across, atop which sit the four largest volcanoes on the planet. Another 3.6 percent or so is due to other crustal and density irregularities.

Today Mars rotates at an angle of about 25°, oscillating in a long-term cycle that ranges about 13° on either side of that number. But before internal geologic processes thrust Tharsis up to its present height, perhaps producing other features as well, the planet's axis may have been centered at a steep 32°. And therein lies the tale.

At the present inclination, according to the authors, maximum temperatures at the poles are about 240°K (− 27.4°F). At an inclination of 35°, however, the lengthened exposure to the sun would raise the poles above the melting point of water for about 40 days in the 688-day Martian year, and they would occasionally get as warm as 280°K (44.6°F). At a 45-degree tilt, temperatures would be above freezing for 90 days, reaching a balmy maximum of 300°K (80.6°F). This would have released vast quantities of water and carbon dioxide into the atmosphere, perhaps enabling a greenhouse effect that could have sustained such a climate for a long time. Certainly the difference from the present would have been, as Burns says, "profound."

Then Tharsis came and spoiled it all. But there is the possibility, boosted of late by the two apparent seismic events detected by Viking, that Mars is still a geologically active planet. Two years ago, in fact, a scientist at a DPS meeting proposed that Tharsis's crust is too weak to hold itself up by main strength, and that active convection is doing the work. Could the bulge recede? Viking has found that the residual polar caps are now only water, a possible sign that there may not be enough carbon dioxide left to rethicken the atmosphere even in warmer conditions. Proposed surface-roving vehicles and instrumented "penetrators" dropped over various points on the planet could tell more. The question is open. □

A new moon of Saturn, and an old one

To an outsider to the field of astronomy, the range of reactions to the term "Janus," listed in many references as the 10th moon of Saturn, is often a bit of a shock. Responses range from acceptance to tolerant smiles to expletive deleted. Claimed as a discovery by Audoun Dollfus in 1966, it was reported only over a relatively short number of days by a small number of astronomers and remains controversial to this day. This controversy is partially due to its cited position, which is so close to the outer edge of Saturn's rings that it can presumably be spotted only on the rare occasions when the rings are edge-on to earth. According to one astronomer at the AAS Division for Planetary Sciences meeting in Honolulu last week, "Saturn is the only known planet which has not only rings, but invisible moons."

Two University of Arizona astronomers, however, have reexamined both Dollfus's original plates and those of other observers as well. They have reported not only the confirmation of a 10th moon of Saturn, but the discovery, in many of the same plates, of an 11th one as well.

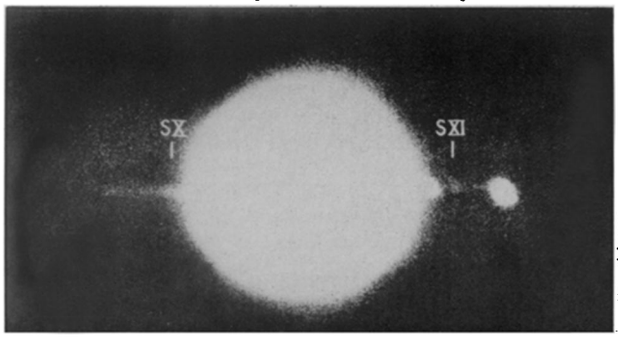
Astronomers Stephen Larson and John Fountain are firm in their conclusion.

"There are no less than 11 objects," Fountain says. The only uncertainty, they maintain, is whether number 10 is really in the orbit that Dollfus reported for Janus. In 18 of the 21 plates they studied, it can be plotted roughly on Dollfus's cited orbit. When all 21 plates are considered together, however, preliminary indications are that a somewhat different orbit yields a better fit.

Fountain points out that Dollfus's observations covered only three consecutive nights, hardly enough time to make precise measurements of such a tiny satellite's motion. However, the other astronomers' plates, cited by Larson and Fountain, represent a combined span of 51 days and should yield a more reliable ephemeris when precise calculations are completed.

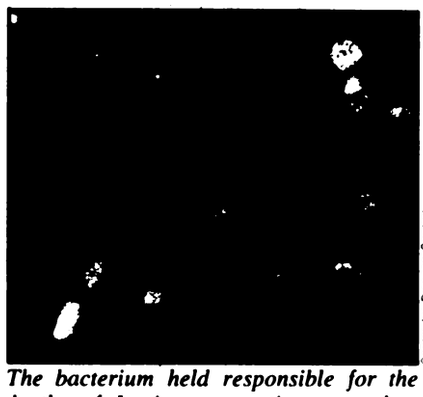
The 11th satellite, meanwhile, is in a path with a semimajor axis of 151,000 kilometers, Fountain says, compared with 137,000 kilometers for the outer edge of the rings. Number 10 has a semimajor axis that is either slightly larger or slightly smaller than that of 11, depending upon whether Dollfus's orbit holds up.

The next favorable viewing opportunity will run from late 1979 through late 1980, a period beginning, coincidentally, just after Pioneer 11 has flown by Saturn to make it a still more intriguing place. Are the Arizona astronomers impatient for a chance to check out their conclusions first hand? "We're impatient enough," says Fountain, "that we've already built a special camera to look with." □



A 10th and 11th moon of Saturn are indicated on this enhanced 1966 photo.

Legion disease: Culprit caged



The bacterium held responsible for the deaths of Legion convention-goers last July. These fluorescent antibody stains indicate the presence of the organism.

After months of searching and researching two microbiologists from the Center for Disease Control (CDC) in Atlanta have isolated the mysterious microorganism responsible for the deaths of 29 American Legionnaires last July. The culprit turned out to be a bacterium of as yet unknown species. It was first thought to be rickettsia, a rod-shaped bacterium carried by ticks, because of the close physical resemblance. Further study, however, proved that the larger "Legionnaire" bacterium was far different from rickettsia or any other bacterium.

Credit for the discovery goes to Charles C. Shepard and Joseph E. McDade of the leprosy and rickettsial branch of the CDC. McDade reviewed tissue sample slides and noticed the bacterium, which had eluded previous inspections. With Shepard, he conducted a series of antibody fluorescence tests, which eventually linked the bacterium with the disease.

Despite their discovery, the researchers are still bewildered by the unusual qualities of the bacterium. Although the organism has been grown successfully in yolk sacs, the CDC staff aren't sure they can grow it in an artificial medium where commonly known bacteria thrive. Says one researcher: "We've seen some growth, but we're not sure it's the same as in the yolk sac."

Nevertheless, the organism has the size and shape of a bacterium, ruling out the possibility that the organism is a virus (which cannot grow in an artificial medium as well). "It's not an ordinary organism," one researcher said. "It doesn't fall into any of the accepted categories of commonly known bacteria."

How the strange bacterium made its way to Philadelphia and singled out the American Legion convention is still an unresolved question. One piece of the puzzle materialized when the CDC staff tested blood sera from victims of a pneumonia epidemic that occurred in 1965 at