Astronomy

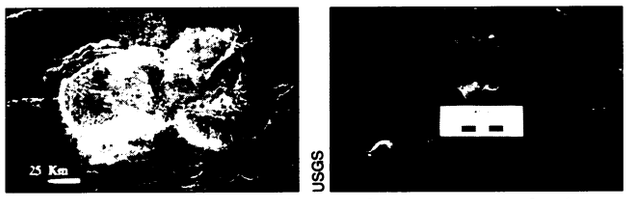
Ron Cowen reports from Houston at the annual Lunar and Planetary Science Conference

Venus' pancakes: A seafloor analog?

In 1990, early in its radar-mapping mission to Venus, the Magellan spacecraft found an unusual set of volcanoes on the cloud-bedecked planet. Measuring 10 to 100 kilometers across, the volcanoes have steep sides and flat tops, features that earned them the moniker "pancake domes."

Planetary scientists reasoned that the domes, which number more than 100, formed from a lava far more viscous than that which shaped the surrounding plains on Venus (SN: 4/13/91, p.229). A silica-rich lava, which has a consistency similar to toothpaste, would more likely coalesce to form the steep, flat-topped structures than a less viscous lava, they suggested.

If silica-rich lava created the domes, it could have far-reaching implications. For example, this might indicate that magma chambers beneath parts of the Venusian surface survived long enough for different density lavas to separate. A volcanic eruption might tap the part of the chamber containing the lower-density, silica-rich material.



Left: Radar image shows volcanoes known as pancake domes on Venus. Right: Volcanoes on the seafloor near the Hawaiian Islands show a similarity to the Venusian domes. Dark horizontal lines indicate areas not mapped by sonar.

Supporting these ideas, researchers pointed out that the pancake domes on Venus bear at least a superficial resemblance to silica-rich volcanic landforms on Earth. These include the flattened domes near Mono Lake, Calif.

But a detailed comparison now shows that the volcanic domes on Earth typically measure one-tenth the width of those on Venus and have a much rougher terrain, reports Magellan researcher Jeffrey J. Plaut of NASA's Jet Propulsion Laboratory in Pasadena, Calif. Instead, the pancake features may have more in common with volcanoes on our planet's seafloor.

Independent analyses by Nathan T. Bridges, who conducted his work at the U.S. Geological Survey in Menlo Park, Calif., and Susan E.H. Sakimoto of Johns Hopkins University in Baltimore suggest that several flat, steep-sided seamounts share similarities with the domes on Venus. These seafloor volcanoes — sometimes dubbed cow patties because of their flattened appearance — have a size, shape, and smoothness akin to the pancake domes, according to recent sonar data.

The Earth's seafloor and the surface of Venus have a key feature in common: Both are under high pressure. Although the pressure on the ocean bottom exceeds that exerted by Venus' thick atmosphere, the seafloor may in fact mimic parts of the Venusian environment better than any other site in the solar system, Bridges speculates. Sakimoto suggests that heat transport and the eruption of magma on the seafloor are similar to such activity on parts of Venus.

Because the seamounts are made by basaltic lava — denser, more fluid material than silica-rich lava — some researchers now propose that the pancake domes on Venus are formed from basalt. A slushy, partly solidified basalt might have the viscosity to create the flat-top domes, Sakimoto notes. Alternatively, says Plaut, the domes on Venus may indeed have formed from a silica-rich lava but erupted in a manner entirely different from any known on Earth.

In either case, says Bridges, Earth's seafloor may provide new insight on the geological processes that shaped Venus.

Biomedicine

Elizabeth Pennisi reports from Tucson, Ariz., at the annual American Cancer Society Science Writers Seminar

Quest for genes that stop cancer spread

Once again, scientists expect to add to the list of genes that play a part in the development of cancer. First they found oncogenes, which stimulate tumor development, then tumor suppressor genes, so named because they normally keep uncontrolled cell growth in check. Next came a metastasis suppressor gene, called nm23, which could keep cancer from spreading. Now it seems that an unidentified gene on chromosome 6 regulates nm23, says Danny R. Welch at Pennsylvania State University College of Medicine in Hershey.

Welch and his colleagues first noticed missing pieces of that chromosome in many of the cells from people whose melanoma, a skin cancer, had spread to other parts of their bodies. He then used a technique called microcell-mediated cell transfer to add chromosome 6 to melanoma cells growing in a laboratory dish. He injected those altered cells into specially bred mice. Those mice developed tumors as expected, but the tumors never spread from the original site, Welch reports.

"This is the first evidence in which metastasis is completely suppressed by the addition of genetic material," he says. But now he needs to pinpoint the gene exerting this effect. He hopes that replacing that gene in people who lack it could prevent a tumor's spread.

Making sense of antisense in cancer

Antisense molecules are tiny pieces of DNA or RNA designed to bind to a cell's own DNA or RNA and interfere with its activity. By showing they can inject such molecules easily and safely into people, researchers have now inched closer to creating antisense "drugs" that slow the course of cancer. Eighteen people with cancer received doses of the antisense molecule OL(1)p53, which kills leukemia cells but not other cells. This molecule should interfere with the production of protein from the p53 gene, says Michael R. Bishop of the University of Nebraska Medical Center in Omaha.

However, even though they gave higher doses of the antisense material to some patients, the researchers have not yet achieved a high enough concentration of this drug in the blood. They plan to extend these studies, says Bishop.

Meanwhile, they are adding OL(1)p53 to bone marrow that has been removed from leukemia patients. The marrow will be returned to these patients after treatment has killed the tumor cells in their bodies. The researchers hope that the antisense molecules will kill any leukemia cells that stow away in the transplant material, says Bishop. Also, they plan to use a different antisense drug to get rid of cancer cells in bone marrow taken from people with chronic myelogenous leukemia.

"Virtual" breast useful as cancer assay

By taking advantage of a cell-culture technique to make breast cells grow more naturally outside the body, researchers have developed a new way to distinguish normal cells from tumor cells. Over the past decade, Mina Bissell and her colleagues at Lawrence Berkeley Laboratory in Berkeley, Calif., have learned that adding cellular scaffolding called a basement membrane to breast cells growing in a laboratory dish causes those cells to behave as if they were still in the body. Instead of growing into a flat layer, the cells form three-dimensional structures (above), and even secrete milk proteins. Working with European collaborators, Bissell has now discovered that within a week, normal breast cells also form new basement membranes, while tumor cells do not. This difference provides the fastest assay yet for telling the two kinds of cells apart, she reports. Also, adding the metastasis suppressor gene nm23 to tumor cells enables them to make this scaffolding, she says.

J. Emerman/Lawrence Berkeley Lab.