

tion, *i. e.*, a hot water non-luminous extract of the luminous gland allowed to cool (containing luciferin), will give light when mixed with a cold water extract of the luminous gland allowed to stand until its luminescence completely disappears (containing luciferase). Moreover, luciferin from the Jamaican species will luminesce if mixed with the luciferase of the Japanese species, and *vice versa*. By carrying out the four possible "crosses" one may determine whether the color of the resulting light is controlled by the ostracod supplying the luciferin or the luciferase.

The following results were obtained:

Japanese luciferase x Japanese luciferin—bluish light.

Jamaican luciferase x Japanese luciferin—yellowish light.

Jamaican luciferase x Jamaican luciferin—yellowish light.

Japanese luciferase x Jamaican luciferin—bluish light.

It is apparent that the luciferase determines the color of the light.

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The influence of volume of culture medium and cell proximity on the rate of reproduction of Protozoa.

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Experiments were undertaken to determine (1) the relationship between the volume of culture fluid and the division rate of Infusoria, and (2) the effect of cell proximity on the division rate. The Infusoria studied were pedigree races of *Paramecium aurelia*, *Paramecium caudatum*, and *Pleurotricha lanceolata*. The experiments comprised four lines of each species bred in 2, 5, 20 and 40 drops of hay infusion. Forty drops were approximately equal to 1 cc. At the end of five day periods the average per diem division rate was obtained for the four lines in each volume.

In the set of experiments with different volumes of culture medium, the average per diem rate was higher in the larger

volumes, as shown by the following data, based on the averages for twenty-seven experiments lasting through a period of five days each for the three species mentioned, or nine experiments per species: animals in 2 drops, 0.92 division; in 5 drops, 1.03 divisions; and in 20 drops, 1.20 divisions. Eighteen of the experiments, or six experiments per species, included four lines each in 40 drops with an average per diem division rate of 1.27. Woodruff¹ in his studies on the effect of excretion products of Protozoa on their rate of reproduction obtained equivalent results and interpreted the lower division rate in smaller volumes of medium as due to the effect of the excretion products of the animals.

The second set of experiments differed from the above in that it was confined to a pedigree race of an hypotrichous infusorian and, instead of one animal, two animals were bred together on each slide, in order to determine whether, as Robertson² maintained in his studies on *Enchelys farcimen* Ehr., cells mutually accelerate their division rate by the production of a chemical agent or "autocatalyst". At the beginning of each experiment single sister cells were isolated and carried simultaneously as controls. The average per diem division rate for two animals, computed on the one animal basis, in sixteen experiments of this type was below that for one animal in the corresponding number of drops, as follows: 1 animal in 2 drops, 1.35 divisions; 2 animals in 2 drops, 1.03 divisions; 1 animal in 5 drops, 1.81 divisions; 2 animals in 5 drops, 1.54 divisions. The division rate in five drops in each instance was the more rapid, and further, there was a smaller difference between the average per diem division rate of the one animal and two animals in the five drops than in the two drops.

In brief, the data from both sets of experiments are entirely concordant and afford not only no evidence that the cells produce a substance which accelerates the division rate, but also supply further evidence that the excretion products of the cells are inimical to reproduction.

¹ Woodruff, L. L., *J. Exp. Zoöl.*, 1911, x, 557; *J. Exp. Zoöl.*, 1913, xiv, 575.

² Robertson, T. B., *Biochem. J.*, 1921, xv, 595; *J. Physiol.*, 1922, lvi, 404; *The Chemical Basis of Growth and Senescence*, Philadelphia, 1923, 81-105.