50. The Furrowed Terrain of Mars. R. S. SAUNDERS, Jet Propulsion Laboratory, Pasadena, California. - Superposed on the ancient cratered terrain in the equatorial region of Mars are numerous sinuous furrows, in width 2 to at least 10 km and on the order of 100 to 1000 km in length. Some furrows radiate from large craters and in at least some cases the central crater appears to be a volcanic caldera. The furrows occur within a global band approximately 2000 km wide. The position of this band is most conveniently represented by the 15°S latitude parallel of a rotated global coordinate system in which the north pole is located at 110°W longitude and 75°N latitude with reference to the present areographic coordinate system. The underlying terrain has been modified by impact and local volcanic activity. The origin of the furrows is uncertain but may be related to volcanic activity either as lava channels or channels cut by water from magnetic volatiles or melted permafrost. The former case requires conditions in the crust favoring early volcanism in this restricted band; the latter case suggests, perhaps in addition, that in this region conditions permitted the existence of liquid water. It might be speculated that the coordinates of the pole to this band of furrowed terrain may represent the position of the ancient pro-Tharsis pole, if the furrowed terrain corresponds to a compositionally anomalous band of crust.

51. Significance of Martian Dune Features. J. A. CUTTS and R. S. U. SMITH, JPL. - A complex of coalescing ridges and dune marginal features in the Hellas promontory region of Mars is identified as a dune mass. This implies a regime of collion saltation on Mars, which has a number of meteorologic and geologic consequences. Saltation is sustained by the planetary wind stress on Mars, although it may be initiated by other means such as impact or mass movement. Eolian abrasion may explain many martian erosional features and provide a source of dust for the layered deposits of the polar regions. Saltation sorting may also account for albedo features on Mars. Individual dunes such as barchans and pyramidal dunes may exist peripheral to the Hellasprotnut dune mass. Pictures also suggest fine-scale dune-like structures in many other areas of the planet. Eolian features are, therefore, thought to be widespread, if not ubiquitous, on Mars. The hazards and scientific opportunities that they present should be carefully considered when planning spacecraft landings on the planet.

52. Salt Weathering on Mars? Michael C. Mailin, California Institute of Technology. - Mariner 9 photographs of Mars indicate significant erosion has occurred on that planet. Although several erosional mechanisms have been proposed, common terrestrial weathering mechanisms cannot function in the Martian environment. One possible explanation is that erosion of unconsolidated material is responsible for the landforms observed. Another, more speculative hypothesis, is that salt weathering, a process ideally suited to the ultra-cold desert conditions on Mars, may have been, or may still be, active on the Martian surface. Volcanic salts are almost certainly available, with their association with water quite probable from both thermodynamic and geologic considerations. Thus, with high winds for removal of weathered material and the presence of salt solutions, the conditions necessary if not sufficient for salt weathering exist on Mars.

53. The Oxidation of the Martian Surface. R. O. Vanguest, T. B. McCord, M. E. Adams, JPL. - The exposure of Martian surface materials contain magnetic or non-Fe(II) bearing minerals and glasses, these ferrous materials will undergo photo-stimulated oxidation as a result of the exposure to solar ultraviolet radiation in the O$_2$-bearing martian atmosphere. Upon colliding with pairs of adjacent vacant adsorption sites on the grain surface, atmospheric O$_2$ dissociates into adsorbed O atoms. Illumination of the Fe$^{2+}$ which attaches to the adsorbed O, forming Chemisorbed O$_2$ and oxidizing the Fe$^{2+}$ to Fe$^{3+}$. The O$_2^-$ then oxidizes Fe$^{2+}$ ions octahedrally. Adsorbed H$_2$O leaches Fe$^{2+}$ ions from the substrate and deposits them on the grain surface, providing additional Fe$^{3+}$ for photo-stimulated oxidation. H$_2$O adsorption also results in the partial substitution of OH ligands for O ligands. On Mars there is a daily alternation between intervals of H$_2$O adsorption and photo-stimulated oxidation, resulting in the formation of Fe(O, OH)$_6$ octahedra (goethite structure) rather than the hematite which was observed to form in the H$_2$O-free laboratory environment. The goethite grows by nucleation, forming mica-like scales that rupture from the grain surface. Adsorption of H$_2$O on these scales during their accumulation results in the formation of limonite. The daily H$_2$O adsorption intervals and abrasion make the oxidation rate orders of magnitude higher than predicted by the kinetic rate equation.

54. Variable Features on Mars: Mariner 9 Observations of Prometheus Sinus. C. SAGAN, J. VEYERKA, P. FOX, R. DUBISCH, P. GIERASCH, Cornell University, and L. QUAM, J. LEDERBERG, F. U. P. SMITH, L. G. TUCKER, B. EROSS, Stanford University, and J. POLLACK, Ames Research Center. - Survey of high-resolution monitoring of the space-time distribution of Martian bright and dark markings—the streaks and splashes—indicate a range of global correlations. The classical dark markings owe their configurations and variability to their constituent streaks and splashes, produced by windblown dust. Streaks and splashes are consistent wind direction indicators. Correlation of global streak patterns with general circulation models suggests that winds are above the boundary layer are necessary to initiate grain motion on the surface and to produce streaks and splashes. The generation of streaks and the progressive albedo changes observed require only threshold velocities at the grain surface, 1-2 m/s for 1 day. We propose that the dark collar observed following the North polar cap in its retreat is produced by the scouring of bright overlying dust from the polar peripheral ground by winds driven by the temperature differences between frosted and unfrosted terrain.

55. Variable Features on Mars: Mariner 9 Observations of Prometheus Sinus. C. SAGAN, J. VEYERKA, P. FOX, R. DUBISCH, P. GIERASCH, Cornell University, L. QUAM, J. LEDERBERG, E. J. HODGKIN, L. G. TUCKER, B. EROSS, Stanford University, and J. POLLACK, Ames Research Center. - Mariner 9 observations of changes in the configuration of bright and dark markings are discussed for Prometheus Sinus; and also for Syrtis Major, and Lunae Palus. These changes are generally consistent with removal of bright and dark dust and uncovering of darker underlying