Arctic fossils record evolutionary burst

Working near the northern limit of land, on Canada's remote Victoria Island, scientists have unearthed a mother lode of microscopic fossils, chronicling an evolutionary explosion among complex cells more than 800 million years ago.

"This is a case of exceptional fossil preservation. We're seeing an awful lot more [species] than people have seen in similarly aged deposits," says Nicholas J. Butterfield of the University of Cambridge in England, who studied the Arctic rocks along with Robert H. Rainbird of the Geological Survey of Canada in Ontario.

Some of the fossils from Victoria Island are bacteria, but many represent larger, eukaryotic cells—the branch on the tree of life that harbors all animals, plants, fungi, and a vast microcosm of single-celled protists including amoebas and paramecia. Like most fossils of early eukaryotes, the Victoria Island forms are so simple that they cannot be assigned to any modern group. Paleontologists call these acritarchs, a catch-all category of unicellular eukaryotic fossils.

Though the researchers cannot unequivocally identify what the original organisms were, the diversity of the acritarchs is startling, says Butterfield, who discussed the discovery in the November GEOLOGY and in Toronto last week at a meeting of the Geological Society of America. The researchers found 30 acritarch species, 13 of which had never been seen before.

Butterfield and Rainbird propose that some of the new acritarchs closely resemble modern eukaryotes called dinoflagellates, which account for much of the photosynthesis in the oceans and thus provide food for larger creatures.

Some modern dinoflagellates survive winter by producing tough-walled cysts that drop to the ocean floor in the cold months and then crack open when the cells are ready to resume growing. Geologists have identified fossils of these cysts only as far back as the Silurian period, roughly 420 million years ago.

Butterfield and Rainbird suggest that this record stretches at least twice that long. Some of the Victoria Island acritarchs, they say, have jagged, polygonal edges, a pattern characteristic of dinoflagellate cysts that have broken open. Despite the similarity, Butterfield and Rainbird say they cannot firmly identify the acritarchs because the fossils lack key features seen on many, but not all, dinoflagellates.

The Victoria Island discovery supports chemical studies of rocks that have found molecular indications of dinoflagellates at least as far back as 850 million years ago, says Roger Summons of the Australian Geological Survey Organisation in Canberra. He and other paleontologists have suspected for some time that a fraction of the known acritarch species represent predecessors of modern dinoflagellates.

Regardless of the acritarchs' affinities, however, the number and complexity of species found on Victoria Island indicate that eukaryotes were passing through a critical evolutionary period at that time, says Butterfield.

"All of this means something. There's a huge amount of diversity in the environment at this time," says Butterfield. It suggests that eukaryotes were rapidly evolving in the face of some new ecological pressure, and one candidate is the appearance of the earliest animals, which could have been grazing on the plentiful organisms, he suggests. Traces of animals don't appear in the fossil record until less than 600 million years ago, but scientists are currently debating whether animals split off from other eukaryotes far earlier in time. *—R. Monastersky*

A 180-micron fossil from arctic Canada.

Theft-stoppers jam pacemakers, shockers

Antitheft detectors in retail stores and elsewhere require patrons to pass through a portal that scans them with a magnetic field in search of stolen goods. New medical findings indicate that certain heart patients who linger near such portals may place themselves in harm's way. The reports find that the scanners' magnetic fields can interfere with implanted electronic devices, such as pacemakers and defibrillators, that control heartbeats.

Heart specialists, including the authors of the new reports, say that the consequences of interference can be life-threatening. However, disruptions occur so rarely and are so easily corrected by simply moving away from the portals that the likelihood of harm is very low. The specialists urge people with implanted heart controllers to walk normally through the scanning gates and then to move promptly away from the instruments.

In a laboratory study described in the October PACING AND CLINICAL ELECTROPHYSIOLOGY, researchers at the Heart Institute of St. Petersburg, Fla., tested the three types of antitheft portals commonly used in the United States. They report that the newest and fastest-growing version of the technology, known as acoustomagnetic surveillance, temporarily affected the functioning of pacemakers in 48 of 50 subjects tested. The other two classes of instruments had little or no effect.

None of the technologies disrupted defibrillators in 25 other volunteers. Implanted defibrillators monitor the heart for a potentially fatal, disorderly quivering known as ventricular fibrillation. They then correct it by delivering electric shocks to the organ.

Because acoustomagnetic detectors are effective over greater distances than competing devices and will work even if concealed, users of the systems are increasingly installing them out of sight in walls, ceilings, and floors. "I think there should be advisory signs," says cardiologist Michael E. McIvor, leader of the study.

Representatives of Sensormatic Electronics Corp. in Boca Raton, Fla., the sole manufacturer of the acoustomagnetic gates, dismiss the St. Petersburg group's results as no news at all. They say the potential for interference has been known, but extremely rarely seen, in the decade since acoustomagnetic scanners were introduced. In instruction manuals given to patients and doctors, defibrillator and pacemaker manufacturers have for years included warnings about lingering near antitheft scanners, they note. "This is a tempest in a teapot," says Douglas P. Zipes, chief of cardiology at the Indiana University School of Medicine in Indianapolis, who is conducting a Sensormatic-funded study of scanner impact on defibrillators.

Sensormatic's business rival, Checkpoint Systems in Thorofare, N.J., gave the lion's share of funding for the St. Petersburg study, but McIvor insists that his team maintained its independence and integrity. In an editorial accompanying the study, J. Warren Harthorne of Massachusetts General Hospital in Boston questions the medical significance of the study's results since "there are no reports in the real world of patient harm."

However, a pair of articles in the Nov. 5 NEW ENGLAND JOURNAL OF MEDICINE now documents real-life instances of the effects. McIvor coauthors one correspondence that describes a 30-year-old woman with a pacemaker who had palpitations, nausea, and other symptoms while passing through a store's acoustomagnetic antitheft gate. In the other report, a team at Rush-Presbyterian-St. Luke's Medical Center in Chicago describes a near-fatal episode in which a 72-year-old man's implanted defibrillator-pacemaker misfired under the influence of an acoustomagnetic portal and temporarily shut off his heart. *—P. Weiss*