Ancient alga fossil most complex yet

Trying to imagine what conditions must have been like when the earth formed 4.5 billion years ago and when life first appeared on earth some billion years later is an intriguing exercise. Some of the most ancient forms of life on earth—blue-green algae and bacteria—are still with us, preserved as fossils in rocks. Both blue-green algae and bacteria fossils dating back 3.4 billion years have been found in rocks from South Africa.

How do those ancient life forms, say, the algae, compare to those that exist today? Evidence from paleontology suggests that the algae haven't changed much. In fact, new evidence now reported by a team of Harvard University paleontologists shows that one blue-green alga fossil is almost a perfect match for its modern counterpart. The fossil they have identified is also the most complex yet discovered and represents a modern order of blue-green algae for which fossils have not been previously discovered.

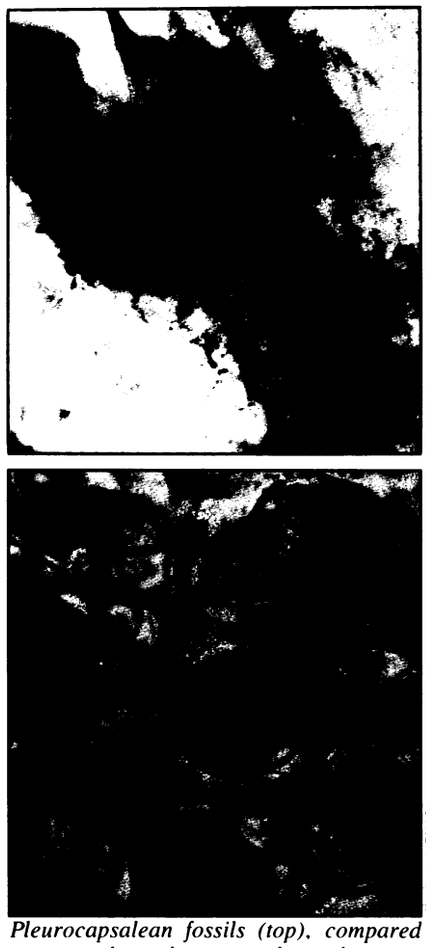
Team members Andrew H. Knoll, Elso S. Barghoorn and Stjepko Golubić report their results in the latest (July) PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. They also discuss the implications of their research for the evolution of eukaryotes (cells with nuclei) from prokaryotes (cells without nuclei) in a paper which is in press with SCIENCE.

In the late 1960's, a South Australian geologist turned over to Barghoorn some ancient rocks from the Skillogalee formation of South Australia. Recently Barghoorn, Knoll and Golubić investigated the rocks for fossil imprints. To their delight, they found that the rocks contained blue-green algae fossils dating back at least a billion years, and that the fossils were for algae of the order Pleurocapsales, one of the four modern orders of blue-green algae. Fossils representing the other three orders had been discovered before, but not fossils representing this order.

Even more intriguing, the pleurocapsalean algae turned out to be almost identical to modern pleurocapsalean algae at the family and possibly even at the generic level. "It's about the most complex known blue-green alga from the Precambrian era," Barghoorn told SCIENCE NEWS. The Precambrian era encompasses seven-eighths of the earth's history, ending 570 million years ago. Previously discovered blue-green algae fossils date back 2.2 to 1.9 billion years.

Do the Harvard paleontologists' findings shed any light on the origin of eukaryotes from prokaryotes? Probably not. As the investigators point out, despite the size of their fossil alga (it can be seen without a microscope), its multicellular structure and the variability in the shape and size of its sheaths and envelopes, "it is clearly prokaryotic." A number of modern algae and bacteria, they say, have attained such a size and level of structural sophistication and some have reached a still higher level of differentiation. They too are prokaryotes (SN: 3/22/75, p. 193).

In brief, as Barghoorn puts it, "We have no really good evidence from all of the Precambrian records . . . of a genuine eukaryotic cell." □



Knoll et al./PNAS

Pleurocapsalean fossils (top), compared to modern pleurocapsalean algae.

Mirror for infrared telescope cracks

If there is anything at all to the old proverb about broken mirrors bringing bad luck, the National Aeronautics and Space Administration is really in for it. The huge, 12-ton slab intended as the mirror blank for NASA's planned three-meter infrared telescope (SN: 8/23/75, p. 134) has developed a crack.

The crack, which extends completely through the slab's 76-centimeter thickness and runs about 100 centimeters from the center of the disk toward the edge, appeared early this month while the blank was on a test stand at Kitt Peak National Observatory in Arizona in preparation for grinding. After the grinding process, which could take more than a year and a half, the mirror would be sent to Mauna Kea, the towering Hawaiian volcanic peak that is an astronomer's paradise, to become the key element in what would be the world's largest infrared telescope. The telescope has been scheduled to begin service in the summer of 1977.

The blank was cast several years ago by the Owens-Illinois Glass Co. in a glass-ceramic composite material trademarked Cer-Vit, often favored for telescopes because of its dimensional stability in changing temperatures. It was bought by NASA to study the material as a candidate for the proposed Large Space Telescope, but was passed over because of the physical stresses anticipated in launching the LST into orbit. It was then made available to the group working on the ground-based infrared telescope.

To buy an identical blank today would cost about $500,000, says a NASA astronomer. The fear is that the crack might grow as the blank is worked on, although drilling a tiny hole at the crack's end may be a possible way of easing the stress. Legal responsibility is a question, as is the threatened timetable. □

Profile of the Ph.D. scientist in U.S.

The National Science Foundation has issued its latest statistics (for 1973) on characteristics of doctoral scientists and engineers in the United States (NSF report 75-301). Among the findings:

- The median age of doctoral scientists is 42 years, with the largest single age group being between 30 and 34. Less than five percent were over 60 or under 30.
- Unemployment is very small, only 1.2 percent of the 229,000 total. Educational institutions were the largest employers, with 58 percent of the scientists. Business and industry had 22 percent and various levels of governments employed 10 percent. About two-thirds of the Ph.D's were primarily engaged in R&D.
- Wages were distributed very narrowly about the median of $20,900. Medical scientists made the highest salaries ($23,000); mathematicians, the lowest ($19,100).
- Geographical distribution was very uneven with strong concentrations of scientists on the West Coast and the industrial Northeast. Nearly three-fifths were located in just 10 states and the District of Columbia.
- Women Ph.D.'s (8.7 percent of the total) had markedly lower salaries ($17,600) and were much more concentrated in their jobs: Four-fifths were life scientists, psychologists or social scientists. More than two-fifths were primarily engaged in teaching (compared to one-third overall). Two-thirds of the women were at four-year colleges or universities (compared to one-half overall). □