SCIENTIFIC PROCEEDINGS.

ABSTRACTS OF COMMUNICATIONS.

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Further light on the conjugation of Paramecium.

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These experiments were undertaken to test the variability after conjugation of *Paramecium caudatum* in respect to the power to conjugate. An individual immediately after separating from conjugation possesses a new fertilization micronucleus and the old macronucleus. The new micronucleus divides into two, these two into four, the four into eight. During these three divisions the old macronucleus goes to pieces and the fragments are gradually absorbed in the protoplasm. Four of the eight new nuclei then metamorphose into four macronuclei, and then for the first time after conjugation, the cell divides. The progeny have two macro- and two micronuclei each. These cells immediately divide again without further nuclear division, forming four cells, each with one macronucleus and one micronucleus. The normal condition of *Paramecium* is then attained. The problem to be solved by experiment was: Do these four cells give rise to progeny which vary in respect to the power to conjugate? In order to get as many chances as possible the products of the first three divisions of each of the four cells were kept isolated, thus giving eight lines of cells from each of the original four. These sets of eight, thirty-two in all, I shall speak of as the 1st, 2d, etc., quadrants. The thirty-two lines were kept isolated in vials and fed at intervals of from six to eight days under conditions prohibitive of conjuga-

tion, from the 27th of last July to the present. From the outset marked differences in the size of the progeny of different lines were noted; the statistical proof, however, is not yet ready for presentation. A marked difference in division rate was also noted; for example, the daily division rate of representative individuals of all the lines was carefully kept for a period of 30 days in October and November. The average rate for individuals of the first quadrant was 0.65 divisions per day; of the 2d, 0.91 per day; of the 3d, 0.81, and of the 4th, 0.95 per day, a difference of from fifteen to twenty per cent. between the rates of individuals from the 1st quadrant and those of the other three. The weaker vitality of progeny of the 1st quadrant is also shown by the extinction by death of all the progeny of four lines of the eight, whereas only one line died out from the progeny of quadrants 2 and 4, and none from quadrant 3. (In quadrant 2, two lines failed to start by reason of a pathological division in the third generation.) The power to conjugate is correlated with these variations in vitality. Conjugation tests (too complex to be described here) were started in October and November, and many pairs were found in two of the four remaining lines of the 1st quadrant, none in the others. The December tests gave similar results; three of the four lines of the first quadrant giving many pairs while none were found in the other twenty lines. Again in January and February all four lines of the first quadrant furnished many pairs, but not a single pair was found in the other lines subjected to exactly the same treatment. A specific example will show how extensive the observations were. In the January test, for example, not less than 150,000 *Paramecium* belonging to the non-conjugating lines passed under my eyes, not a single conjugating pair being seen. Of the four conjugating lines not less than 50,000 *Paramecium* were observed, of which more than 2,000 pairs were in conjugation. It is evident therefore that a very decided difference exists in the total progeny of an ex-conjugant; some are potential germ-cells, others apparently are not. These experiments may give a clue to the divergent results obtained by Maupas, Woodruff and myself, which cannot be harmonized on the ground of abnormal conditions or bacterial poisons in one case and not in another. The divergence must be due to some more deeply lying cause in

the organisms themselves. The race that I worked with in 1901 was a conjugating race which died out in the 742d generation. Woodruff's long line of over 3,500 generations is a non-conjugating race and the two races cannot be compared in regard to vitality, since normal conjugation was prevented in the conjugating race, whereas in the non-conjugating race there has been no artificial prevention of a normal process. The following conclusions may be drawn; they must be considered provisional, however, since the experiments are not yet concluded.

1. The traditional view that each *Paramecium* is a potential germ cell is not true.

2. Some descendants of an ex-conjugant are potential germ cells, others are not.

3. The life history of conjugating lines has shown that if conjugation is prevented, the race dies out.

4. Weismann's hypothesis that natural death is absent in protozoa is not borne out by the facts.

5. Care must be exercised in arguing that one effect of conjugation is to bring about variations because of amphimixis until we know that such variations are not brought about by every individual ex-conjugant in its normal development.

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Note on the intraperitoneal lysis of tubercle bacilli.

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In a previous communication,[1] it was shown that tuberculous guinea-pigs, rabbits and dogs react to intraperitoneal reinoculation with tubercle bacilli by causing rapid degenerative changes in the injected bacteria and a rapid decrease in their number, not observed in normal animals. The question now arose as to the mechanism of this heightened peritoneal resistance. From the similarity between this phenomenon and the Pfeiffer reaction

[1] These TRANSACTIONS, 1912, X, p. 30.