Astronomy

From Houston at the annual Lunar and Planetary Science Conference

Biology on Europa

New close-up images of Jupiter's moon Europa show a mesmerizing array of fine-scale ridges, cracks, and faults on the icy surface. Taken by the Galileo spacecraft and due to be released April 9, the pictures confirm previous findings that blocks of ice on Europa have moved and rotated, as if they had slipped across an underlying layer of warm ice or water.

This evidence suggests that Europa's surface was once—and may still be—thin and easily deformable, says Robert T. Pappalardo of Brown University in Providence, R.I. Beneath this crust, "there just about had to have been an ocean," he says.

Assuming that Europa still has a subsurface ocean, Jonathan I. Lunine and Ralph D. Lorenz of the University of Arizona in Tucson have calculated the effect of sunlight shining through cracks in the ice. These cracks fill so slowly, they find, that enough light can penetrate to the top of the water layer to produce prebiotic, complex organic compounds.

The team notes that Jupiter's gravity causes Europa to flex, generating heat within the moon and perhaps melting enough ice to form an ocean. The same heat may prevent ice from filling in surface cracks for several hundred years. Although photosynthesis can't occur if the ice layer exceeds 80 meters, organic molecules can form beneath even thicker layers of ice, where there is less light. Water or ice erupting through the cracks may fall back down as snow, which blocks more sunlight than ice does. Snow also acts as an insulator, however, and might keep the ice from thickening near cracks, Lunine notes.

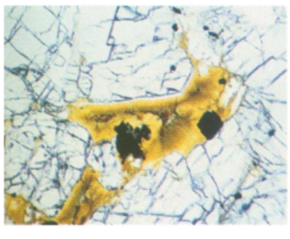
On Earth, some organisms flourish at the seafloor, near the blasts of heat vented by underwater volcanoes. Although gravitational flexing on Europa may create similar subocean volcanoes, some researchers doubt that complex biological compounds could form in the presence of such high heat. Therefore, if organic compounds exist in the upper reaches of a Europan ocean, Lunine says, they would play a crucial role in fostering life on this distant moon. —*R.C.*

Recent water on Mars?

In 1931, a scientist happened on a rock languishing in a desk drawer in the geology department at Purdue University in West Lafayette, Ind. The rock, ultimately found to hail from Mars, now has another claim to fame. Scientists say the age and composition of certain parts of this so-called Lafayette meteorite hint that water flowed at or near the surface of the Red Planet as recently as 700 million years ago.

The meteorite, say Timothy D. Swindle of the University of Arizona in Tucson and his colleagues, contains an abundance of iddingsite, a mixture of clays and iron oxides that forms only in the presence of water. Analyzing 10 samples of the meteorite by radioactive dating, the team found that the iddingsite formed between 274 and 655 million years ago. Those ages prove that the mixture formed before the rock left Mars, since they far exceed the time the meteorite has spent on Earth and in traveling to the planet. The team details its analysis in an upcoming JOURNAL OF GEOPHYSICAL RESEARCH-PLANETS.

The researchers had previously shown that the iddingsite contains substantial amounts of xenon and krypton, elements likely to have been captured from the Martian atmosphere. Their presence suggests that the water that formed the iddingsite was at or near the surface. If near-surface water existed on Mars less than 1 billion years ago, then life may have persisted on the Red Planet for a lot longer than researchers have suspected, Swindle says. —*R.C.*



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Iddingsite (orange-brown) in the Lafayette meteorite.

Biology

Algal origins of a protozoan part

In the microbiological world, small cells engulfed by big cells have sometimes evolved into essential cell parts. That endosymbiotic scenario was the likely origin of the energy-generating organelles known as mitochondria in human cells. Similarly, the chlorophyll-containing chloroplasts of plant cells were once free-living photosynthesizers. Algal cells, too, have engulfed and incorporated other algae (SN: 3/16/91, p. 164). Now comes another variation on that cell-swallowing theme: an organelle in protozoans that seems to have come from an algal cell.

The organelle contains DNA that resembles the genetic material from green algae chloroplasts, report Sabine Köhler and David S. Roos of the University of Pennsylvania in Philadelphia and their colleagues in the March 7 SCIENCE. In addition, four cell membranes surround the DNA like nested Russian dolls. These membranes are probably remnants of the series of evolutionary gulps that landed the DNA inside an alga that eventually ended up in the single-celled protozoans.

"It's a wonderful finding," says Lynn Margulis, a biologist at the University of Massachusetts at Amherst and a key proponent of endosymbiotic theory.

Besides bolstering the theory that endosymbiotic events were common in evolutionary history, the finding may have medicinal value: The protozoans belong to the group Apicomplexa, which includes the organisms responsible for malaria and toxoplasmosis. The ex-algal organelle may provide a unique DNA target for drug development. —*C.M.*

Away from the wolf, into the falcon

In Brazil's Emas National Park, the maned wolf prowls the savannas and grasslands for birds and other small game. Overhead, the aplomado falcon searches for some of the same prey. Leandro Silveira and other park researchers noticed that the falcon often trails the wolf on its hunts, nabbing about 25 percent of the prey that gets away from the wolf. The researchers report their observation in the recently released February issue of THE CONDOR.

Bob Hines/Fish & Wildlife Serv.

The aplomado falcon is common in central Brazil's parkland but is usually seen only in captivity in the United States. It has been eliminated from its range in the U.S. Southwest.

The birds' association with wolves is new to researchers but not too surprising, says Stanley A. Temple, a falconer and wildlife ecologist at the University of Wisconsin-Madison. Other hunting associations exist between birds and monkeys, even sea birds and dolphins. "Birds of prey learn very quickly that other animals can flush prey for them," says Temple. Even human hunters can provide a tip-off, he adds. —*C.M.*

The early born bird catches the hormone

More fuel for sibling feuds: Cattle egret mothers seem to deposit an extra dose of male hormones into the eggs that are laid first, possibly giving these chicks an aggressive edge over younger siblings when begging for food. In the March 20 NATURE, Douglas W. Mock of the University of Oklahoma in Norman and his colleagues conclude from studies of eight different egg clutches "that hormonal favouritism may be a common mechanism for bird mothers to influence sibling competitiveness." First-born favoritism isn't universal, however, even in the bird world. Earlier work has shown that canary mothers give the hormonal dose to later-laid eggs. —*C.M.*