clog the pipes. It is often discovered quite unexpectedly, being dislodged by the current attending hydrant flushing or by the draft caused by fire engines. Dead ends are spots likely to harbor it, and its long, rusty filaments have been mistaken for horse manure.

There are three types of the growth, each possessing the peculiarity of precipitating from the water in which it grows its own particular metallic hydroxide. By far the commonest of the three is crenothrix kuhniana, which demands iron for its development and which deposits large amounts of iron hydroxide as the result of its growth. The iron required for growth must be in solution, and the quantity demanded would seem to be about 0.3 part of Fe per million.

In order that the iron may be in solution, we naturally would expect the dissolved oxygen to be low and the quantity of reducing agents, such as organic materials, to be high, and those are the conditions that we find in practice to be favorable to the development of the plant.

It is likely to be encountered in waters from swampy, peaty sources where dissolved oxygen is scanty and where the necessary iron in solution may be had. Driven wells in such localities frequently furnish it. Darkness favors its growth, and its development in city water mains is often excessive, resulting in a material reduction of the carrying capacity of the pipes. The writer has some doubt about the "manganese" variety of crenothrix being as rare as some think it is, he having found large quantities of manganese in a heavy Wisconsin growth. Beythien and others have, moreover, noted that the presence of manganese in water directly favors the growth of the ordinary form of crenothrix.

Beyond the mechanical stopping of street pipes, crenothrix is exceedingly objectionable to the laundry interests of the community, for the reason that its rusty filaments cause "iron stains" to appear upon white linen.

Removal of the iron by oxidation and filtration is the best guard against troubles due to crenothrix.

It must not be sweepingly assumed that all the "plankton" life is to be rated as uniformly objectionable; quite the contrary, as a reasonable degree of it acts as a distinct help in maintaining the safety of natural waters. Thus we find "bacteria eaters," such as many kinds of ciliated infusoria, rotifers, daphnia and the like, feeding upon minute germ life, and doing so to our great advantage.

To quote from a translation by Kuichling: "The question is, what becomes of the great quantities of offal and excreta, the many remnants of decaying plants, the refuse of communities, and the finely divided factory wastes of every description, which find their way into our streams, even under normal conditions, if a large portion thereof is not consumed by the aquatic detritus-eaters and the omnivorous fauna before settling to the bottom?"

With a view to avoid the troubles arising from the undue growth of taste- and odor-producing organisms, the stripping of reservoir sites and the removal of a portion of the upper soil has been advocated and carried into practice. This, of course, entails very great expense when the surface to be stripped is at all extensive, as in the instance of stripping the Nashua reservoir supplying Boston. At Columbus, Ohio, such work cost $159 per acre.

In their report upon the probable cost of stripping the surface soil from the Ashokan reservoir site, which is to hold the water supply for New York City, Messrs. Hazen and Fuller stated it would possibly reach the great figure of $5,000,000.

In view of the expense of such treatment for large reservoirs, the question is pertinent, "Does it pay?"

At Holyoke, Mass., the annual water report for 1908 says: "Great care had been taken in cleaning and stripping the reservoir by removing all vegetable and organic matter, thus lessening to a minimum the food supply for supporting living organisms in the water. The thorough cleaning of the reservoir has not been wholly successful, as an aquatic plant known as 'Chara' has grown and flourished in the reservoir all summer and imparted to the water a taste and odor that made it unfit for drinking or even for cooking purposes."

Mr. J. M. Diven ("American Water Works Association," 1908) has had interesting and contrasting experiences with both stripped and unstripped reservoirs:

The Elmira reservoir was as thoroughly stripped as possible; great care was taken to keep out the first washing from the drainage area and the muddy flood waters. There was little or no marsh land on the drainage area, the catchment area being seemingly ideal. The reservoir was clean and clear; on the sides the slopes were abrupt, and there was very little shallow water.

"At Charleston, S.C., the drainage area was largely swamp, and there was much decayed vegetable matter on all of the area drained, the water being decidedly peaty. The reservoir covered a large surface, was shallow, and absolutely unstripped or even cleared. Much of the land flooded was composed of black muck or decayed vegetable matter.

"In the first case (Elmira) the conditions were at the first satisfactory and the water good for several years. But trouble from algal growth came in time and has steadily grown worse, in spite of strenuous efforts to remedy the condition.

"The second case (Charleston) was troublesome and unsatisfactory from the first, but has somewhat improved and promises to continue to improve."

The writer's experience leads him to advocate the expenditure of comparatively little money in the preparation of sites for large storage reservoirs, for the reason that, although thorough stripping will likely give immunity from algal growths for some years, yet freedom from the occurrence of taste and odor in the stored water may not last for long. Sooner or later there will be carried into even the most carefully cleaned reservoir enough food material to sustain a plankton growth of a density governed by the local conditions. Broadly speaking, an "old bottom" is better than a new one, because it is likely to contain less plant food; but the rule has many exceptions.

Even natural lakes are frequently seen "in bloom"—that is, loaded with minute life—and they so remain for a period during which their waters are not acceptable for domestic use. The character of the tributaries must be considered as well as the nature of the bottom of a proposed reservoir, for it is manifestly loss of money to improve the latter if the former can quickly replace much of what has been taken away.

For the sake of general appearances, if for no other reason, trees, shrubs and bushes should be removed. Dead, standing timber and fallen logs are most unsightly and are very likely to produce complaint from the visiting public. In other words, the reservoir site should be cleared and grubbed, with, of course, entire removal of every vestige of human habitation; but beyond that it scarcely pays to go. The portion of the flooded land lying between high-water and low-water marks should receive especial attention, for the reason that during the