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### PLUTO IS THE NEW MARS!

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Data from NASA's New Horizons encounter with Pluto in July 2015 revealed an astoundingly complex world. The surface seen on the encounter hemisphere ranged in age from ancient to recent. A vast craterless plain of slowly convecting solid nitrogen resides in a deep primordial impact basin, reminiscent of young enigmatic deposits in Mars' Hellas basin. Like Mars, regions of Pluto are dominated by valleys, though the Pluto valleys are thought to be carved by nitrogen glaciers. Pluto has fretted terrain and halo craters. Pluto is cut by tectonics of several different ages. Like Mars, vast tracts on Pluto are mantled by dust and volatiles. Just as on Mars, Pluto has landscapes that systematically vary with latitude due to past and present seasonal (and mega-seasonal) effects on two major volatiles. On Mars, those volatiles are H<sub>2</sub>O and CO<sub>2</sub>; on Pluto they are CH<sub>4</sub> and N<sub>2</sub>. Like Mars, some landscapes on Pluto defy easy explanation. In the Plutonian arctic there is a region of large (~40 km across) deep (~3-4 km) pits that probably could not be formed by sublimation, or any other single process, alone. Equally bizarre is the Bladed terrain, which is composed of fields of often roughly aligned blade-like ridges covering the flanks and crests of broad regional swells. Topping the unexpected are two large mounds approximately 150 km across, ~5-6 km high, with great central depressions at their summits. The central depressions are almost as deep as the mounds are tall. These mounds have many of the characteristics of volcanic mountains seen on Mars and elsewhere in the inner solar system. Hypotheses for the formation of these Plutonian mounds so far all have challenges, principally revolving around the need for H<sub>2</sub>O ice to support their relief and the difficulty imagining mechanisms that would mobilize H<sub>2</sub>O. From the perspective of one year after the encounter, our appreciation of the extent of Pluto's diversity and complexity is quite reminiscent of the perspective the science community had of Mars, with similar quality data sets, soon after the early reconnaissance of that planet in the late 1960s and early 70s. So certainly in this sense, Pluto is the new Mars.

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