

all his troubles began, received the International Congress's Fields Medal for "distinguished achievements in mathematics," awarded every four years. By using Smale's theorem, topologists map spheres in all dimensions. ♦

MAVERICK

## The Metric Missile

A year after the end of the Civil War, Congress passed a bill which authorized, but did not require, the use of the metric system in the United States and expressed the hope that increasing use of the system would ultimately do away with the cumbersome pounds and inches that were predominant at the time. Similar efforts throughout the succeeding century were to no avail. In every year since 1960, proposals for study of the problem have come and gone, or simply been ignored to death, despite the fact that the U.S. and the members of the British Commonwealth are almost the only holdouts in a virtually metric world.

**Now**, in an independent effort to flesh out supposition with firm data, the Air Force has finally taken what could be the first step in putting the metric system across to industry, whose resistance to the costly changeover is the biggest barrier in the way of the gram and meter.

For more than a year the Air Force has considered development of a television-guided air-to-surface weapon called Maverick. Now it has asked each of the two companies competing for the possible business to see if it would be possible to make the entire missile, from the ground up, under the metric system.

**The plan** goes much further than merely multiplying all the inch measurements by 2.54 to read in centimeters. Every nut, bolt, tool, die and production machine would be made or calibrated in metric units, extending all the way down to the smallest subcontractor. Though one missile does not by a long shot become a national policy, it could greatly ease the way for subsequent projects.

Except for the initial cost of conversion, many military officials favor the adoption of the metric system; it would ease joint development of weapons by the U.S. and its allies, and give the U.S. a much wider source of logistic support, including spare parts and fastenings.

The Air Force first considered doing the Maverick metrically at the request of the Department of Defense, and the stamp of Secretary Robert S. McNamara is evident on the program. At least one USAF-approved statement

from North American Aviation, which is studying Maverick along with Hughes Aircraft, stresses the need for "widening the scope of commonality in Free-World armament design," a pet notion of McNamara's.

**The Maverick** missile would be the first major U.S. weapon to be completely designed in the metric system. A U.S.-West German project to develop a new Main Battle Tank for the 1970s is being carried out in half-and-half fashion, with U.S. contributions measured in inches and German ones in centimeters (SN: 7/30/66).

Almost \$11 million in contracts have been awarded on Maverick; but except for the metric aspect, the Air Force wishes it could stay out of the news altogether. It is, after all, a secret. ♦

VENUS

## Life in the Clouds

Although the surface conditions of Venus—high temperature and absence of moisture—make the chances of life there implausible, the clouds of earth's nearest neighbor planet present an entirely different picture. According to Dr. Carl Sagan of Harvard College Observatory and the Smithsonian Astrophysical Observatory in Cambridge, Mass., the essentials for photosynthesis—water, carbon dioxide and sunlight—are plentiful in the clouds.

Drs. Sagan and Harold Morowitz of the department of molecular biophysics at Yale University, New Haven, Conn., therefore speculate that organisms the size of ping-pong balls could be floating in the atmosphere of Venus, at a level just underneath the base of the clouds, which consist of water droplets at the bottom and ice crystals at the top.

**Dr. Sagan** believes that the main point is not that such life forms actually exist—there is no evidence for them—but that the possibility of some kind of living organisms should not be excluded. Because the "atmosphere is primarily carbon dioxide and nitrogen, a float bladder filled with hydrogen would be very effective," the scientists suggest. The bladder would be self-regulated to stay at a relatively fixed altitude.

An organism living just below or in the clouds of Venus, they speculate, would collect water either as rain or by contact with water droplets. Minerals blown up from the surface would be captured by the sticky underside of the thin-walled gasbag, then ingested by fluid uptake. Mineral requirements would be modest.

**A model** for such a life form can be worked out using biochemical mechanisms known on earth, Drs. Sagan and

Morowitz say in the Sept. 16 NATURE. They report that the conditions in the lower clouds of Venus resemble those on earth more than any other extraterrestrial environment known.

It is even possible, they suggest, that life arose "under more moderate conditions on the surface of Venus in its early history . . . then emigrated to the clouds." Neither the U.S. nor the Soviet Venus probes scheduled to arrive near Venus in October carry instruments for detecting biological forms. ♦

FROM GENEVA

## Lockjaw: A Killer

Tetanus has killed a million people in 10 years; more than 50,000 deaths are formally counted each year.

Dr. Boris Bytchenko, a Russian member of the World Health Organization's Bacteriology Unit, has conducted a worldwide survey of all available data and found surprising totals.

"Tetanus kills more people than smallpox, rabies, plague, anthrax and polio," he says, "yet it receives less attention by public health authorities and medical science than any of these."

**Paradoxically**, he notes, it is easy to prevent by vaccination. But once a victim gets it, chances are he's done for. The fatality rate in the United States is surprisingly high. Up to 78 percent of the patients die, according to published figures, despite good antibiotics, muscle relaxants and tranquilizers.

Japan and the Philippines also have high death rates. Europe, Asia and Africa reportedly enjoy a bit of extra immunity; only half the cases are fatal.

"In all parts of the world," Bytchenko explained recently, "men appear more vulnerable to the toxin than women, and tetanus strikes hard at newborn children and people over 50."

**In some tropical areas**, as many as 80 newborns per 1,000 get tetanus and die. (Most of the world's babies are still delivered by midwives or without help; a survey sponsored by the International Federation of Obstetricians and Gynecologists finds it about 75 per cent. These people use bamboo shoots, glass and even cow dung in their ritualized procedures.)

The overwhelming majority of cases is due to trivial cuts or punctures, especially of the feet and legs, Dr. Bytchenko finds. The bacillus lives in the soil, especially in rich loam. "It's a part of our world," he says. "but no one knows its habits and exactly how it kills so large an organism as man." In many countries, including Russia, scientists are meticulously studying soils. ♦