rate by changes in pH. Therefore it is logical to assume that the ecological balance among the bacteria will be greatly altered by changes of pH, and that where a large number of bacterial species are living together, as in a hay infusion, different species will predominate at different H-ion concentrations.

From the above it is concluded that the difference in division rate of *Paramecium* at different H-ion concentrations, between the limits of pH 5.9 and 7.7, at least, is due to a qualitative change in available bacterial food, and not to direct action of the pH on the Protozoa.

Further work is being carried on to determine the behavior of *Paramecium* in a pure culture of bacteria at higher and lower H-ion concentrations than those used in the present experiments.

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INDUCED AUTOTOMY IN THYONE

THE holothurian, *Thyone briareus,* has long been known to exhibit unusual autotomy. During this process it casts off the extreme anterior end including the ring of tentacles, calcareous lantern, water vascular ring, nerve ring and throws out with these organs the oesophagus, stomach and intestine.

A. S. Pearse,[1] by injecting strychnine into the body cavity of 20 Thyone, produced such evisceration in seven individuals. J. W. Scott,[2] induced autotomy in 40 out of 65 individuals by "allowing Thyone to stand in stagnant water until the water became foul" and then following with a "treatment with running water. Alternating these processes produced as high as 65 per cent. self-mutilated individuals."

During this summer's work at Woods Hole I have found that ammonia water will invariably bring about evisceration. Seven N ammonium hydroxide was used in the proportion of one part ammonia to 800 parts of sea water.

When the animal is placed in this solution there is usually a brief period of muscle relaxation and an expulsion from the cloaca of the water which filled the respiratory trees. Within 15 seconds the longitudinal and circular body muscles contract strongly, reducing the animal to minimum size. A few seconds of such contraction is followed by a gradual elongation of the anterior end of the body into which lantern, stomach, intestines and the fluid content of the body cavity are forced. As the pressure increases, the body wall about ¼ of an inch behind the tentacle ring becomes greatly distended. There are no strong circular muscles in this region. The body wall tissue in the distended region thins out and soon bursts allowing the body fluid to gush out carrying along with it part of the viscera. At this point in the procedure the Thyone is transferred to fresh sea water. Most of the viscera are tangled around the lantern, which is partly covered over with the small portion of the body wall anterior to the break. The strong circular muscles just posterior to the break contract so as to close tightly the body cavity at the anterior end. The whole procedure to this point occupies about 30 seconds. The original break in the tissue becomes gradually more extensive until within several hours the eviscerated parts are free from the body.

The hydroxides and carbonates of sodium and potassium have been used with some success. Electrical stimulation applied to the muscles of the body wall will also produce autotomy.

One hundred and fifty Thyone were eviscerated by the ammonia water method. Of this number five Thyone did not live. In each of these cases the body wall broke at places other than at the customary anterior point. One hundred and forty-five Thyone lived until they were killed for the study of the regenerated organs.

Under the conditions outlined, autotomy is regular and uniform in occurrence. In 96 per cent. of the possible cases it was favorable for continued life and the regeneration of lost parts. A study is being made of the regenerated tissues.

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[1] A. S. Pearse, "Autotomy in Holothurians," *Biol. Bull.*, vol. xviii, 1909.

[2] J. W. Scott, "Regeneration, Variation and Correlation in Thyone," 1914.

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