PLANEary SCIENCE

New Front-Runner for Carving Martian Gullies

The discovery of gullies on Mars 3 years ago electrified planetary scientists. Water seemed to have gushed from the planet’s rocky cliffs, and where there’s liquid water, there could be life. But how could water ever flow on the frigid surface of the Red Planet?

At a NASA press conference here last week and in a paper published online by Nature on 19 February, planetary scientist Philip Christensen of Arizona State University in Tempe presented intriguing images from Mars. They suggest that water melting of snowfields left from the last martian ice age could have eroded gullies beneath the snow. If so, lingering snow patches might harbor life still. The snow-patch hypothesis has shot to the front of a large pack of gully explanations.

The idea’s prominence doesn’t necessarily make it a winner, however. Researchers are welcoming the new entry but, given the difficulties of interpreting planetary remote sensing, they’re stopping far short of declaring it the answer. “It’s probably more plausible than anything I’ve seen so far,” says Mars geologist Michael Carr of the U.S. Geological Survey in Menlo Park, California, “but no one’s come up with a really plausible way of making these gullies. They’re a puzzle.”

Christensen pieced together his model for gully formation from ideas that go back as much as 30 years. His inspiration was in the images returned by the camera he operates on the orbiting Mars Odyssey spacecraft. It has a unique combination of capabilities: sufficient resolution to make out gullies, but enough breadth of view to include their surrounding terrain. In these just-right images, Christensen could see that gullies at various stages of development are closely associated with patches of “pasted-on” or mantling material first seen in the early 1970s and now thought to be in ice or even mostly ice. Some gullies run beside these snow patches or seemingly begin to form in them, suggesting to Christensen that one feature may have caused the other.

In Christensen’s scenario, snow fell on the martian midlatitudes tens of thousands of years ago, when the increased tilt of the planet made water likely to sublimate from polar ice and fall as snow at lower latitudes. When Mars again became more upright, more sunlight fell on the snowfields, penetrating just beneath the surface, and warmed the ice there past the melting point. The dust-tinged snow acted like a greenhouse, letting in sunlight but holding in the heat. The resulting meltwater eventually worked its way down to erode the loose soil on any steep slope beneath, while the snow protected the water from evaporation. Where the snow is now gone, gullies show up. Beneath remaining patches of dirty snow, liquid water—and, conceivably, ice-loving algae—may remain.

The snow-patch model has plenty of competitors, such as water gushing from ice-sealed aquifers, brine seepage, and carbon dioxide bursting from dry ice in the rock, among others (Science, 22 June 2001, p. 2241). Christensen sees a clear advantage in snow patches being able to both promote melting and protect the liquid water as it erodes. Such snow patches would also work on the central peaks of impact craters, he notes, where gullies are seen but aquifers are unlikely.

Planetary scientists concede that Christensen’s snow patches have some advantages, at least compared to the alternatives. “We’re finding that some models work a little better than others,” says Michael Mellon of the University of Colorado, Boulder, “but none of them works well,” including his own, which involves seepage from an aquifer.

A particular concern with Christensen’s model is just how much meltwater would be produced. It might be “really difficult to get things to melt and produce runoff under current atmospheric conditions,” says Gary Clow of the U.S. Geological Survey in Denver. He did the melting calculations published in 1987 that Christensen depends on. “Everything had to be just right,” Clow adds. Even so, “it’s an interesting idea that’s worth pursuing,” says Mellon. But until a clear winner emerges, “I don’t know if we need to have more press conferences.”

—JEFFREY MERVIS

LABOR UNREST

Yale Grad Students Prepare to Strike

Chronic labor problems at Yale University have taken a turn for the worse in a dispute that revolves around a decade-long attempt to organize more than 2000 graduate students.

Last week, the Graduate Employees and Students Organization (GESO) at Yale voted 482 to 141 to join two recognized unions representing support staff in a strike unless school administrators by 3 March “agree to a fair negotiating process” over the right to unionize. About 30% of GESO members are pursuing degrees in the life and physical sciences, a larger share than in most graduate-level labor organizations. Student organizers have vowed to stay out of their labs and classrooms for 5 days, forgoing their duties as research and teaching assistants in hundreds of undergraduate courses. “We deserve a say in our working conditions,” says GESO activist Maris Zivarts, a doctoral student in molecular biology.

Labor relations are sufficiently sensitive at Yale to warrant a prominent link on the home page of its office of public affairs. In 1996, the two unions representing support staff struck for 4 weeks before winning their current contracts, which expired at the end of February. Although 27 U.S. universities bargain with unions representing graduate students, Yale president Richard Levin has declared repeatedly that “the unionization of graduate students would not be in the best interest of the students” or the Yale community. Yale has said it would not recognize a graduate student union, and GESO has not pushed for a federally supervised election on the issue.

GESO plans to set up picket lines and hold teach-ins during the strike, set for a week before spring break. Yale’s administration has urged faculty members to maintain normal class schedules and to pick up the slack left by absent teaching assistants, although dining hall services have been cancelled. “Many graduate students will continue what they’re doing,” deputy provost Charles Long predicted to the Yale Daily News. “I don’t expect classes will be very disrupted.”

—RICHARD A. KERR