

Astronomy

From a meeting in Houston of the annual Lunar and Planetary Science Conference

Callisto conundrum

When the Voyager spacecraft flew past Jupiter's icy moon Callisto 18 years ago, it discovered a battered world, riddled with overlapping craters and huge basins. Although those images didn't show much detail, they suggested strongly that Callisto was as pockmarked as our own moon.

Last December, when the Galileo spacecraft began sending close-up pictures of selected areas on Callisto, the outermost of Jupiter's four large satellites, some planetary scientists had a rude awakening. The high-resolution Galileo images show that although the moon indeed has plenty of large craters, it possesses surprisingly few smaller than 100 meters in diameter.

That's a conundrum, says Clark R. Chapman of the Southwest Research Institute in Boulder, Colo., because bombardment by asteroids and comets would have produced craters of all sizes. Moreover, Callisto, like Earth's moon, is thought to have been geologically dead for more than 3 billion years. Both moons lack current volcanic activity, for example, which might have erased craters.

"Apparently, giant craters last throughout Callisto's history, but building-size things are continuously destroyed in just tens of millions of years," Chapman says.

On other planetary bodies, "it's fairly clear what causes a crater to disappear. Another crater might lie on top of it, or a volcanic event or [eruption of ice] on the surface will flood it," he notes. On Callisto, in contrast, "craters . . . are kind of falling apart in place. It's as though material is coming unglued, disintegrating like a dirty snowbank in Boston in the spring."

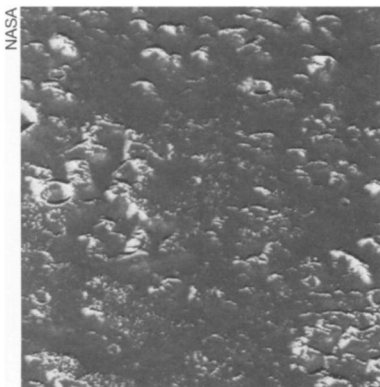
Not only does it seem that small craters are falling apart, but some mysterious process has apparently moved the debris over distances of several kilometers, blanketing and smoothing over other pockmarked features on the surface, Chapman adds. None of the other icy Jovian moons shows such a pattern.

The debris isn't simply rolling downhill, because the smoothed regions do not lie at the bottom of slopes. In addition, Callisto has neither an atmosphere to blow the debris about nor liquid water on its surface to foster migration.

Jeffrey M. Moore of NASA's Ames Research Center in Mountain View, Calif., and his colleagues propose that debris from some of the craters disintegrates as ices evaporate and then develops an electric charge. The charged dust particles repel one another and rise above the surface, traveling a significant distance before settling back down, they suggest. Planetary scientists have found evidence of electrostatic levitation on the moon and on asteroids, Moore notes.

One caveat, notes Chapman, is that Galileo has so far revealed only a few small patches of Callisto at high resolution. It's possible that other parts of Callisto show a more heavily cratered facade, he notes.

"It's embarrassing that we don't have better answers, but it's only been less than a year that we've had this [high-resolution] data to look at," says Galileo scientist Torrence V. Johnson of NASA's Jet Propulsion Laboratory in Pasadena, Calif. The craft's Jovian tour, which began in December 1995, had been scheduled to end this December, but NASA recently extended the mission for 2 years. — R.C.



Galileo image shows that Callisto's Valhalla impact region, about 11 kilometers wide, is curiously devoid of small craters.

Biomedicine

Study casts doubt on breast self-exam

Women who want to detect a breast cancer at an early, and thus most curable, stage are often advised to do a regular examination of their breasts. That advice seems like common sense. But do women who regularly examine their breasts detect more malignant breast tumors than women who do not? A new study suggests the answer may be no.

David B. Thomas of the Fred Hutchinson Cancer Research Center in Seattle and his colleagues, including a Chinese team, studied 267,040 women who work in Shanghai textile factories. Half received intensive training on how to do a breast self-exam, and the other half formed a control group that attended training sessions on how to prevent back pain.

For several years, the researchers noted how many participants developed breast cancer. They discovered that malignant tumors were detected at the same rate in the control group as in the self-exam group, although the women doing self-exams turned up more benign tumors. The team details its findings in the March 5 *JOURNAL OF THE NATIONAL CANCER INSTITUTE*.

The findings suggest that breast self-exam won't reduce the number of women dying from breast cancer. However, the researchers must continue their study for another 5 years in order to prove—or disprove—that conclusion, Thomas says.

Women who regularly examine their own breasts and don't find lumps shouldn't be lulled into a "false sense of security," Thomas says. On the other hand, because the research can't provide a definitive answer on breast self-exams, he doesn't want to discourage women from this practice. Neither does the Atlanta-based American Cancer Society, which still advises breast self-exams as a prudent course of action.

From a public health perspective, the only screening measure generally recognized to reduce the breast cancer death toll is mammography in women age 50 and older, Thomas says.

For everyone else, the science of breast cancer prevention remains murky. For now, women under 50 must make decisions based on incomplete data. "I tell people, you just have to learn to live with uncertainty," Thomas says. — K.F.

A complicating view of breast implants

Although fears about breast implants have focused on autoimmune disease, scientists have yet to prove a link between an autoimmune syndrome and the implants. A new study now takes a different tack, showing that one-quarter of women who get implants will develop other significant medical problems.

Sherine E. Gabriel of the Mayo Clinic in Rochester, Minn., and her colleagues studied 749 women who had received a silicone or saline breast implant between 1964 and 1991.

The team discovered that 5 years after the procedure, 178 of the women had developed at least one complication that required a surgical follow-up. The most frequent problem was capsular contraction, a painful condition in which scar tissue forms around the implant, sometimes distorting the shape of the breast. The report in the March 6 *NEW ENGLAND JOURNAL OF MEDICINE* notes that 131 women had an operation to remove such disfiguring scar tissue. The researchers also found that 43 women had experienced a ruptured implant. Other problems included blood blisters and infection, the team noted.

Women who had implants for cosmetic reasons reported fewer such problems than women who got the implants to reconstruct a breast after a mastectomy.

The study applies to both silicone and saline implants. In 1992, the Food and Drug Administration banned the use of silicone implants in cosmetic surgery, but some breast cancer patients still receive silicone implants as part of research studies.

An accompanying editorial by Stephen J. Mathes of the University of California, San Francisco points out that most women who get breast implants are satisfied with the result. — K.F.