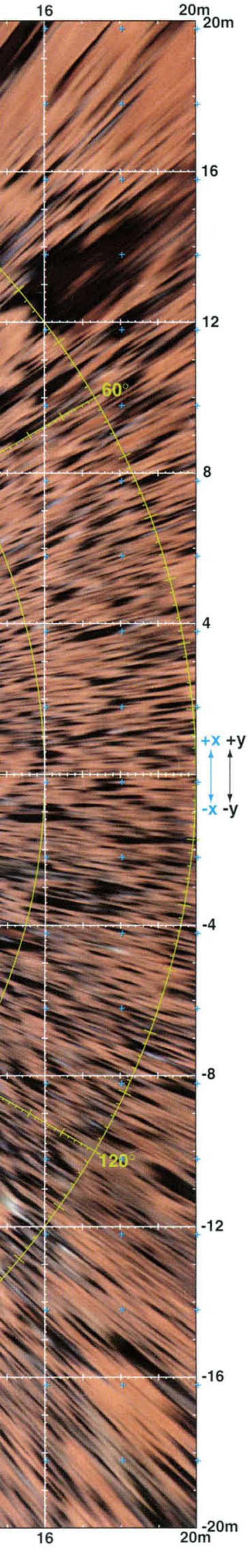


Plate 3

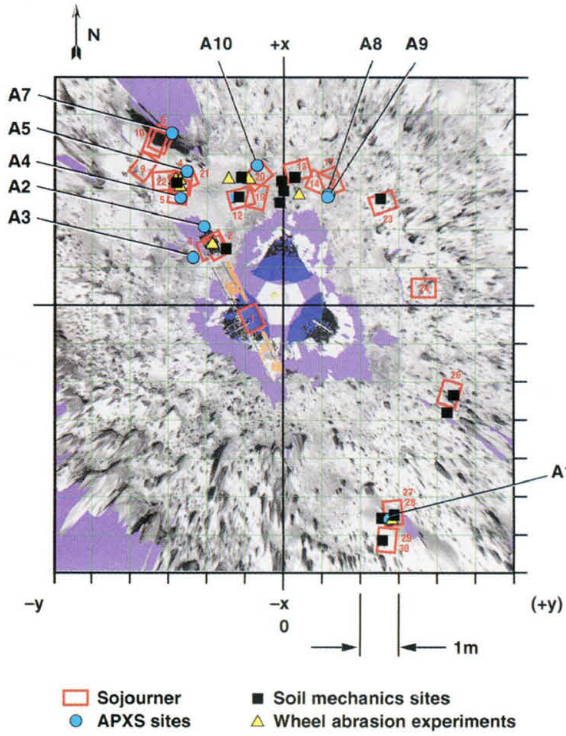


Plate 3. Overhead view of the area surrounding the Pathfinder lander illustrating the Sojourner traverse. Red rectangles are rover positions at the end of sols 1-30. Locations of soil mechanics experiments, wheel abrasion experiments, and APXS measurements are shown. The A numbers refer to APXS measurements as discussed in the paper by Rieder *et al.* (p. 1770). Coordinates are given in the LL frame.

The photorealistic, interactive, three-dimensional virtual reality (VR) terrain models were created from IMP images using a software package developed for Pathfinder by C. Stoker *et al.* as a participating science project. By matching features in the left and right camera, an automated machine vision algorithm produced dense range maps of the near field, which were projected into a three-dimensional model as a connected polygonal mesh. Distance and angle measurements can be made on features viewed in the model using a mouse-driven three-dimensional cursor and a point-and-click interface. The VR model also incorporates graphical representations of the lander and rover and the sequence and spatial locations at which rover data were taken. As the rover moved, graphical models of the rover were added for each position that could be uniquely determined using stereo images of the rover taken by the IMP. Images taken by the rover were projected into the model as two-dimensional "billboards" to show the proper perspective of these images.

Plate 4

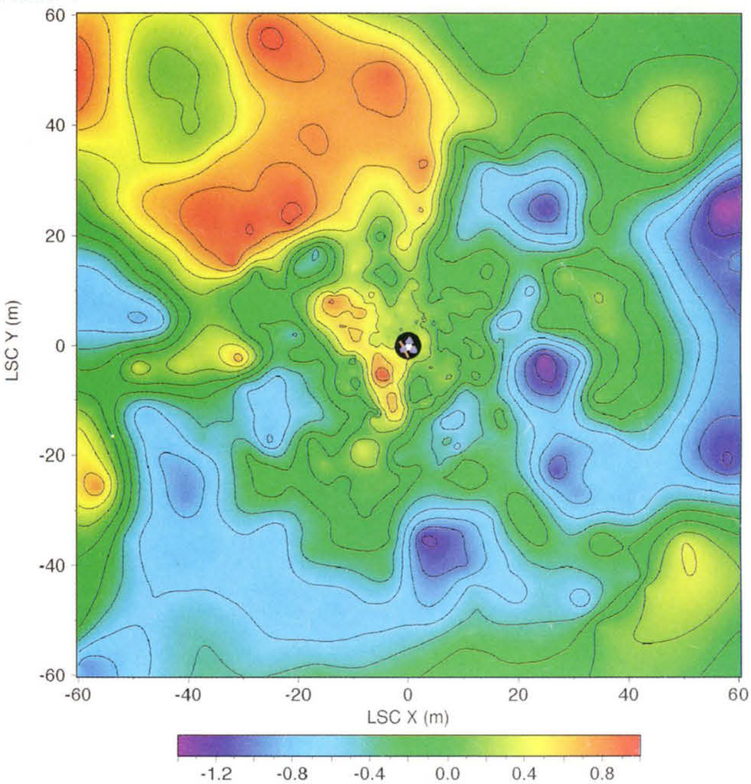
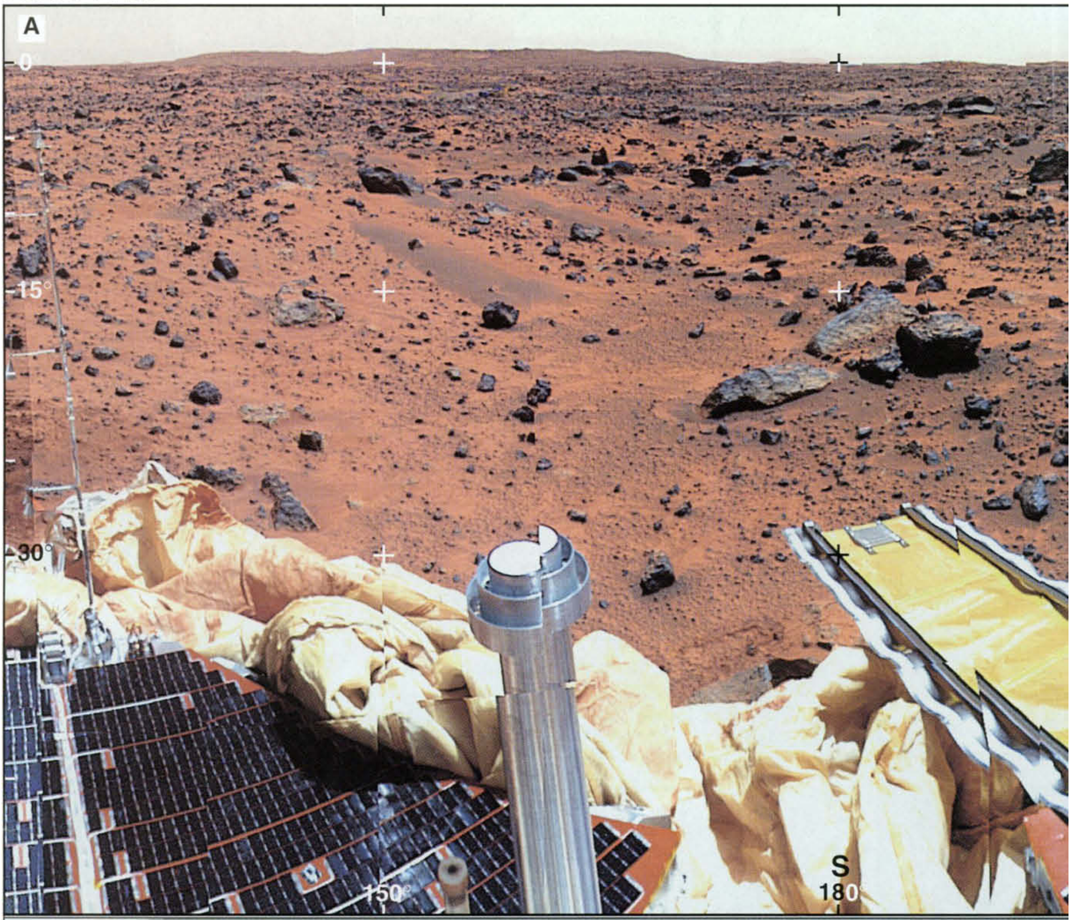
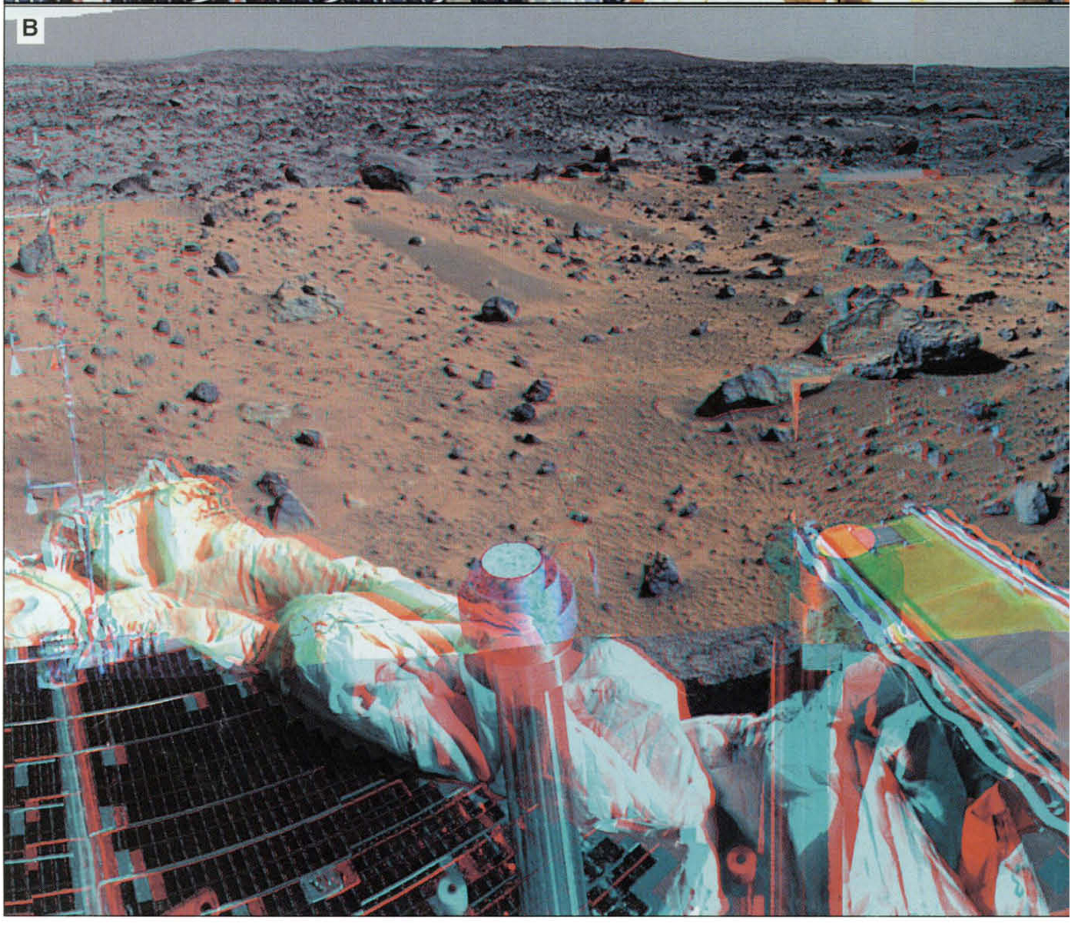
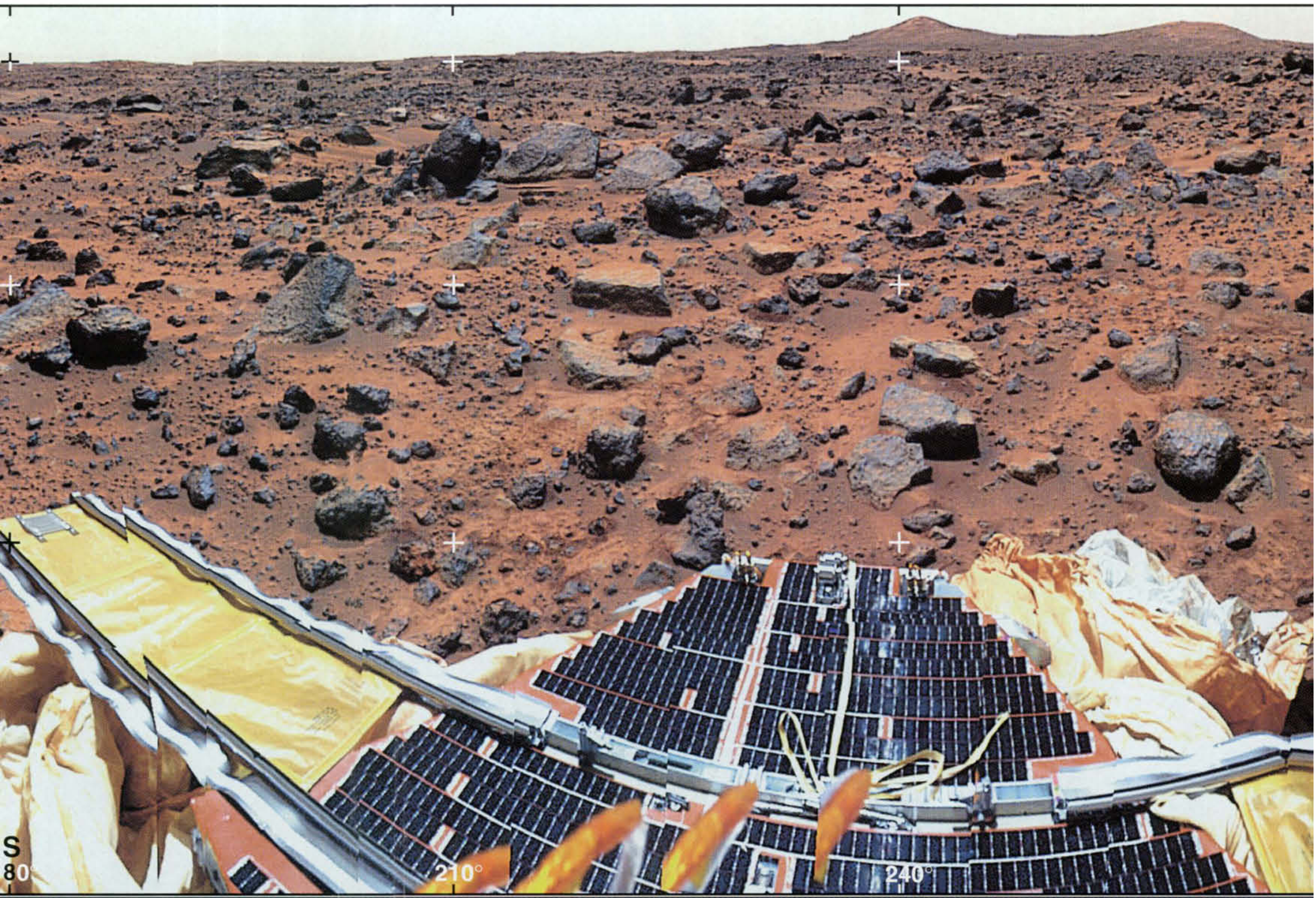


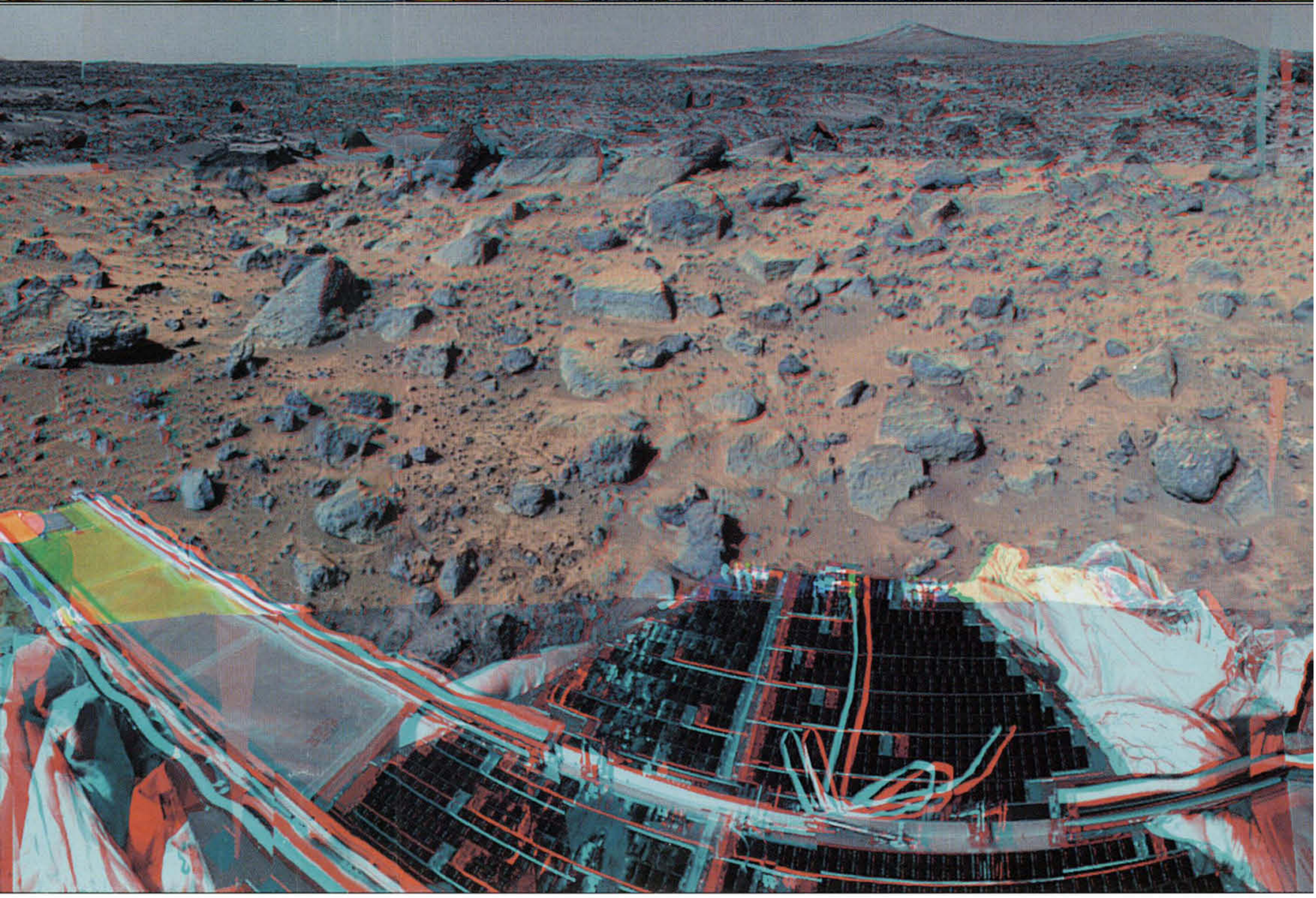
Plate 4. Topographic map of the landing site, to a distance of 60 m from the lander in the LSC coordinate system. The lander is shown schematically in the center; 2.5-m radius circle (black) centered on the camera was not mapped. Gentle relief [root mean square (rms) elevation variation 0.5 m; rms adirectional slope 4°] and organization of topography into northwest and northeast-trending ridges about 20 m apart are apparent. Roughly 30% of the illustrated area is hidden from the camera behind these ridges. Contours (0.2 m interval) and color coding of elevations were generated from a digital terrain model, which was interpolated by kriging from approximately 700 measured points. Angular and parallax point coordinates were measured manually on a large (5 m length) anaglyphic uncontrolled mosaic (similar to Plate 1B but without least-squares adjustment of image orientations) and used to calculate Cartesian (LSC) coordinates. Errors in azimuth on the order of 1° are therefore likely; elevation errors were minimized by referencing elevations to the local horizon. The uncertainty in range measurements increases quadratically with range. Given a measurement error of 1/2 pixel, the expected precision in range is ~ 0.3 m at 10 m range, and ~10 m at 60 m range. Repeated measurements were made, compared, and edited for consistency to improve the range precision. Systematic errors undoubtedly remain and will be corrected in future maps compiled digitally from geometrically controlled images. Cartographic processing by U.S. Geological Survey.

Plates 1 A&B

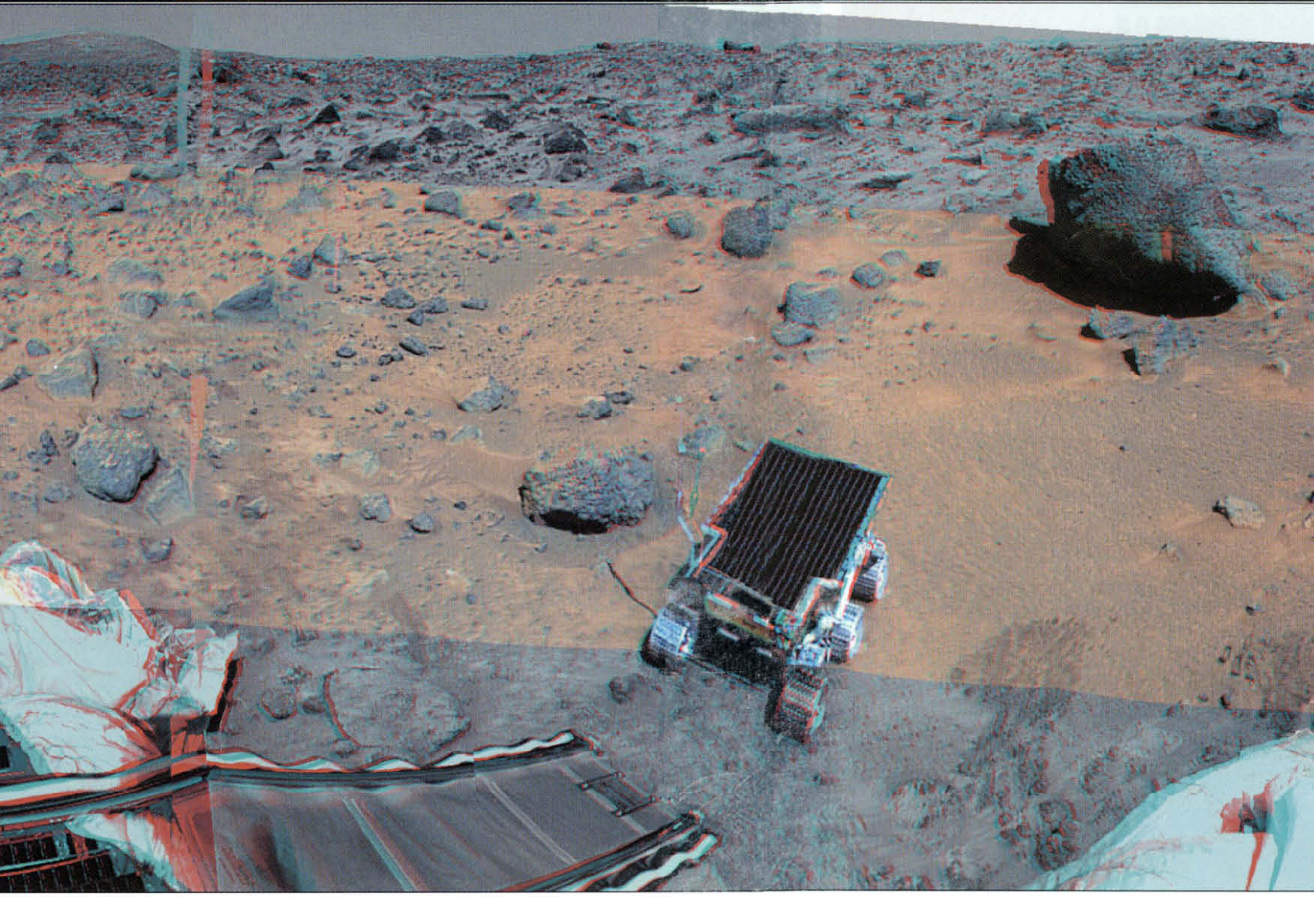


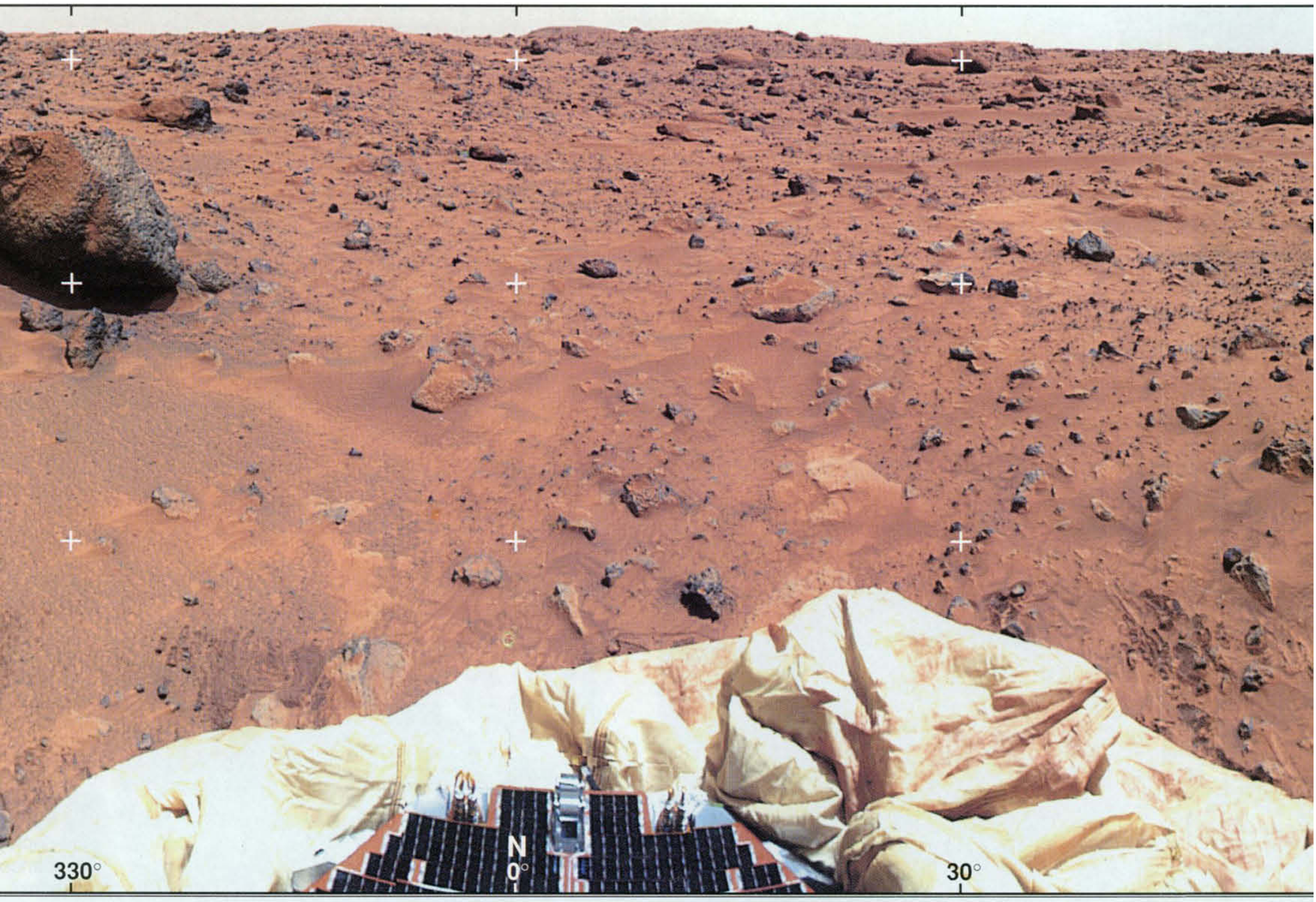


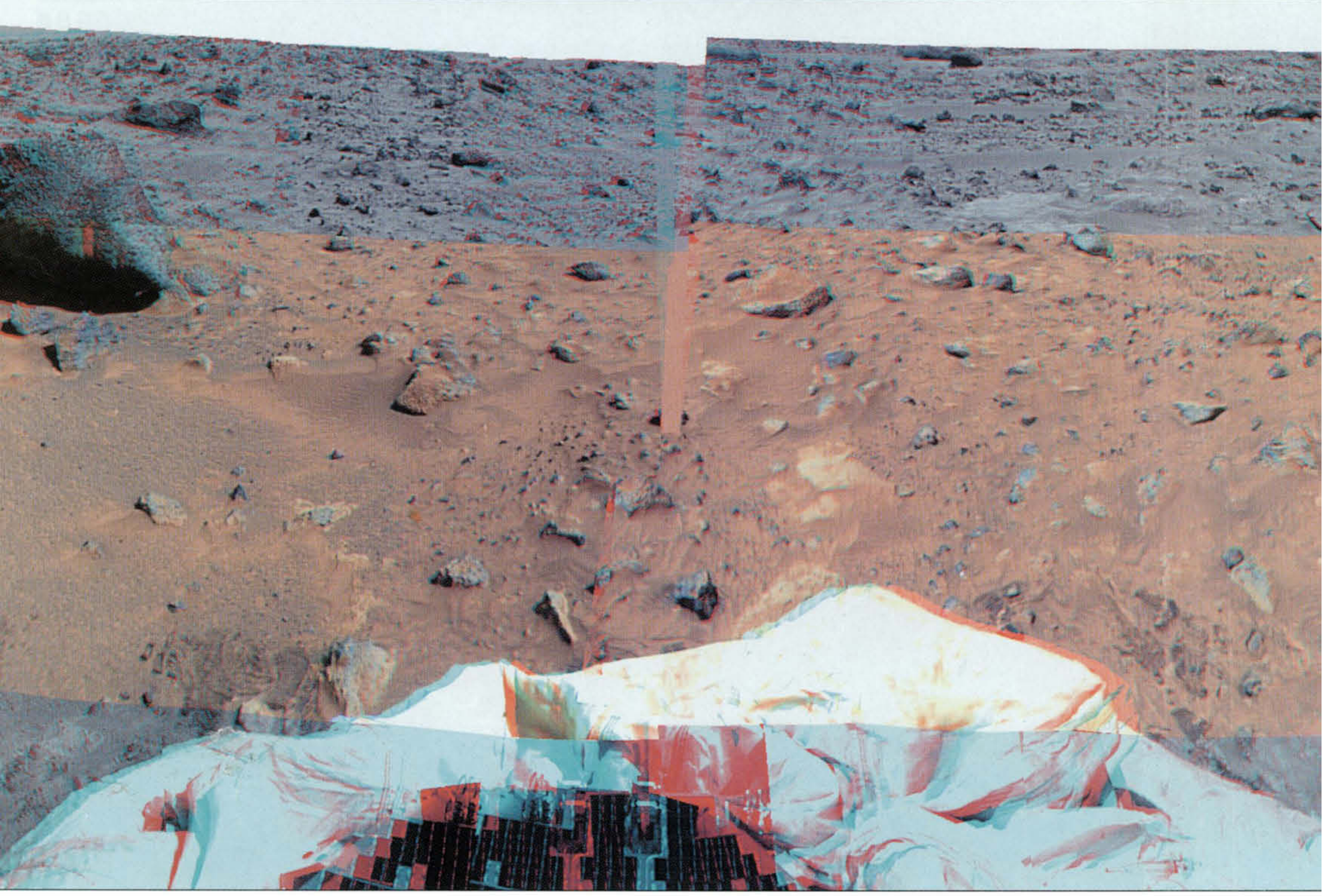

S
80
210°
240°

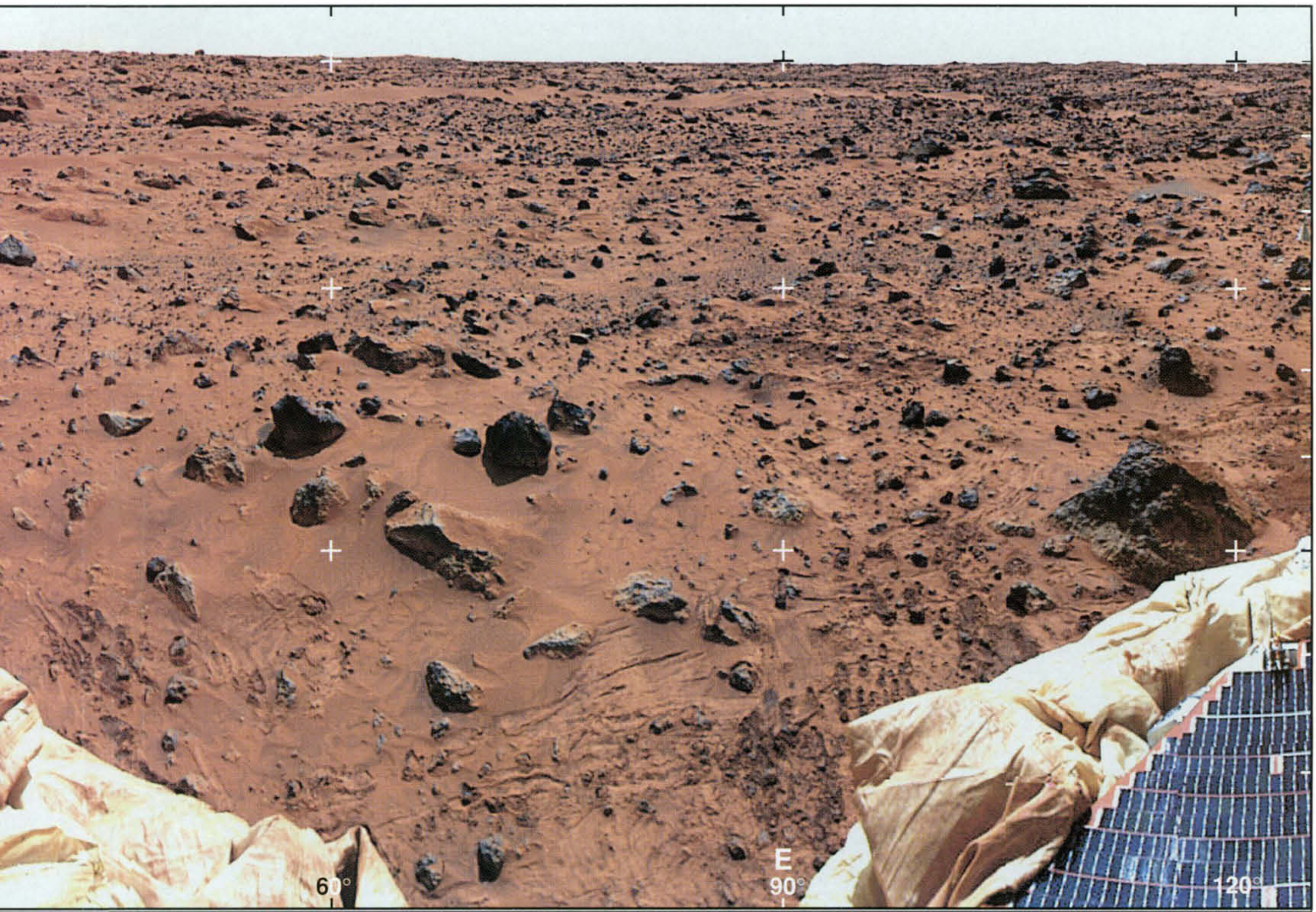



W
270°
300°
330°




330°
N
0°
30°




60°
E
90°
120°

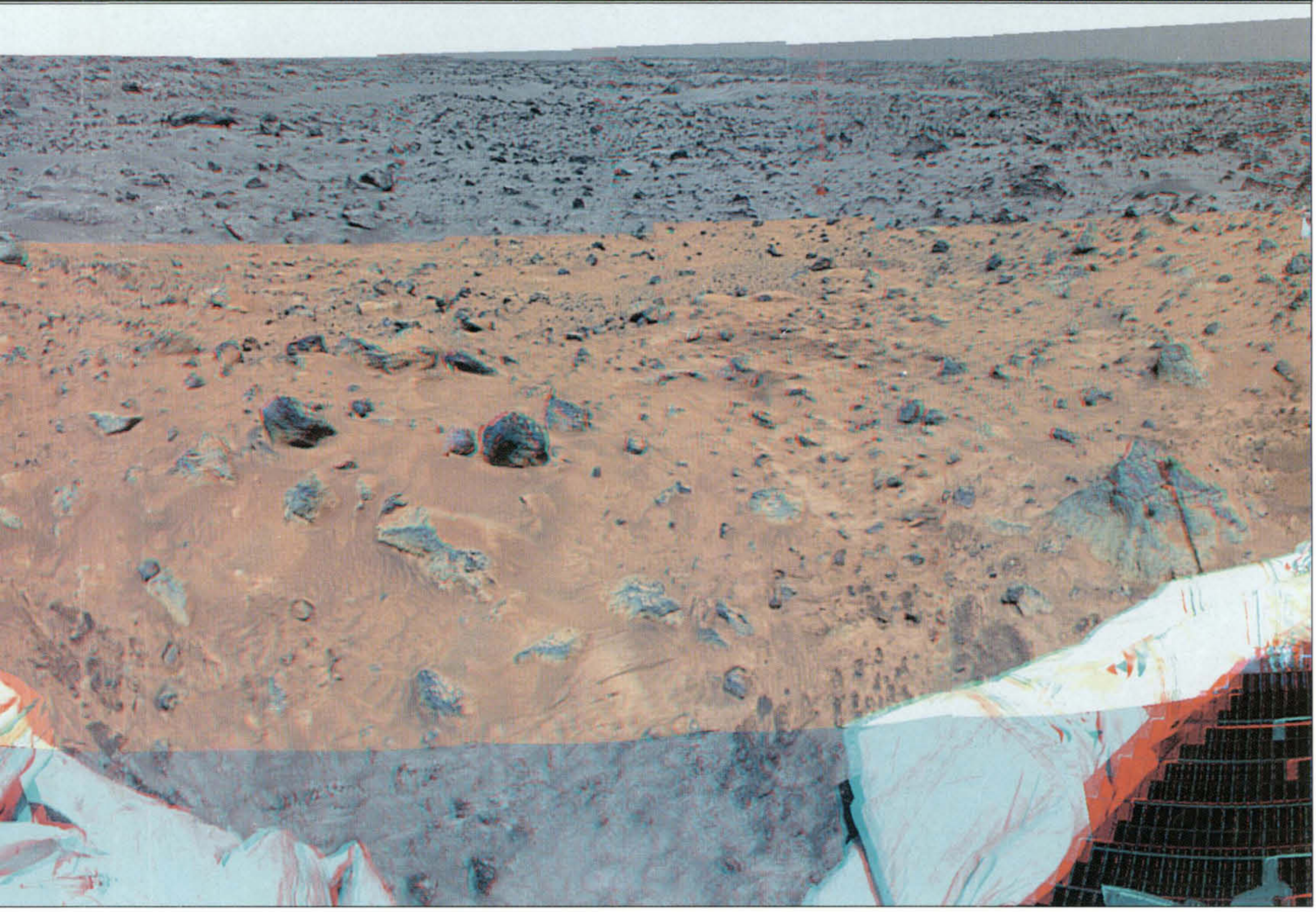


Plate 6

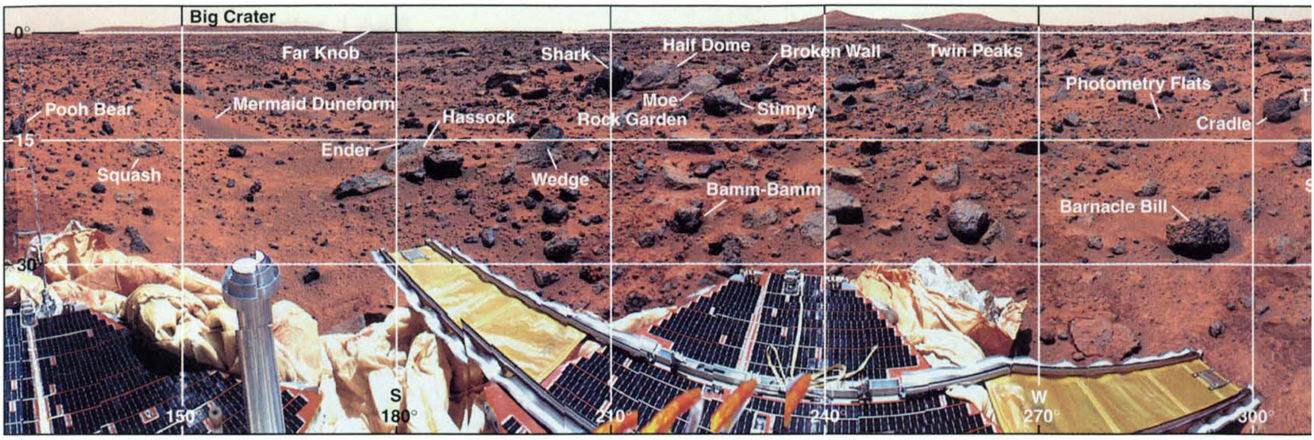
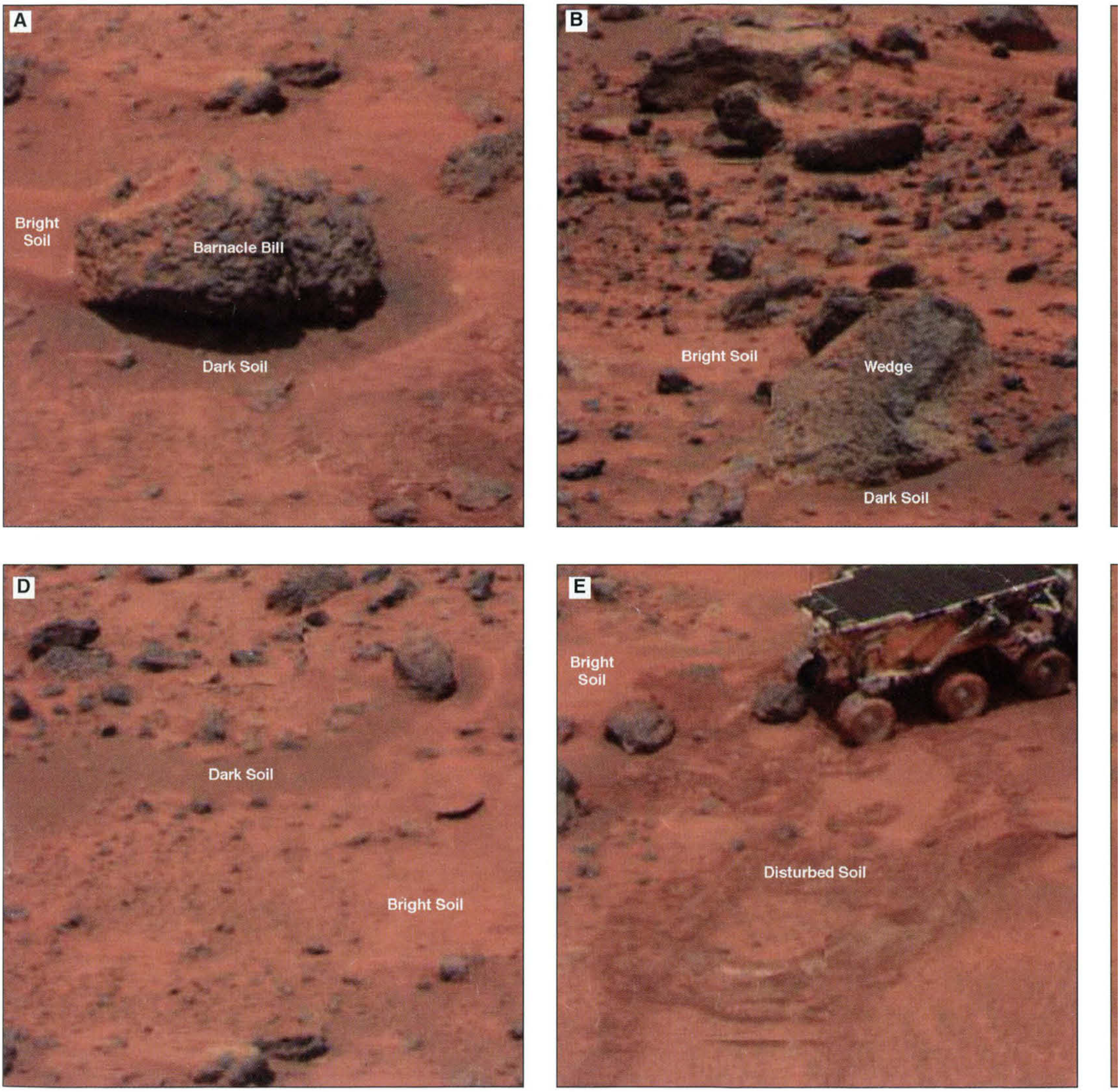
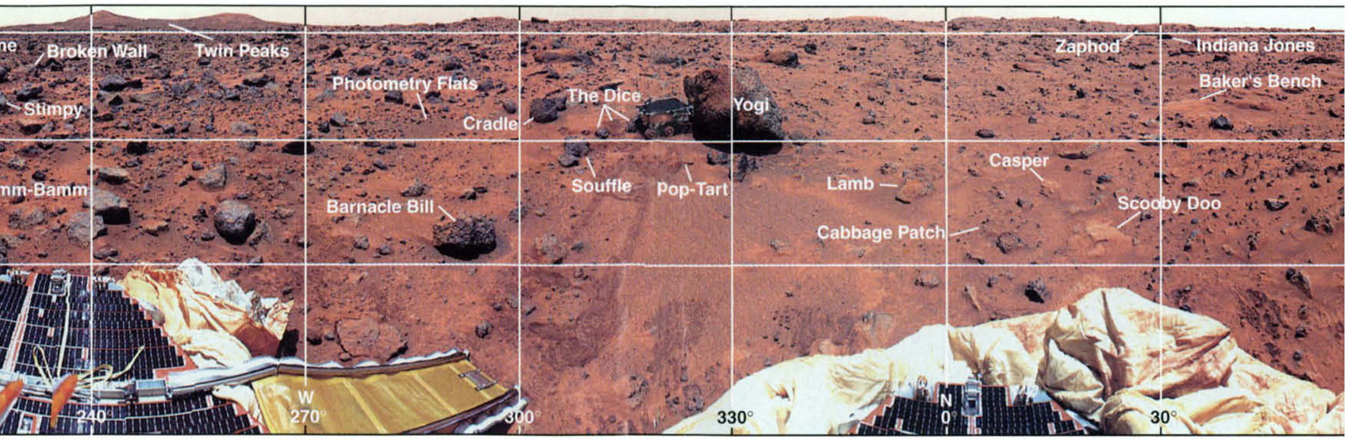
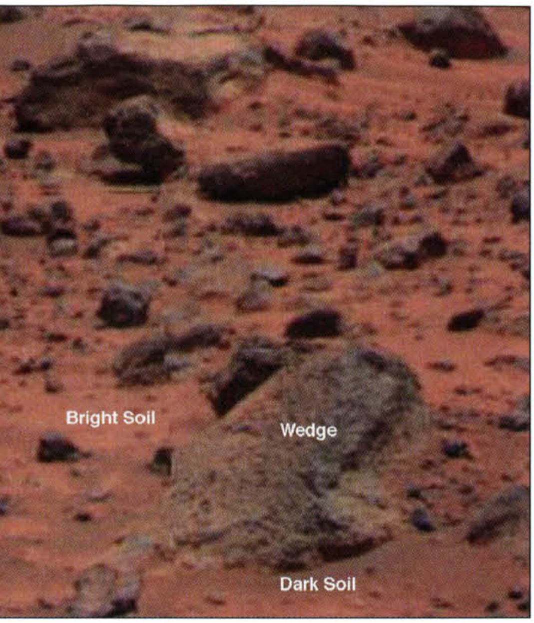


Plate 7







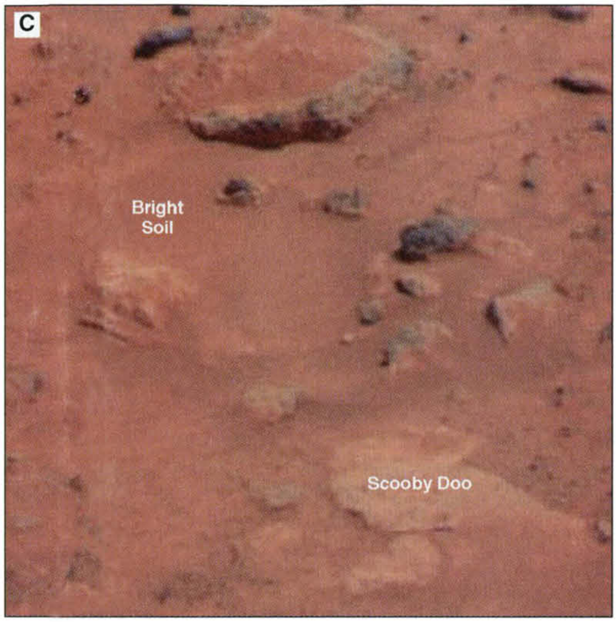


Plate 8

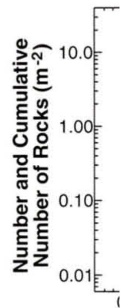
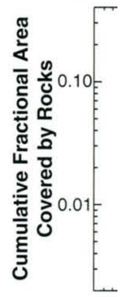
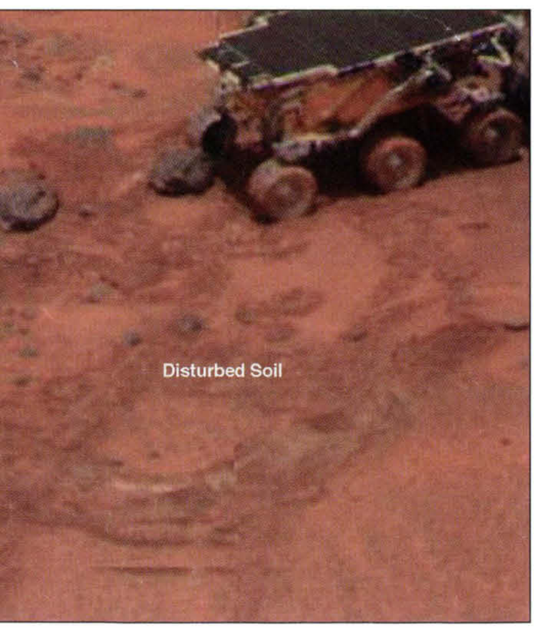


Plate 9





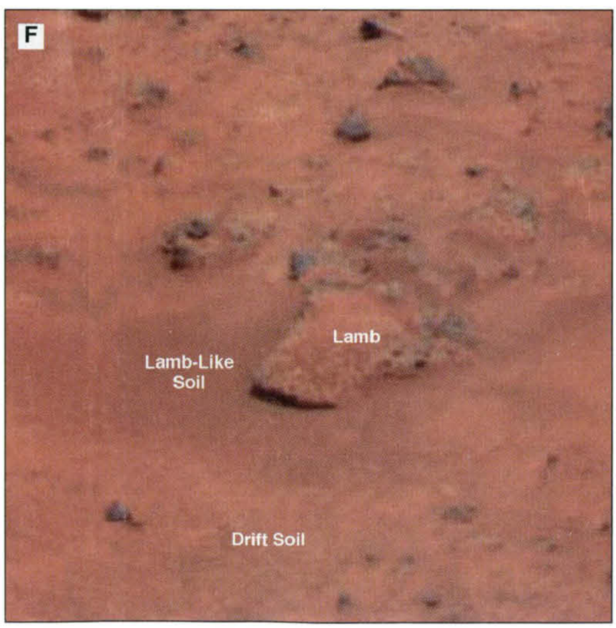
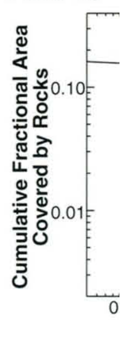


Plate 10



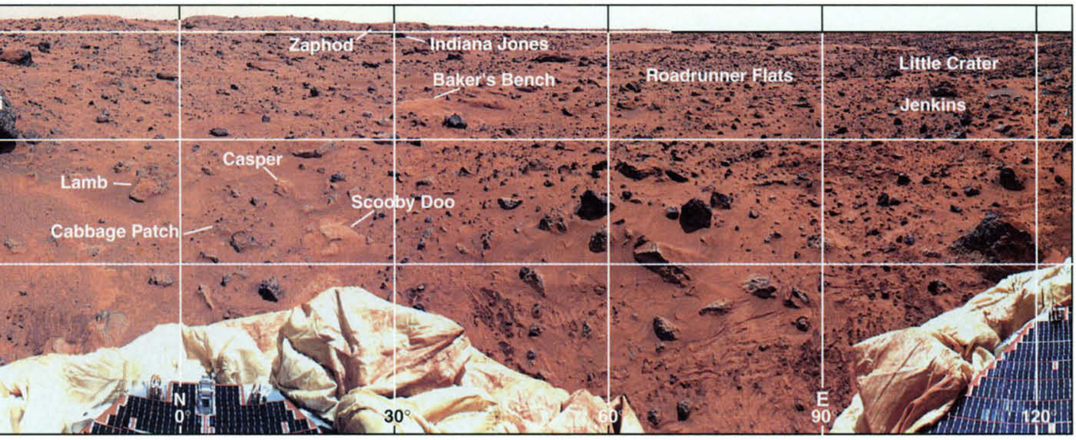


Plate 6. Panoramic mosaic of the Mars Pathfinder landing site (compare with Plate 1A). Informal names of rocks and other features referred to in the Reports in this issue are indicated. Grid spacing is 30° in azimuth and 15° in elevation; vertical axis is linear in tan(elevation). Cartographic image processing by the U.S. Geological Survey and the Jet Propulsion Laboratory.

Plate 8

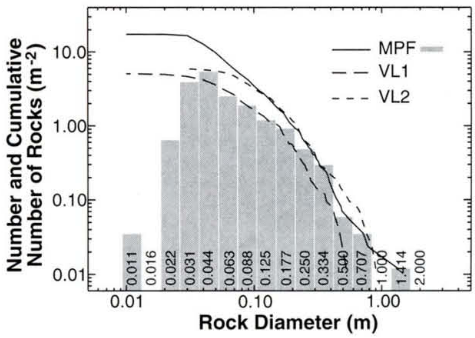


Plate 8. Comparison of number and cumulative number of rocks versus rock diameter for MPF and the Viking landing sites (VL1 and VL2). The number of rocks per m^2 for MPF is binned in $\sqrt{2}D$ (m). Numbers indicate bin centers. The 1.414 m bin contains only Yogi. Cumulative number of rocks were calculated on a rock-by-rock basis and plotted at 1 cm intervals. VL diameters are the average of rock width and length. VL1 data do not include outcrops and neither VL line includes corrections for small rocks. Yogi produces a kink in the MPF line. Measurements in the far field using vertical stereo from pre- and post-deployment IMP images suggest an abundance of Yogi-sized rocks around 3×10^{-4} m^{-2}.

Plate 9

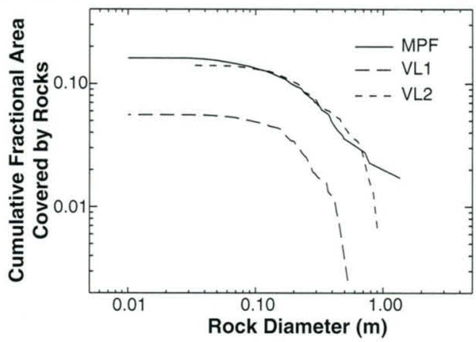


Plate 9. Cumulative fraction of area covered by rocks with diameters ≥ D within the annulus. Data are the same as for Plate 8. 16.1% of area is covered by rocks with $D \geq$ 3 cm for MPF. VL1 coverage is 5.6% and VL2 is 14.1%. Rock area coverage in particular directions at MPF is highly variable (Plate 5); between azimuths 20° and 140°, coverage is 10.2%, and between 165° and 285° (in the Rock Garden) it is 24.6%. Yogi contributes 1.7% to the area. In the farfield, Yogi-sized rocks probably cover 0.015% of the area.

Plate 10

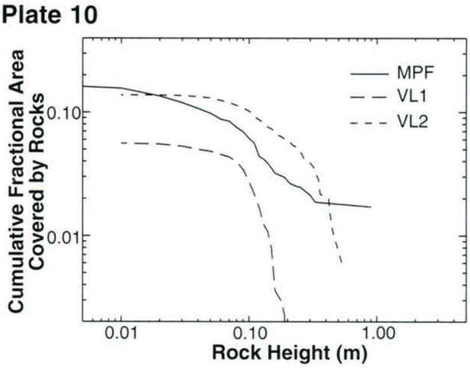


Plate 10. Cumulative area covered by rocks with heights ≥ H around MPF and the VL sites. Data are the same as Plate 5. Because of the resolution in H, rocks with relief below about 1 cm were assigned H = 0.5 cm.