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chains, a finding that supports a biogenic origin for the mineral.

Using different radioactive dating techniques, two independent research groups disagree on when ALH84001 acquired its carbonates. One team suggests that the carbonates were deposited some 3.6 billion years ago, when researchers believe Mars had an abundant supply of water. Another estimates that they were inserted about 1.4 billion years ago, by which time Mars' water supply might have dwindled.

The time of carbonate deposition remains an open question, but McSween notes that the more recent age is consistent with his team's experiments, reported in the July 4 NATURE, indicating that the material derived from a hot vapor rather than liquid water. That scenario severely weakens the case for a biological origin of the carbonates, he notes.

Not necessarily, contends Kathie L. Thomas-Keprta of Lockheed Martin in Houston, a coauthor of the initial meteorite study. She says the composition of the carbonates varies throughout the tiny samples of ALH84001 the team examined, with bands of calcium-rich carbonates adjacent to calcium-poor ones, for example. That distribution argues for low-temperature deposition, she contends. A high-temperature process would be more likely to generate a uniform globule.

The temperature at which the carbonates formed does not dictate whether the rocks ever housed life, says Craig S. Schwandt of JSC. However they formed, he argues, the carbonates in the rock may have created a haven for primitive bacteria that arrived later. Carbonates regulate pH and could act as a buffer zone inside a rock that might otherwise be inhospitable to life. Schwandt proposes that the carbonates formed first, laying down a niche for mineral-producing bacteria that later colonized the margins of the globules.

Jeffrey L. Bada of the Scripps Institution of Oceanography in La Jolla, Calif., says he's all but convinced that cell walls and other biological artifacts, if found, come from meltwater that passed through the meteorite during its 13,000-year sojourn in the Antarctic. The meltwater, he notes, contains PAHs whose molecular weights are the same as those found in the Martian rock.

Bada and his colleagues melted blocks of Antarctic ice and inserted solid carbonates into the solution. The next day, they found the carbonates heavily contaminated by PAHs from the water. It's long been known that carbonates scavenge PAHs, he explains, and the experiment demonstrates that the PAHs found in the Martian rock could have come from Antarctica. "This rock has been on Earth for too darn long" for contamination not to be a major problem, he concludes.

Simon J. Clemett of Stanford University and his colleague are less worried about contamination. They examined a large supply of micrometeorites from the same Antarctic ice field as ALH84001. Because these tiny rocks have a much larger surface-to-volume area, they would seem to be more susceptible to contamination, yet all of the rocks had different distributions of PAHs. Had contamination been significant, the rocks should all have had the same PAH distribution, the researchers say.

Whatever the outcome of the debate over ALH84001, the potato-shaped rock from Mars may become an icon for the ages, says astrophysicist Richard Berendzen of American University in Washington, D.C. In exploring the possibility of life on the Red Planet, he says, "We'll find our destiny. We'll find our future. We'll find ourselves." □

Materials Science

Corinna Wu reports from Boston at the Materials Research Society meeting

Biological glue for cartilage . . .

To help damaged cartilage heal, scientists are developing implants on which cartilage cells can grow. These cellular scaffolds, however, must be held firmly in place at the site of the injury. Julia J. Hwang of the University of Illinois at Urbana-Champaign and her colleagues are synthesizing a biodegradable glue that may do the job.

The glue consists of long, hybrid molecules that stick to cartilage on one end and the implant on the other. "They contain units of lactic acid, which preferentially absorb onto the [implant] surfaces," Hwang says.

The molecules also link with each other, enhancing the glue's strength. The cartilage scaffolding must be precisely cut before it is implanted because "the shape has to be a very good fit to get tight adhesion," says Anna Gutowska of the Pacific Northwest National Laboratory in Richland, Wash.

. . . and for corneas

Fibrin glue, made from a blood-clotting substance, can seal tissues together, eliminating the need to suture a wound. The glue is commonly used after surgery on the cornea, says Russell T. Kronengold of the Robert Wood Johnson Medical School in Piscataway, N.J., "because suturing can lead to astigmatism." Although it is biologically compatible, fibrin glue is not very strong, he notes. Kronengold and his colleagues have improved its strength 26 percent by mixing gelatin with the glue, making it nearly as strong as stitches.

In cataract surgery, ophthalmologists usually leave the cuts in the cornea to seal themselves. However, in automated lamellar keratoplasty, a procedure that corrects near-sightedness, the loose flaps of the cornea sometimes shift around, leading to complications. Scanning electron micrographs show that the modified fibrin glue can seal those wounds effectively.

Aerogel films as electronic insulators

As computer chips get smaller, the need for high-quality component materials grows larger. One of the latest prospects is nanoporous silica, a whisper-light gel that's an exceptionally good electrical insulator. Douglas M. Smith, president of NanoPore in Albuquerque, N.M., reports a simplified method that deposits thin films of this material and enables researchers to control both the thickness and the porosity of the films.

For years, nanoporous silica has been used as bulk thermal insulation in refrigerators and for other industrial applications in a form called an aerogel. Because it contains an abundance of air-filled pores, many only 20 or 30 nanometers in diameter, the gel effectively blocks the transfer of heat.

The pores also make the gel almost as good an electrical insulator as air. The gel could shield chip components from each other to prevent cross talk—interference that becomes increasingly troublesome as the components of electronic devices are crammed closer together. Use of nanoporous silica could also allow chips to run faster, says Changming Jin of Texas Instruments in Dallas. Jin presented his group's research on characterizing the deposited films and making them water repellent.

Unlike silica gels used for thermal insulation, gels for computer chips must be able to dissipate heat rapidly. "As you shrink the device size, the metal mass gets smaller and smaller," Jin says, "but it's going to pass the same current." The increased current density generates more heat, which can damage the electronic components.

To improve heat conduction, Jin and his colleagues are testing denser gels, which have about 75 percent of the gel volume filled with air. Silica gels used for thermal insulation typically have porosities of 95 to 99 percent, he says.