

and to reconstruct its three-dimensional structure. The researchers say their technique is powerful enough to handle diffraction data produced by a variety of methods currently used by scientists to probe the nature of surfaces, including photoelectron and Auger spectroscopy.

"We can do the reconstruction in a few minutes on a personal computer," Saldin says.

The resulting image shows the relative positions of a typical atom and its nearest neighbors. Because individual atoms yield only one electron, the hologram and its subsequent reconstruction represent averages over all electron-emitting atoms and their nearest neighbors. Thus, the new technique works best when all the electron-emitting atoms sit in roughly the same surroundings, as they would in a near-perfect crystal.

Surface scientists have several methods for punching electrons out of specific types of surface atoms. Each method produces a distinctive electron diffraction pattern amenable to holographic reconstruction. In many cases, researchers can focus on one element, which allows them to work out how its particular atoms are arranged.

Saldin and his colleagues have successfully tested their reconstruction scheme on diffraction patterns created by electrons scattering from copper surfaces. — I. Peterson

## Magellan radio loss remains mysterious

Venus-orbiting Magellan — its wayward radio link now restored for the second time — has forced NASA to devise new measures to restore communications should the spacecraft go silent again.

Mission engineers at the Jet Propulsion Laboratory in Pasadena, Calif., have written emergency commands to send to Magellan if the signal problem recurs. They plan to send the new instructions slowly, at 40 bits a second, to the craft's low-gain antenna, which has a wider field of view than the other antennas. Officials admit they don't know and may never determine precisely what silenced Magellan on either occasion (SN: 8/25/90, p. 117).

Magellan lost contact with Earth for nearly 15 hours on Aug. 16 and for 17 hours on Aug. 21. Both signal interruptions apparently occurred when the craft unaccountably entered a "safe mode." Magellan's attitude-control-system computer is programmed with several such modes to help protect the craft against malfunctions that arise without warning.

Officials hope the new commands will rapidly correct any future communications losses. "I want a safing action that the spacecraft takes to establish quick communications to Earth," says project

## Herbicide curbs human parasite's spread

In the search for new drugs against human parasitic diseases, a popular weed killer has emerged as a promising candidate.

Farmers in the United States and abroad use an herbicide called trifluralin to eliminate grasses and some broadleaf weeds in fields of soybean, cotton, safflower and other crops. But new research on human and mouse cells shows that the herbicide also stops the parasite *Leishmania mexicana* dead in its tracks while leaving the mammalian cells unharmed. This suggests that some close chemical cousin of trifluralin may eventually prove therapeutic for many of the world's 10 to 20 million people infected with leishmania protozoans. These single-celled organisms, common in many developing countries, cause skin ulcers and potentially fatal organ damage.

The odd discovery had its beginnings in work performed two years ago. Dunne Fong and his colleagues at Rutgers University in Piscataway, N.J., determined the exact sequence of amino acids that form a leishmania protein called beta-tubulin, a key component of tiny fibers called microtubules. Microtubules provide cells with structural support and are critical to cell division.

Although leishmania parasites belong in the animal kingdom, Fong's team found that the amino acid sequence of leishmania beta-tubulin has more in common with plant tubulin sequences than with animal ones. Reasoning that chemicals toxic to plant tubulin might, if specific enough, interfere with leishmania cells without bothering human

tubulin, Fong and Marion Man-Ying Chan began searching for such a compound.

The Rutgers researchers tested several herbicides whose *modus operandi* is to interfere with plant beta-tubulin. They report in the Aug. 24 *SCIENCE* that trifluralin binds to *L. mexicana* beta-tubulin but not to mammalian beta-tubulin. Even at extremely low concentrations, the herbicide interferes with the parasite's replication, cutting infectious spread by half in cultured human and mouse cells, they say. Yet at 20 times this dose, it still leaves the mammalian cells unscathed.

Fong and Chan don't propose spraying the herbicide on infected people. For one thing, they note, the compound breaks down very quickly in sunlight — an advantage for an agricultural chemical not meant to build up in the environment, but a drawback for a drug applied to skin. Instead, they suggest that scientists might design a closely related compound with anti-leishmania activity and superior pharmacological traits. Moreover, they say, "there may be other potentially useful . . . agents [against these and other parasites] among the commercially available herbicides."

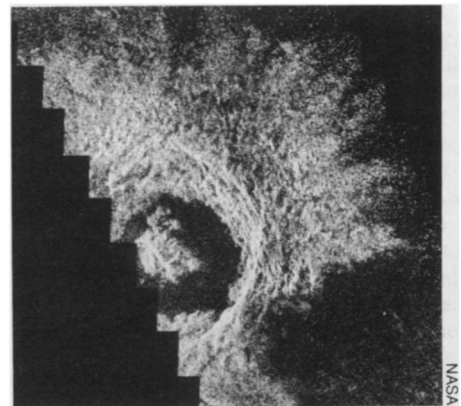
Health officials estimate that parasitic diseases such as leishmaniasis, malaria, amoebiasis and toxoplasmosis affect more than one-quarter of the world's population, or well in excess of 1 billion people. For many of these diseases — including leishmaniasis, transmitted by a biting sandfly — current drug treatments remain unsatisfactory at best. — R. Weiss

*Magellan test image indicates that Golubkina, a crater about 34 kilometers in diameter, resulted from a meteorite striking Venus. The image reveals Golubkina's terraced inner walls, a central peak and radar-bright features that appear younger than the surrounding plain.*

manager Anthony Spear. "My heart can't stand this 17 hours' loss of signal."

Magellan science manager Thomas W. Thompson says engineers succeeded on Aug. 24 in getting the craft to send 1,200 bits of information per second, not just the 40 bits per second to which it dropped during its recovery from the first signal loss. The data speed-up was only a test, however, because transmissions sometimes prove less reliable at the faster rate, Thompson says.

Project officials have formed a special team of about 12 experts from inside and outside NASA to study the communications failures. Spear says the group is analyzing several possible causes, including an electric spark; a cosmic ray



striking and altering a computer chip; and computer memory failures during the jettisoning of the rocket motor that put Magellan into its Venus orbit.

With the communications mystery still unsolved, Thompson says Magellan will not begin its full radar-mapping of Venus before late September. The long-term mapping had been scheduled to start on Sept. 1. — J. Eberhart