Living Large on the Precambrian Planet

For the first 3 billion years of life on Earth, the forces of evolution worked their wonders on a small scale, producing microbes and algae of mostly microscopic dimensions. At the end of the so-called Precambrian time, life broke through the size barrier, giving rise to a group of large-bodied enigmas known as the Ediacaran biota.

Some paleontologists view these organisms as the first animals, while others see them as a separate form of life that died out, leaving no heirs in the modern world. Yet even as researchers struggle to understand them, new fossil discoveries indicate that the Ediacaran oddities inhabited the planet far longer than previously thought.

This week, Mark A.S. McMenamin of Mount Holyoke College in South Hadley, Mass., reports finding the oldest known collection of Ediacaran fossils. Unearthed in northern Mexico, the remains date to 600 million years ago, he announces in the May 14 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. "Prior to this find, the oldest Ediacaran fossils were 575 to 580 million years," he says.

Other discoveries announced last year have extended the Ediacaran reign forward in time, countering the idea that this group went extinct before modern animals appeared.

First discovered in Australia's Ediacara Hills in the 1940s, the fossils are simple shapes, typically discs or fronds up to a meter across. Paleontologists originally interpreted them as the earliest jellyfish, corals, and segmented worms—the progenitors of more complex animals.

Subsequent workers questioned these identifications, however. Many of the fossils have unusual, quiltlike textures and lack obvious mouths, digestive tracts, or anuses. Adolf Seilacher of Tübingen University in Germany proposed in 1983 that the fossils represent massive unicellular organisms whose bodies were fluid-filled compartments arranged like the cells of an air mattress (SN: 7/8/95, p. 28).

Until recently, paleontologists thought that the Ediacaran beings disappeared some tens of million of years before signs of complex, modern animals started appearing in the fossil record at the start of the Cambrian period, 543 million years ago. Last year, however, John P. Grotzinger of the Massachusetts Institute of Technology and his colleagues described Ediacaran fossils from Namibia that hail from right before the Cambrian. They reported their finds in the Oct. 27, 1995 SCIENCE.

A 6-centimeter disc-shaped fossil from Mexico.

While the Namibian fossils bring the Ediacaran organisms up to the start of the Cambrian, finds in Ireland suggest that this group survived even longer, until 510 million years ago. T. Peter Crimes of the University of Liverpool in England, who described the Irish fossils last year, says that researchers are now finding many examples of Ediacaran fossils in the Cambrian. "There was no mass extinction at the end of the Precambrian," he says.

The new finds have not lacked for controversy. McMenamin, in particular, has aroused criticism over his dating of the Mexican fossils. Because he has no absolute measure of the rocks' age, he has dated the fossils indirectly, by correlating the Mexican site with similar formations in North Carolina and elsewhere. In contrast, Grotzinger's group used the radioactive decay of uranium isotopes in volcanic rocks to date the Namibian fossils with extreme precision.

Joseph L. Kirschvink, a geobiologist at the California Institute of Technology in Pasadena, says that the Namibian dates are solid, but he questions the dating link between Mexico and North Carolina. "It makes me sweat a little bit to start pushing [these] correlations," he says. The Mexican finds could be much older or much younger than McMenamin has estimated, says Kirschvink.

McMenamin admits the current age is a rough estimate but claims that "one thing is certain: They are the oldest." He has collected volcanic rocks from the Mexican site and plans to get firmer dates by using radiometric techniques.

Although they broaden the time during which the Ediacaran organisms lived, the new fossils have not silenced debate about these beings, says Douglas H. Erwin of the National Museum of Natural History in Washington, D.C. "We now know when they lived, we just don't know what they were."— *R. Monastersky*

Antibiotics take a bite out of bad gums

Bleeding, receding gums may signal a serious disease that affects the roots of teeth and, if unchecked, can lead to tooth loss. To combat it, dentists scrape or plane away the root-level plaque and tartar caused by bacteria. In severe cases, oral surgeons make cuts at the gum line to improve access to affected roots—a procedure that can cost as much as $3,000.

Now, with treatments costing less than one-third of that, researchers at the University of Michigan School of Dentistry in Ann Arbor have successfully fought severe root-level bacterial infections with antibiotics, usually without surgery.

They treated 90 inner-city clinic patients who had advanced gum disease; in every case, other experienced periodontists had recommended surgery. After standard nonsurgical cleaning of tooth roots, all participants received drug capsules to be taken for 2 or 4 weeks, depending on the severity and extent of gum disease. The dentists followed up recalcitrant cases with as many as three rounds of topical antibiotics that they administered by temporarily gluing an experimental, drug-impregnated cellulose film to the root surface. Some patients received placebos during parts of the trial.

Using this antibiotic regimen, the researchers averted surgery or extraction for 690 of the 783 teeth initially deemed to need it. About 67 percent of the "hopeless teeth"—those identified by experienced specialists as being too far gone to save—no longer needed extraction or surgery, notes Walter J. Loesche, a leader of the study.

Overall, 81 percent of the patients avoided surgery, his team reports in the May JOURNAL OF ORAL SURGERY, ORAL MEDICINE, ORAL PATHOLOGY, ORAL RADIOLOGY, AND ENDODONTICS. "And ones who still needed it required a greatly reduced amount," Loesche says.

He says that future studies will attempt to identify the most effective dose of antibiotics and work toward Food and Drug Administration approval for the drug-impregnated films used in the topical treatments. — *J. Raloff*