

Owing probably to the lateness of the season the cross-fertilization experiments were unsuccessful.

However, the following results were obtained in the self-fertilization of sea-urchin egg fragments which indicate that the size of the nucleus in the swimming larvæ depends directly upon the initial size of the nucleus in the fertilized egg fragment whereas the size of the larva bears no direct relation either to the size of the nucleus or to the initial amount of cytoplasm in the fertilized egg. Mature eggs were deprived of their nuclei by cutting them out together with a minimum amount of cytoplasm. The non-nucleated fragments were about $\frac{4}{5}$ the size of the entire eggs. These, when fertilized, developed into dwarf larvæ of about half the size of the control and with abnormally small nuclei. Other eggs were deprived of more than half of their cytoplasm. These, upon fertilization, developed into dwarf larvæ of about half the size of the control but possessed nuclei equal in size to that of the control.

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Halophilic bacteria.

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The salt-fish industry of the United States suffers a large annual loss as a result of the salt fish developing a red coloration during the summer or when stored under warm moist conditions. Work undertaken by the U. S. Bureau of Fisheries has demonstrated that the red coloration is due to the growth of two microorganisms whose origin is the solar evaporated sea salt with which the fish are cured. The coloration may vary from a pale opaque pink to a deep transparent crimson due to the harmonious intergrowth of a spirochete producing a pale pink coloration and a bacterium producing a transparent red coloration. Likewise their separation into pure culture is difficult. These organisms exhibit very decided helio-, thermo-, and halophilic characteristics. The optimum concentration of salt for growth forms is saturation, growing lux-

uriantly on heavily salted fish, brine, sea salt, and saturated salt-fish agar. No growth appears on media containing less than 16 per cent. sea salt by weight. The shape, size, and motility of both forms is dependent upon the salt concentration of the medium, varying from the largest form found in saturated media (14 micra) to the spherical forms (2 micra) found in media of 18 per cent. concentration with all the intermediate forms between. The motility varies from the actively motile long forms, through a tumbling motion in the intermediates, to the non-motile spheres. The amount, character and coloration of the colonial growth does not seem to be affected by the changes in the concentration. Due to their extreme halophilic requirements, the staining of these organisms is very difficult. The optimum temperature for growth is 50° to 55° C. Both forms are strictly aërobic and produce neither gas nor acid in carbohydrates. Both forms will tolerate indefinite exposure to the brightest sunlight. In all probability the brilliant pigmentation is a protection against the bright sunlight in the salina of the tropics where the sea salt is produced. Likewise their tolerance to heat and salt indicates such an origin. Influenced by low temperatures and accumulation of metabolic products these organisms suffer a temporary loss of pigment which is regained on reincubation at high temperatures. In the spirochete this loss of pigmentation is accompanied by the formation of coccoid bodies. The peculiar characteristics of these organisms augmented by bacteriological examinations of the sea salt and observations at the point of production have demonstrated that reddening of salted fish is due to the *Spirocheta halophilica* and the *Bacterium halophilica* which are present in the solar evaporated sea salt with which the fish are cured. Sea salts from all over the world contain similar organisms.

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An appliance to be used with a gasometer for recording the volume of each expiration.

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The appliance, as demonstrated, is used with a gasometer in