Chemical of alga kills its relatives

Minnesota researchers have discovered a chemical produced by a freshwater alga that destroys other algae. That chemical, the researchers report in the Jan. 22 SCIENCE, eventually could be used as an algicide, ridding lakes of the microorganisms that fill the water with putrid scum and rob other aquatic life of dissolved oxygen.

The discovery of the chemical had its roots in the summer of 1978. Then, Charles P. Mason, of Gustavus Adolphus College in St. Peter, Minn., was attempting to grow various algal species in Petri plates. After setting up several cultures with different combinations of algae, Mason found that the freshwater blue-green algae *Scytonema hofmanni* killed other blue-green and green algae grown near it. Further tests eliminated the possibility that "this clearing was due to competition for nutrients."

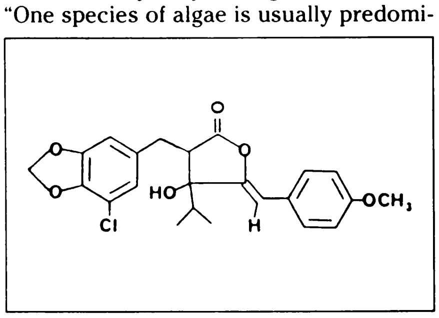
Mason—along with K. R. Edwards of the H. B. Fuller Co. in St. Paul and F. K. Gleason and colleagues of the Gray Freshwater Biological Institute in Navarre, Minn.—then performed several analyses to determine the structure of the microorganism-destroying chemical from *S. hofmanni.* What they arrived at is a compound with a molecular weight of 430 and an empirical formula of $C_{23}H_{23}O_6Cl$. This they dubbed cyanobacterin.

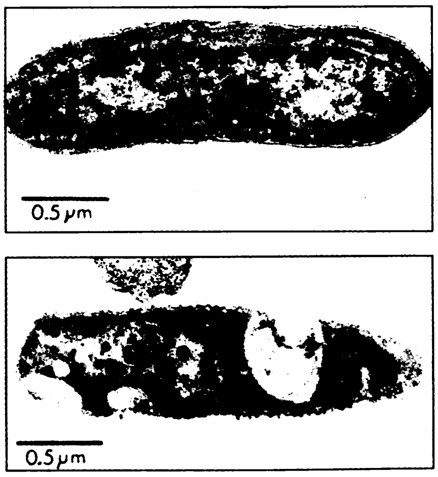
"Perhaps the most unusual aspect of the structure of cyanobacterin is the presence of a chlorinated aromatic [a ring of carbon atoms that has something other than the traditional hydrogen attached to it in at least one spot] substituent," Mason and colleagues report. Chlorine-containing toxins from algae are generally thought to be produced only by the *marine* species, the researchers explain.

Another interesting aspect of the toxin is that while it inhibits the growth of various algae, it has limited effect on nonphotosynthetic bacteria or protozoans. This specificity is in part why Mason and co-workers believe cyanobacterin has algicide potential. Still, they caution, it may take three to four years to find an easy way to synthesize the chemical and another two to three years to test the algicide in lakes.

Meanwhile, the research could help solve the mystery of algal succession. "One species of algae is usually predominant in the spring, then gives way to a succession of dominant species occurring throughout the summer," Gleason says. "Nobody knows quite why this succession occurs.... There are lots of theories on why one particular alga will grow in a lake and another won't. Our discovery fits with the theory that some algae produce chemicals that kill other species of algae."

—*L. Garmon*





Mason et al./SCIENCE

The upper electron micrograph shows an untreated Synechococcus *blue-green alga. The lower micrograph shows the same cell after exposure to* Scytonema *extract.*

Court stalls TMI-1 restart

The U.S. Appeals Court has ordered the Nuclear Regulatory Commission to drop its plans for authorizing the restart of the Three Mile Island-1 reactor until it has complied with National Environmental Policy Act requirements. Prior to the ruling, NRC had been expected within weeks to authorize the plant's restart. Now NRC must prepare an environmental assessment of how any restart might affect "the psychological health" of nearby residents and "the well being" of surrounding communities, according to Circuit Court Judges J. Skelly Wright and Carl McGowan. NRC's assessment is to determine whether a "full environmental impact statement" will also be needed.

When TMI-1 shut down in February 1979 to refuel, it was expected the plant could restart on March 20 of that year. But the March 28 catastrophic shutdown of TMI-2 (SN: 4/7/79, p. 227) killed any chance of that.

In dissenting with his colleagues' judgment, Circuit Court Judge Malcolm Richard Wilkey noted that TMI-1's restart is being restrained over "an assorted" psychological impact — "an 'impact' which has never before been considered covered" by NEPA. He cites this as "yet another example of a court inventing new procedural requirements for an administrative agency in a manner which has enormous substantive consequences." □

Reading the record of ancient floods

A new technique for estimating the intervals at which rare, large-magnitude floods are likely to recur is simplicity itself. A geologist selects a river, identifies its main tributaries, and digs a trench near a tributary mouth so that its sediments can be studied. The quick and inexpensive technique, described in the Jan. 22 SCIENCE, requires only that the scientist read the record preserved by sediments deposited in areas where so-called "slack water" was retained during floods.

Slack-water deposits often occur at the mouths of tributaries when flood waters from major rivers back up. Velocities of these flood waters tend to be low, and particles carried by the main river usually are distinct from those carried by tributaries. These sediments may accumulate in thick layers in tributary mouths, leaving a record that reveals mineralogy and the direction in which flood waters moved. With the additional tool of radiocarbon dating of organic material such as twigs, geologists can calculate when large floods occurred, even in arid areas and where historical records are short or nonexistent.

R. Craig Kochel of State University College in Fredonia, N.Y., and Victor R. Baker of the University of Arizona in Tucson developed the technique because statistical measures usually used by hydrologists in estimating recurrence intervals fail when the last major flood occurred before collection of historical data began. While slack-water deposits were recognized as early as 1920, until recently they were not used in compiling flood histories. The new analytical method will be a boon to engineers who need accurate information in order to plan structures such as flood control dams, or even cities.

In testing the method, the authors established a 10,000-year paleoflood record for the lower Pecos and Devils rivers in southwestern Texas. They found that estimates by hydrologists using conventional methods placed the recurrence interval for the major flood on the Pecos River in 1954 anywhere between 81 and more than 10 million years. Using the slack-water method, scientists studied the layering and composition of slack-water deposits, conducted radiocarbon dating of organic sediments, and extrapolated the height of sediments in tributary canyons to the main stream. They adjusted the estimate to about 2,000 years.

The technique is being tested in Virginia, although, Kochel told SCIENCE NEWS, vegetation there may complicate the analysis. The authors suggest that in humid, temperate regions slack-water sediments be studied as soon as possible after large floods. Vegetation recovers rapidly from flood damage, and roots may alter the sedimentary record. —*C. Simon*