in the ripening of cheese, the flavoring of butter, and even in the curing of tobacco, they are important agents, and we may with reason ask ourselves, would life be worth living without them?

People have a tendency to think that what is living and dangerous must be an animal; if, in addition, it is minute, it must be an insect, and insects are detestable. Bacteria have thus been nick-named insects, and are abhorred accordingly. The dog has been given a bad name, and it seems useless to plead for him. These minute organisms, however, are not animals, but plants so low in the scale of

FIG. 2. A BACILLUS FOUND IN WATER.

vegetable life that we may easily consider them the lowest forms that exist. They may at one time have been higher, but their bad habits of living upon decaying organic matter or upon living animals, has carried the curse with it, which it always does, and they have degenerated. They are none the less plants, however, and form a well-marked sub-division of the plant world, including multitudes of species, each species being separated by definite characters from all the rest. These species are grouped into genera, each genus being given a special name. For instance, in one genus the bacteria are all globular, as in Figure 1, and it is given the name of micrococcus. In another, they are rod-like, and the name bacillus is applied (Fig. 2); in another, spiral, and we have the name spirillum (Fig. 3.) In all cases, however, they are characterized by their extreme minuteness. The bacillus which causes tuberculosis, for example, is so slender that 125,000 of them may lie side by side in an inch, and of the largest which we know and which has been called *bacillus megatherium* on account of its comparatively enormous size, only 10,000 will lie side by side in the same space. It would seem as if little damage could be done by such minute creatures, but they reproduce so rapidly that they make up in numbers for their insignificant size. Their reproduction consists simply in one individual, when it has reached a certain size, dividing into two new ones, and as this, under favorable conditions, may take place every twenty minutes, it is easy to obtain some idea of the enormous rapidity of increase. Even when conditions are such that they only divide every hour, at the end of twenty-four hours the one individual is represented by over sixteen millions. In bacteriological investigations we make use of this rapid multiplication to facilitate our studies, and in much of our work pay only slight attention to individuals, but study the appearances of their colonies, in which they are present in millions. We are able to do this, thanks to Robert Koch, who introduced methods so exact that we now know not only the form and size of multitudes of bacteria, but also the foods upon which they grow, the conditions which affect their growth, and many of the chemical substances formed by them while growing. The chief of these methods is the cultivation of bacteria in nutritive jellies. Every housewife knows that calves' foot jelly, if left in a warm room exposed to the air, will soon putrify. This putrefaction is due simply to the growth of bacteria in the jelly. Bacteriologists prepare such a jelly by