Plentiful Plankton Noticed at Last

Oceanographers have identified a tiny plankton form that appears to be one of the two most numerous plants living in the world's oceans. The discovery of the as-yet-unnamed plants — each roughly one-fiftieth the diameter of a human hair — is helping to illuminate the vast world of ocean microorganisms still undescribed by science.

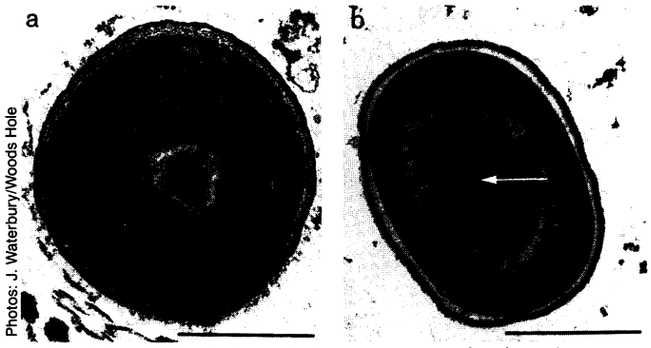
Thriving about 100 meters deep, where sunlight barely penetrates, these newly found single-celled plants can reach concentrations of more than 100,000 cells per milliliter of water. "There are as many of these cells in 10 gallons of water as there are people on Earth," says Sallie W. Chisholm of the Massachusetts Institute of Technology in Cambridge, who reports the discovery in the July 28 NATURE along with colleagues from Harvard University and the Woods Hole (Mass.) Oceanographic Institute. The researchers have found these organisms almost everywhere they have looked, including in the Pacific, Atlantic, Caribbean and Gulf of Mexico.

In spite of their abundance in the upper reaches of the ocean, the plankton have escaped scientific scrutiny until now because they are minuscule and barely fluorescent — characteristics that render them almost invisible to the epifluorescent microscope that has become the standard tool in biological oceanography within the last decade. Chisholm's group found the plants with a flow cytometer, a laser-based machine used routinely in biomedical research and slowly making its way into the marine sciences.

Describing the flow cytometer, oceanographer Paul Johnson says, "I was amazed. It's a fabulous technique, very well suited to natural samples." A decade ago, Johnson and John Sieburth, both at the University of Rhode Island in Kingston, discovered an extremely abundant form of marine cyanobacteria, or blue-green algae, that had similarly gone unnoticed by biologists. At that time, they also took electron micrographs of the plant that was recently identified by Chisholm's group. But Johnson and Sieburth, unable to grow the plant in culture, could not identify it and thought it might be another form of cyanobacteria.

Almost all plants contain pigment molecules that capture sunlight, which is then converted into organic matter in a process called photosynthesis. While complex plants rely on a palette of pigments that includes two types of chlorophyll, cyanobacteria use only one chlorophyll and several other pigments.

In studying the newly identified plankton, Chisholm's group found it contains both types of chlorophyll. That places it in a rare phylum of single-celled plants known as prochlorophytes, which were discovered 10 years ago and include only two other known forms.



Photos: J. Waterbury/Woods Hole

Two most abundant plants in the ocean. Figure (a) shows cyanobacteria discovered 10 years ago. Figure (b) shows smaller plankton type just now identified. Scale bar represents 0.5 micron.

Prochlorophytes have sparked interest among biologists because they seem remarkably similar to the organelles, called chloroplasts, that hold all the photosynthetic machinery in complex plants. According to one widely held theory, chloroplasts started off as single-celled photosynthetic organisms that began to live symbiotically in a more complex host — an arrangement that allowed the host to live on sunlight. Some scientists have suggested that prochlorophytes may have been the progenitors of the chloroplast. In an attempt to untangle the complex evolutionary history of photosynthetic plants, geneticists are now comparing the DNA sequences of cyanobacteria, prochlorophytes, higher plants and chloroplasts.

Chisholm has succeeded in growing the new prochlorophyte in culture, but she has yet to isolate this finicky plant — a necessary step before it can be given a taxonomic name.

It is unclear what animals eat this prochlorophyte, but as an abundant source of biomass it helps form the basis for marine ecology, Chisholm says. The fact that the last decade has seen the discovery of the two most numerous ocean plants, she says, "points out how far we have to go before we will really understand the operation of the marine food chain." — *R. Monastersky*

Private parts = private property?

In a hotly disputed decision that some say threatens a cornerstone of biotechnological research, a California state court of appeal last week ruled a person may retain property rights to tissues and cells removed during surgery and subsequently used in scientific research. The case was brought by John Moore, a cured leukemia patient whose spleen was removed in 1976 by physicians at the University of California at Los Angeles (UCLA) Medical Center.

According to UCLA physician and defendant David W. Golde, the surgery "saved Moore's life." What Moore didn't know until later, however, is that the university also saved part of his spleen. Cells from the grossly enlarged organ were grown in culture and found to produce substances with potentially therapeutic properties — including a white-blood-cell-stimulating substance now known as granulocyte-macrophage colony-stimulating factor (GM-CSF), which researchers say may prove useful against cancer or AIDS. The university obtained a patent on the cell line and its products. Later, Moore claims, Golde and the university profited from his cells through an arrangement with Genetics Institute, Inc., a biotechnology company in Cambridge, Mass., that may someday develop a drug from the cell line. Moore seeks a percentage of any commercial profits from the cell line or patent.

Last week's ruling, which the university says it will appeal to the California Supreme Court, suggests researchers may have to become more businesslike in the way they obtain the living specimens used in their work. Researchers rely largely upon surplus blood specimens and cells "discarded" after surgery to do the basic studies that have spawned a revolution in biomedical research.

But while scientists and some bioethicists lambast the ruling, saying it will stifle new research, raise the cost of biotechnological progress and destroy the "gift ethic" that has characterized organ and tissue donations, others say the decision may have little impact, in part because very few people have truly rare cells. "The worst that will happen is that researchers will add a new line to the consent form, which will say you give up all your rights to anything that is developed from your blood or your urine or whatever," predicts George Annas, a bioethicist at Boston University. — *R. Weiss*