Astronomy

Europa's salty surface

Evidence that Jupiter's moon Europa recently had and may still contain an ocean beneath its frozen facade continues to trickle in. Analyzing sunlight reflected from Europa, the Galileo spacecraft has found the chemical signature of what appear to be crystals of magnesium sulfate. On Earth, this salt is often found as a residue in dry lake beds and other places where brine has evaporated.

The places on Europa with the highest concentrations of magnesium sulfate are dark and display linear features that could be cracks or fissures, reports Thomas B. McCord of the University of Hawaii in Honolulu. Other researchers have speculated that these features are areas where an underground reservoir of water has seeped or erupted. If a briny ocean did penetrate the surface, it would evaporate immediately into the vacuum of space and could leave behind crystals of magnesium sulfate, he notes.

Robert T. Pappalardo of Brown University in Providence, R.I., suggests that warm ice coming into contact with a churning ocean could also have carried magnesium sulfate to the surface. If scientists can determine how long the sulfate survives on Europa's surface—the moon is bombarded with energetic particles from Jupiter's magnetosphere that could erode the compound—they may gain another clue to how recently an ocean would have had to have existed, he adds.

McCord and his colleagues, including University of Hawaii planetary scientists Gary B. Hansen and Frazier P. Fanale, base their findings on data gathered by Galileo's near-infrared mapping spectrometer during several passes by Europa. The infrared spectra also show that the moon's surface contains a significant supply of organic compounds, including carbon dioxide. Both water and organic compounds are considered necessary for life as it exists on Earth (SN: 11/1/97, p. 284).

The researchers reported their results last month at a meeting of the American Geophysical Union in San Francisco. —*R.C.*

Fossils from Mars: Point, counterpoint

The debate goes on. Researchers haven't stopped arguing about whether the Martian meteorite ALH84001 contains fossils of primitive life. In the Dec. 4, 1997 NATURE, two groups—scientists on the discovery team and members of a team that has criticized their findings—duke it out.

For more than a year, the naysayers have maintained that wormlike features found within the Mars rock are not fossils of tiny bacteria (SN: 12/14/96, p. 380). However, these critics did not use the same electron microscopy technique to study the rock as the researchers who announced the initial findings.

Now they have, and they contend that the purported fossils are merely the fractured surfaces of pyroxene and carbonate crystals. These artifacts have no biological origin, assert John P. Bradley of MVA in Norcross, Ga., and the Georgia Institute of Technology in Atlanta, Ralph P. Harvey of Case Western Reserve University in Cleveland, and Harry Y. McSween Jr. of the University of Tennessee in Knoxville.

Members of the discovery team agree that the microstructures examined by Bradley and his colleagues are not fossils. Indeed, they maintain that they long ago discounted similar artifacts in their own samples.

"I don't know how else to put this, but we're not stupid," says Kathie Thomas-Keprta, a Lockheed Martin researcher based at NASA's Johnson Space Center in Houston.

She and her collaborators note that the features which might represent tiny fossils occur in greater numbers, are significantly larger, and display a wider variety of orientations than the tiny crystals do. Moreover, they add, some of the possible fossils have an ovoid shape rather than the wormlike appearance of the disputed features. —*R.C.*

Behavior

Evolution of attention

Many scientists assume that attention deficit–hyperactivity disorder (ADHD) stems from a poorly understood brain malfunction. As many as 1 in 20 school-age children are estimated to have the disorder, which includes a limited attention span, constant fidgeting and moving about, and frequent impulsive and disruptive acts.

In some cases, however, these symptoms may represent biologically based traits that served people well in prehistoric environments, even if such propensities wreak havoc in today's schools, proposes a research team headed by Peter S. Jensen, a psychiatrist at the National Institute of Mental Health in Rockville, Md. Traits linked to the disorder probably exist in different combinations and varying magnitudes throughout the general population, Jensen and his colleagues theorize.

In the dangerous, food-scarce environments in which hunter-gatherers frequently lived, a hyperactive, get-up-and-go attitude in some folks would have fostered effective exploration of potential threats and opportunities, the scientists contend. In the same contexts, rapidly shifting attention and impulsive, hair-trigger responses would have helped in locating threats and defending against them.

As a result of innate temperament combined with childhood experiences, such as growing up in impoverished or abusive families, some modern youngsters may approach the world in a response-ready mode characterized by ADHD symptoms, Jensen's group suggests in the December 1997 JOURNAL OF THE AMERICAN ACADEMY OF CHILD AND ADOLESCENT PSYCHIATRY. Other children grow up in safer, more relaxed environments that encourage the contemplative style cherished in many classrooms and workplaces, the researchers add.

Extensive childhood exposure to television and video games may promote development of brain systems that scan and shift attention at the expense of those that focus attention, according to Jensen and his coworkers.

Educational strategies or even separate classes tailored to response-ready children may make a difference, the scientists suggest. For example, some kids with ADHD do well in small classes that stress hands-on learning projects, especially if the youngsters relate well to their teacher. Still, in the researchers' view, medication may be the only available or most effective way to calm and focus some children.

"Rethinking [mental disorders] along developmental and evolutionary lines is clearly a step in the right direction," writes psychiatrist James F. Leckman of the Yale University School of Medicine in an accompanying comment. This approach may encourage researchers to examine the benefits of ADHD traits, Leckman says. For instance, hyperactivity and rapid responses may aid business entrepreneurs (SN: 7/31/93, p. 70). —*B.B.*

Magnetic mood brightener

Magnetic stimulation of the brain shows promise as a treatment for depression, a pilot study finds.

A team headed by Mark S. George, a psychiatrist at the Medical University of South Carolina in Charleston, administered transcranial magnetic stimulation for 10 days over a 2-week period to 12 adults suffering from major depression or manic depression. An electromagnet placed over the scalp delivered pulses to the front of the brain's left side, possibly halting neural communication in that area temporarily. The volunteers were assigned at random to receive either the active treatment or stimulation that did not reach the brain.

Only the transcranial procedure markedly lifted mood, George's group reports in the December 1997 AMERICAN JOURNAL OF PSYCHIATRY. If longer trials confirm this effect and illuminate how the technique works, it may provide an alternative to antidepressant drugs, the scientists say. —*B.B.*