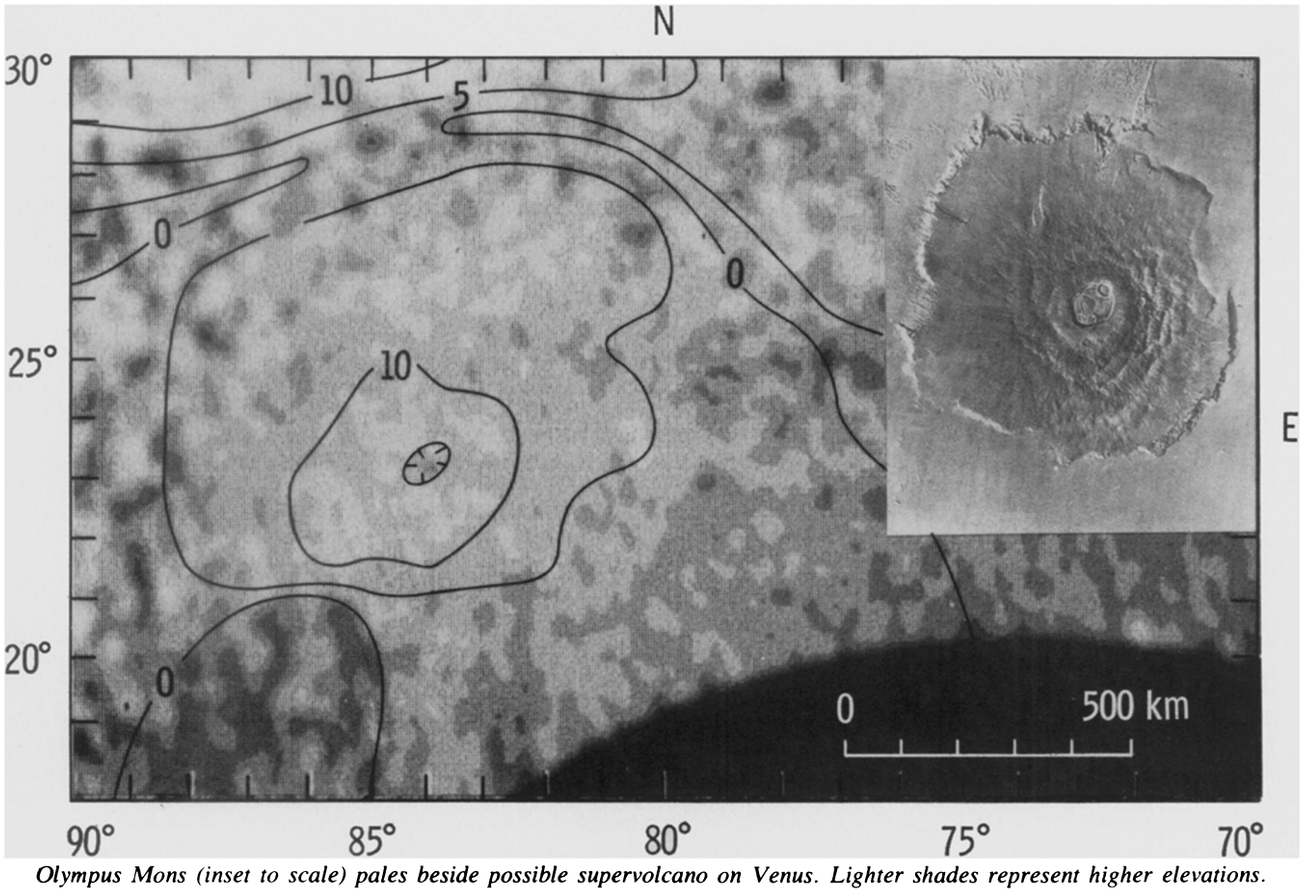
Move Over Olympus Mons—Here Comes Beta!

A possible volcano bigger than New Mexico has been detected on Venus

BY JONATHAN EBERHART

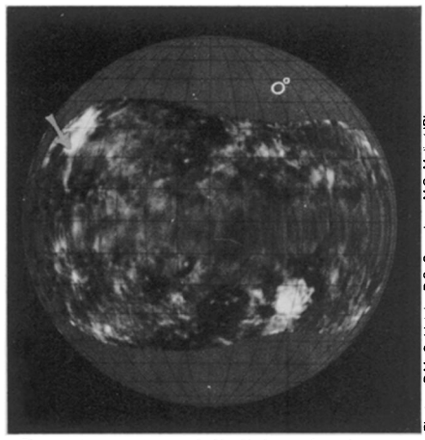


Olympus Mons (inset to scale) pales beside possible supervolcano on Venus. Lighter shades represent higher elevations.

The first sign was a huge ring, seemingly floating, dark and stark, atop the global dust storm that was shrouding the planet Mars when Mariner 9 arrived there in 1971. As the rolling clouds receded, the ring was seen to be a vast, volcanic caldera. And then, at last, the volcano itself: Olympus Mons—awesome, staggering—five times the height of puny Everest, flanked by skirts of ancient flows that, on earth, could nearly touch the four borders of New Mexico. The variously touted wonders of the earth shrank a bit, perhaps, before a true wonder of the solar system.

Can it be, only six years later, that a still larger volcano has been found?

Possibly. High-resolution radar studies have revealed what appears, at least in shape, to be a substantially larger volcano on the planet Venus. On earth, a feature its size would cover all of New Mexico out to the corners, spilling over for perhaps 100 kilometers into Colorado on the north, Arizona on the west, Texas on the east and southeast, and even a bit of Mexico to the southwest. At least a fourth larger than Olympus Mons, it occupies a highly radar-reflective spot, identified only as Beta in previous studies, in Venus's northern hemisphere.



Photos: R.M. Goldstein, R.S. Saunders, M.C. Malin/JPL

Beta (arrow) on full-disk radar image.

The altitude measurements showing that the bright spot rises to a peak with a lower, calderalike center were obtained from radar interferometry data provided by Richard M. Goldstein of Jet Propulsion Laboratory, using two of the Goldstone antennas (64- and 28-meter) in California. In the interferometric image (on this page), each gray-scale step from black toward white represents an altitude increase of about 3.3 kilometers (with an uncertainty of about 2 km) says Stephen Saunders of JPL. Also, he says, Beta strongly depolarizes the reflected radar beam, which implies the sort of rough surface that could be a volcanic region.

The implied volcano, according to Saunders and Michael C. Malin, also of

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JPL, is about 700 kilometers across, with a central depression that may be as much as 90 kilometers wide. Olympus Mons, by comparison, spans perhaps 550 kilometers, with about a 60-kilometer-wide caldera. The entire volcanic island of Hawaii, even measured from the seabed, reaches about 120 kilometers in width at its maximum, Saunders points out, and its several surviving calderas are trivial on this scale. The main Kilauea caldera is slightly more than 3 kilometers across.

Olympus Mons may still hold the altitude trophy, however. Born scarcely fettered by the low Martian gravity, it looms perhaps 25 kilometers high. The possible volcano at Beta would have been held down by a gravitational acceleration nearly 2.3 times as great, combined with Dantean temperatures that would have produced plastic rocks perhaps incapable of accumulating to great heights. Another substantial diminishing effect could be chemical erosion from acids and other components in the planet's atmosphere (SN: 4/16/77, p. 252). On earth, wind, water and a still-churning interior conspire to make molehills out of mountains from the day that new peaks are born. In the words of one planetary geophysicist, "Ozymandias Syndrome."

Researchers have been looking at radar images of Venus for well over a decade, but it is the addition of the altimetry data that has enabled a near-featureless bright spot to be envisioned as the vast cone of a titanic volcano. There are several other such spots of Venus—some of them apparently larger than Beta—but their elevations have yet to be determined. Even the two-dimensional, radar-reflectance images of the planet, however, suggest some stirring possibilities.

One is a great dark stripe, which Malin has suggested to be a troughlike depression about 1,400 kilometers long and up to 150 kilometers wide (SN: 4/10/76, p. 228). It would be dwarfed by Valles Marineris, the huge canyon on Mars, but it would similarly dwarf earth's Grand Canyon. Perhaps most intriguing is Malin's speculation that the feature is probably not a huge erosion ditch but an extensional feature—a crack—and thus a sign of large-scale tectonic activity in the planet's past.

Elsewhere is what could be a long, curved mountain range, possibly bowed inward where it is intersected by a less-prominent linear feature. Could the displacement represent horizontal slippage along a major fault? There is even the possibility of a second major volcano, this one a mere 350 by 450 kilometers with an 80-kilometer caldera.

Besides expanding the two-antenna coverage, Goldstein is now beginning to chart the planet using *three* antennas simultaneously. It may take a year or more, he says, but the results should be, to say the least, worth waiting for. □