tist Steve Squyres of Cornell University and his colleagues unveiled the images, taken with the rover Opportunity, at a March 23 NASA press briefing.

The surface of the region explored by Opportunity is bone-dry. But detailed images that the rover has taken of a shallow crater, dubbed Eagle, indicate that an outcrop of rocks there was laid down by a briny body of flowing water. Opportunity landed on Jan. 25 in the crater, which is part of an equatorial plain called Meridiani Planum.

"We think Opportunity is parked on what was once the shoreline of a salty sea," says Squyres.

The rover's magnifying lens shows that rocks in the outcrop contain fine, rippled layers that are at various angles rather than in orderly, parallel rows. The layers can best be explained as having been caused by ripples of water flowing above a sandy surface, says rover scientist John Grotzinger of the Massachusetts Institute of Technology.

He estimates that the water was at least 5 centimeters deep and gently flowed at 10 cm to 50 cm per second. There's no indication yet of how long the body of water persisted.

The new findings enlarge the water story that made a splash 3 weeks ago (*SN: 3/6/04, p. 147*). Scientists then announced that data gathered by Opportunity showed that rocks in Eagle had at one time been soaked by water, leaving behind a residue of sulfate minerals and BB-size particles.

The evidence announced this week suggests that the rocks were not only chemically altered by water seeping through them but had been deposited by a persistent, standing body of water.

"These Mars sedimentary structures look just like what we see on Earth," says Dave Rubin of the U.S. Geological Survey in Santa Cruz, Calif. Rubin is a member of an independent team of scientists that reviewed the findings.

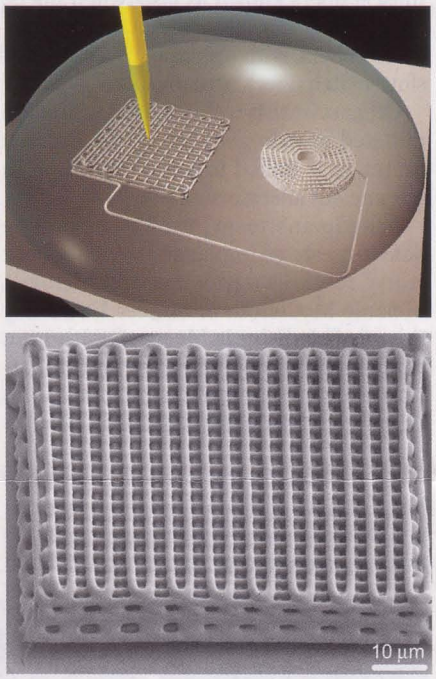
If these Mars rocks are, in fact, just like those on Earth, they would be well suited to preserve remains of organisms, says James B. Garvin, lead scientist for Mars exploration at NASA headquarters in Washington, D.C. Opportunity isn't equipped to search for fossils, but a mission planned for launch early next decade is intended to collect samples and return them to Earth.

Opportunity is now headed for another crater, named Endurance, which lies 700 meters away from Eagle. Rover images taken at a distance suggest that Endurance may also contain sedimentary rocks. If close-up images corroborate this, it would provide an indication of how extensive the ancient Martian water was. —R. COWEN

Miniaturized 3-D Printing

New polymer ink writes tiny structures

A printing technique emulating the way spiders spin silk generates polymer microstructures a hundredth the size of those produced by existing three-dimensional printing technologies. The new fabrication scheme could prove to be a cheaper and more flexible route to building miniature constructions, including scaffolds for growing replacement tissues and photonic crystals for optical computing.



FIT TO PRINT A micronozzle secretes a stream of liquid polymers into a reservoir (top). As the computer-controlled nozzle moves across the surface, polymer streams coagulate into a three-dimensional structure (bottom).

Using a printer to create 3-D structures layer by layer isn't new. Designers have done it for years in the production of prototype machine parts. However, printing structures with features on the scale of microns or smaller has been a challenge. Researchers have used light to etch such features onto polymer wafers, but that approach is costly and can't build 3-D structures.

The new technique, developed by Jennifer Lewis and her colleagues at the University of Illinois at Urbana-Champaign, overcomes those barriers. For inspiration, the Illinois team examined how spiders spin microfibers of silk. Spinneret organs on the animals' abdomens extrude a solution of proteins that solidify as silk outside the spider.

The researchers designed a new kind of ink consisting of one negatively charged polymer and one positively charged polymer. In spiderlike fashion, a syringe loaded with the liquid polymers squirts out thin streams of the mixture.

To form filaments, however, the syringe must extrude the ink into a liquid reservoir—in particular, a dime-size drop of alcohol and water on a glass slide—rather than onto a dry surface. Because the ink is insoluble in the reservoir, the oppositely charged polymers bind to each other, causing the ink to coagulate. A robotic arm moves the syringe across the glass surface, depositing sequential layers of filaments in a specified pattern within the alcohol drop, ultimately generating a 3-D structure.

By varying the width of the syringe's nozzle, the researchers can control the diameter of the polymer filaments. In the March 25 *Nature*, the researchers report that they've printed filaments 1 micron in diameter. Team member Gregory Gratson says his lab has since fabricated even smaller filaments, measuring only 0.5 micron, or 500 nanometers, wide. A typical strand of hair spans about 75 microns.

"What I like about this technique is its incredible simplicity," says applied physicist David Weitz of Harvard University. Researchers can program the printing system to build any kind of structure. For instance, the Illinois scientists say they might be able to print biodegradable and biocompatible scaffolds for growing new tissues for surgical procedures.

Right now, the team is using the printer to make photonic crystals, which can manipulate light on a small scale and potentially serve as optical computer chips or lasers. The idea is to print 3-D polymer structures and use them as molds. Filling in the mold's pores with silicon or selenium and then removing the polymer will yield a photonic crystal, says Gratson. —A. GOHO

Surgical Option

Hysterectomy may top drugs for women with heavy bleeding

Women who chronically have heavy menstrual periods face a difficult choice. Many cases of abnormal bleeding stem from a hormone imbalance, and drugs containing progesterone and estrogen often alleviate the problem. Medications don't always work, however. Another option is a hysterectomy, or removal of the uterus, which stops menstrual bleeding. But it is major surgery and

LEWIS