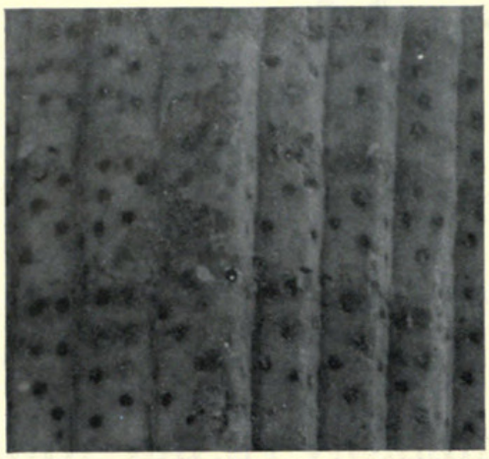

Fig. 2. CLOSE-UP OF THE 'WINDOWS'
Actually, traces of stifled coral buds.

platforms come, are almost even, too, in all the tubes. The similar level of floors and bud-holes leads us to conclude that there was a "community flesh" covering the top of the colony, as there is in many modern corals. This is a very convenient provision, for if one polyp (individual coral animal) has greater success in catching food than his neighbors, his nourishment is shared with the others, and if one detects a danger, a nerve-like impulse can be distributed through the colony and cause all its members to withdraw into their stony forts.

The soft parts of the animals are gone, but by observing the limy structure that remains and by comparing this with structures of present-day animals whose soft parts are known, we can form a probably reliable idea of the nature of these inhabitants of the Silurian sea.

ALGAE AND WATER SUPPLIES

By HARRY K. PHINNEY
ASSISTANT CURATOR OF CRYPTOGAMIC BOTANY

The water supplies of most American cities are kept healthful by rigid regulation of the disposal of domestic and industrial wastes within the supplies' watershed. By close observation of the bacterial content of the water it is possible for the laboratory bacteriologist to note pollution and to check its source.

Although water-borne contagion can thus be kept at a minimum, many water supplies are occasionally afflicted and some are constantly endangered by the presence of members of a group of organisms quite distinct from the disease-producing bacteria. These organisms belong to the group of chlorophyll-bearing cellular plants generally and collectively known as algae, pond scums, water blooms, and the like. They are plants reproducing by means other than seeds and lack true roots, stems, and leaves. The menace of these plants is their nuisance value in producing unpalatable tastes and odors in the water.

Any algal species may grow so abundantly in a water supply that upon death and decomposition of the plant body it imparts an objectionable flavor to the water. Before and after death occurs, algae may also cause trouble in interfering with waterworks operation in clogging intakes, filter screens, and filter beds. In addition, certain species are noted for producing tastes and odors in the medium in which they grow as a normal metabolic phenomenon. Odors have been noted resembling both fresh and rotten fish, rotten wood, cucumbers, and musty grass.

CHEMICAL TREATMENT

Once the water has become unpalatable through any of these causes, the problem must be handled entirely as a chemical deodorizing process. This is accomplished in most waterworks at the same stage where chemicals are added to flocculate sediments or where chlorine is added to reduce the bacterial population. The two common agents employed for this purpose are chlorine and ammonia, either singly or together as ammoniachlorine.

If the control biologist periodically checks the algal content of the water and a sharp increase is noted or objectionable species appear, treatment should be undertaken to destroy the organisms before they reproduce in sufficient quantity to cause difficulty. This may require treatment of the lake or river that is the original source of the water or often the reservoir or storage basin into which the water is pumped.

The method of making population counts of free-floating organisms has been standardized and offers no obstacle to the aquatic biologist. It has been the accepted practice for more than forty years to use copper as an algaecide in such situations. The copper is applied as copper sulfate (blue vitriol) either in the dry state or as a concentrated solution. The calculation of the quantity of dry salt necessary to make the water to be treated a copper solution of the required strength must be made by a person having accurate first-hand information concerning the quantity of water to be treated and the biological and chemical content of that water.

BOTANISTS ASSIST

The problems of applying the algaecide are of an engineering nature and do not enter the realm of cryptogamic botany. Frequently, however, the identification of the organism creating the difficulty must be undertaken by a specialist who can make a positive determination and thus give the information necessary for adequate control. It is for this reason that cryptogamic botanists are called upon for their help.

Such inquiries are received not only from waterworks engineers but also from tropical fish fanciers whose aquaria become clouded and green, from owners of outdoor swimming pools, and from people whose property includes lakes and ponds all of which are quite susceptible to the algal plague. It is impossible for the botanist to attempt more than the identification of the causal organism and, possibly, furnish any information regarding its lethal threshold to copper.

Investigation in the laboratory and experience in the field have shown that most of the organisms that constitute a menace are susceptible to less than one part per million of copper. Some species have reported lethal thresholds as low as one-tenth part per million. Thus, accurate identification of the organism involved can result in savings by allowing the use of a minimum amount of copper sulfate. This is important because many fish species are relatively sensitive to copper and it is best to keep the dosage of copper as low as is possible.

SPECIFIC FORMS AND REMEDIES

Of the green algae, Cladophora,* Hydrodictyon,* and Spirogyra* clog filter beds and screens while Volvox, Dictyospherium, Pandorina, and Eudorina cause odor and taste. Here the differences in amounts of copper needed for eradication are great. They vary from one-tenth to ten parts per million. The diatoms* are frequent trouble makers, as they are responsible for both vile flavors and clogging of filters. The amounts of copper needed for their control vary from two-tenths to five-tenths parts per million.

Among the yellow-brown algae, Ceratium,* Dinobryon, Synura, and Uroglena are the most frequent producers of a fishy taste and it requires from two-tenths to five-tenths parts per million of copper to kill them.

Aphanizomenon, Anabaena, Microcystis,* and Rivularia (Gloeotrichia)* among the blue-green algae have been reported to clog filter beds and to cause odors. These forms can be eliminated or sharply reduced in number by adding copper sulfate in a quantity to give one-tenth to four-tenths parts per million of copper.

Occasionally the stoneworts (Chara) cause trouble because they form large masses and on decay give forth a sulphurous, rotten-onion odor. They are destroyed by copper in concentrations from one to five-tenths parts per million.

NON-CHEMICAL METHODS

Under certain circumstances in which the water is not put to domestic or industrial uses and the basin involved is small, it is possible to control the algae by other than chemical means. In small pools the masses may be removed by raking.

If no harm would ensue, draining the basin for a period of days will at least reduce the number of organisms but will not eradicate them. Shading small pools is often effective,

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* The forms singled out in the above discussion by an asterisk are represented in the glass model display of algae at the north end of Martin A. and Carrie Ryerson Hall (Plant Life–Hall 29).