

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 re-

leased 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 Audouin 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.

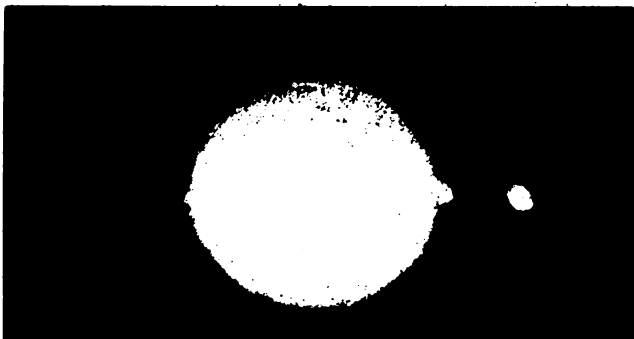
"There are no less than 11 objects," Fountain says. The only uncertainty, they maintain, is whether number 10 is really in the orbit that Dollfus reported for Janus.

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.

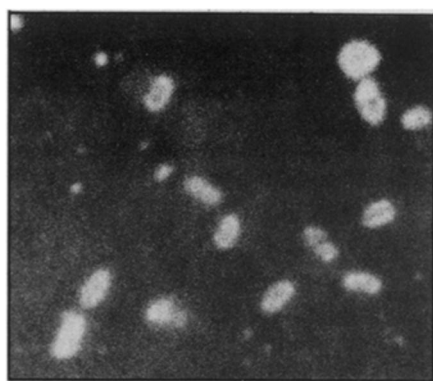
The next favorable viewing opportunity will run from late 1979 through late 1980, a period beginning, coincidentally, just after Pioneer 11 has flown by Saturn to make it a still more intriguing place. Are the Arizona astronomers impatient for a chance to check out their conclusions first hand? "We're 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.

Univ. of Arizona

Legion disease: Culprit caged



Center for Disease Control

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

St. Elizabeth's Hospital in Washington.

The researchers ran the same fluorescent antibody test on the blood sera from the patients at St. Elizabeth's. The results were the same, indicating the bacterium was the same in both cases. How the piece fits into the puzzle is still unanswered, but researchers are running tests on other sera in search of similar results.

Epidemiologists also hope that the location of other pneumonia cases in the vicinity of the convention-goers' hotels will guide them to the bacterium's origin. The exact time and location of exposure

must be established and a blood sample must be procured and tested before any positive statements about the geographical distribution of the disease can be made. Besides the logistical difficulties involved in tracking down the blood samples and the correct information about exposure researchers fear that the publicity surrounding the disease may have interfered with routine sampling procedures. In face of the odds, however, the CDC staff will still be plugging away at the cause and identification of the Legionnaires' disease for the next few months. □

Cambridge may O.K. gene research

After months of stormy debate, the city council of Cambridge, Mass., is near a decision on regulation of genetic research using spliced genes, or recombinant DNA. This week the council narrowly passed, on a preliminary vote, an ordinance permitting moderate-risk research, but imposing safeguards somewhat more stringent than those required by the National Institutes of Health (SN: 6/3/76, p. 3). The ordinance must now be published and public hearings completed. The final council vote on the ordinance and any amendments will occur on Feb. 7, which is also the last day of a seven-month city moratorium on moderate-risk genetic research.

The proposed ordinance is the product of a committee of Cambridge citizens. This eight-member review board, appointed by the city manager, includes a former Cambridge mayor and businessman, medical personnel, an engineer, a professor of urban policy and community activists. They spent more than 100 hours learning about research techniques, studying the NIH guidelines, visiting laboratories and listening to scientists debate. They then reached a unanimous decision.

The controversial research in question is a class of experiments that the NIH guidelines designate moderate risk. These experiments include splicing the genes of a virus or bacteria to partially purified DNA from mammals or birds or from lower animals known to produce potent toxins or pathogens. The Massachusetts Institute of Technology has a laboratory for cancer research that meets the NIH requirements for such work. The issue of recombinant DNA research first came to the attention of Cambridge mayor Alfred Vellucci last June when Harvard undertook construction of such a P3 facility.

In a report presented Jan. 5, the citizens' committee recommended that moderate-risk genetic research, both in profit and nonprofit institutions, be permitted in Cambridge as long as it conforms to the NIH guidelines. The board further stipulated that institutions using recombinant DNA must train all laboratory personnel in appropriate safety procedures; include

representatives of both laboratory technicians and the community on biohazards committees; test the purity of experimental organisms and check for resistance to common antibiotics, and monitor the health and intestinal flora of laboratory workers. The committee also specified that all experiments requiring P3 laboratories use genetically crippled bacteria and viruses (ensuring that no more than one spliced gene in one hundred million will survive outside a carefully regulated laboratory environment). Finally, the committee proposed that Cambridge establish a biohazards committee to oversee all recombinant DNA research. The biohazards committee would review proposals for recombinant DNA research in the city, receive reports of violations, visit laboratories, modify the city safety requirements as the federal guidelines evolve, and examine reports of the institutional biohazards committee.

Scientists, both those opposing and favoring city regulation of the research, praised the work of the citizens' committee. Although some think the extra stipulations are unnecessary, they do not consider them a major problem. Harvard and MIT are preparing responses, expected to express willingness to comply with the proposed ordinance.

Phillip Sharp, an MIT biologist who hopes soon to do P3 experiments in his own research, called the report of the review board "superb." He told SCIENCE NEWS: "I am encouraged that laymen would take time to do the homework, and that they considered the need for research and realized risk is involved in all research. The laboratory research board went through all of it and came out with a very intelligent report."

Jonathan King, another MIT researcher, praised the committee's strong statement on citizen control, but thought the report should have been more explicit. "It lacks teeth, it lacks a mechanism of enforcement," he says. He feels that experiments assigned to a lower risk category by NIH should also be regulated under the ordinance. The ordinance may be amended before final passage to make it stronger, King says. Some Harvard laboratory em-

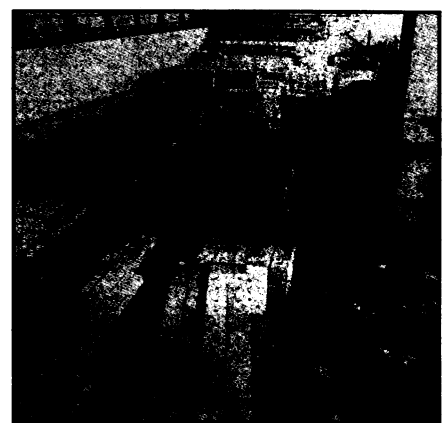
ployees, a group not consulted by the citizens' committee, have written to the city council with a number of recommendations.

The final passage of the ordinance would set two important precedents. The first is the decision not to ban the moderate-risk research, but to regulate it locally. Other city and state governments, including the New York Attorney General's office, are following developments in control of research using recombinant DNA.

The other precedent is the success of a committee of lay citizens in tackling a highly technical and controversial topic and emerging with concrete and intelligent recommendations.

"In presenting the results of our findings we wish also to express our sincere belief that a predominantly lay citizen group can face a technical scientific matter of general and deep public concern, educate itself appropriately to the task and reach a fair decision," the citizens' committee wrote. "Decisions regarding the appropriate course between the risks and benefits of potentially dangerous scientific inquiry must not be adjudicated within the inner circles of the scientific establishment." □

400-GeV experiments begin at Geneva



Overview of SPS West Experimental Hall.

On January 7, with the feeding of the first 400-billion electron-volt (400-GeV) protons to the West Experimental Area of the Super Proton Synchrotron, Western Europe's CERN laboratory entered the newest range of high-energy physics. The laboratory, owned and operated by a consortium of West European nations, also operates the 30-GeV Proton Synchrotron and the Intersecting Storage Rings, the world's most energetic colliding-beam apparatus for protons.

The Super Proton Synchrotron, which straddles the French-Swiss border near Geneva, is in many ways a companion piece to the 500-GeV synchrotron at the United States's Fermi National Acceleration