Astronomy

Mars in 3-D

From a basin deep enough to hide Mount Everest to a 2-kilometer-high ring of rock, a new map of Mars is providing scientists with greater detail about the Red Planet than they have about some parts of Earth.

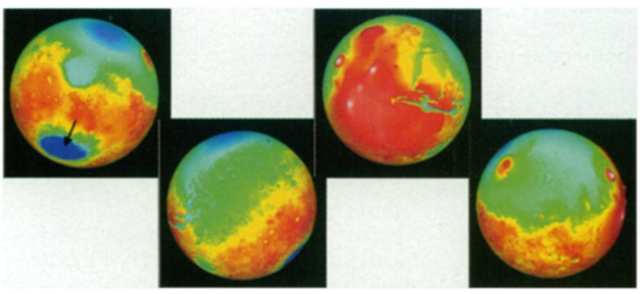
By bouncing a laser beam off the Red Planet, the Mars Global Surveyor spacecraft has made some 27 million measurements of the Martian terrain. Overall, the highs and lows gauged by the laser technique are accurate to within 13 meters, with large areas of the flat northern hemisphere measured to better than 2 m. Highlights of the map include:

• A persistent downhill slope from south to north at all latitudes indicates that if water once flowed on the Red Planet, 75 percent of it would have drained into the northern lowlands, notes Surveyor scientist Maria T. Zuber of the Massachusetts Institute of Technology. Intriguingly, previous measurements with Surveyor's Mars Orbiter Laser Altimeter (MOLA) experiment revealed that the northern lowlands are as flat as ocean floors on Earth (SN: 4/4/98, p. 218). "It certainly looks like a lot of water pooled in the north," comments James W. Head of Brown University in Providence, R.I.

• The new map suggests that processes inside the planet generated the low elevation of the northern hemisphere, says MOLA researcher David E. Smith of NASA's Goddard Space Flight Center in Greenbelt, Md. Some astronomers had argued that the low-lying terrain was shaped by the impact of a giant asteroid or comet.

• A detailed look shows a giant ring of material, 2 km high, surrounding the deep impact basin Hellas in the southern highlands. The ring, which has a volume equivalent to a 3.5-km-thick layer of rock spread over the continental United States, is presumed to be material excavated when an asteroid gouged out Hellas. This ejected material, along with debris surrounding another southern highlands basin called Argyre, may account for the uneven terrain and high elevation of southern Mars, Smith says.

Smith *et al.*/NASA



Three-dimensional map of Mars, presented as a globe. Each successive view shows the planet rotated a quarter turn. Blue denotes the lowest elevation, red the highest. Arrow indicates the basin Hellas.

• On a smaller scale, the map shows that the eastern part of the vast Valles Marineris canyon slopes westward and lies 1 km below an adjacent region where channels that may once have carried water emptied. This suggests that at some time, water filled the canyon. "The data clearly reveal the localized areas where water may have once formed ponds," says Zuber.

• The volume of the north and south polar ice caps indicates that they now contain only 40 percent of the amount of water required for the oceans that scientists theorize once existed in the northern hemisphere. "This does not say that there was no ocean," says Smith. Additional water could have evaporated or gone below the surface, he notes.

Smith, Zuber, and their colleagues describe the global map in the May 28 SCIENCE. —*R.C.*

Biology

Recipe found for orchid aphrodisiac

Researchers have at last figured out the recipe for one of nature's sexier perfumes, the scent produced by an *Ophrys* orchid. The blend packs more power than they expected.

The odor wafting from the small, reddish-brown blooms of the European *Ophrys sphegodes* drives male bees of the species *Andrena nigroaenea* into such a frenzy that they try to mate with the blossoms. The blooms offer no nectar and depend on these delusory encounters for pollination.

Early attempts to analyze the scent yielded compounds that evoked only mild interest from male bees. Researchers had speculated that the flowers attracted only those bees "with a low threshold for sexual stimuli," as Florian P. Schiestl of the University of Vienna and his colleagues describe the work.

Using new techniques, however, they located and identified a much more potent aphrodisiac. In the June 3 NATURE, they describe exposing male bees to extracts of various parts of both flowers and female bees. The flower power came from the waxy coating on part of the bloom, suggesting that the sexual attractant may have had its evolutionary roots in waterproofing.

The team then ran extracts of both flower and bee parts through a gas chromatograph hitched to male-bee antennae and checked to see which compounds kicked up nerve-cell activity.

Fifteen substances from female bees interested males quite a bit, and the orchid flower turned out to produce 14 of them.

A synthetic blend of these fairly simple compounds, straight-chain saturated and unsaturated hydrocarbons, drove males wild with passion. But to the human nose, notes Vienna's Manfred Ayasse, the scent "is almost nothing." —*S.M.*

How moths tell if a yucca's a virgin

Female yucca moths appear to leave a scent mark on flowers they visit, a bit like dogs claiming their fire hydrants.

Brushing flowers with substances from female abdomens tricked moths into reacting as if the bloom had already been visited, report Chad J. Huth and Olle Pellmyr of Vanderbilt University in Nashville in the June OECOLOGIA.

Pellmyr

A female moth pollinates a yucca flower after laying her eggs in the blossom's ovary.

These latecomers waggle their antennae furiously as if checking for scents. If one or more moths have already found the same flower, the late visitor reduces the number of eggs she lays there or just departs.

Huth and Pellmyr also observed that females crawling around a blossom make a characteristic gesture that looks like scent smearing, dragging their abdomens over the flower surface.

Yuccas and yucca moths need each other. During a female's few days of adult life, she cruises for yucca blooms, the only place she deposits her 100 or so eggs. When she finds a likely flower, she injects three to five eggs into the flower's ovary, and in most cases, pollinates the flower too. This is the only pollination service the flower gets, Pellmyr explains.

When an egg hatches, the developing larva eats about 20 of the yucca flower's 300 seeds. If too many larvae hatch in the same flower, however, the plant aborts it, and the larvae die. The moths therefore face a strong evolutionary pressure not to overload a flower, says Pellmyr.

Other insects leave perfume calling cards, such as *Heliconius* butterflies scenting the leaves on which they lay eggs. The new analysis, Pellmyr says, is the most direct evidence that yucca moths also leave their marks. —*S.M.*