yielded identical data for both the natural and synthetic preparations.

Acrylic acid, which is known as a toxic chemical, is apparently nontoxic to at least certain animal tissues in dilute solutions. The free acrylic acid content of the *Phaeocystis* preparations was calculated to be 0.38 percent (7.4 percent dry wt.). This level was apparently nontoxic for euphausids which were grazing on *Phaeocystis* blooms and whose stomach contents had antibacterial activity identical with that of the algae upon which they were feeding. Concentrations of acrylic acid sufficient to cause inhibition of the penguin gastrointestinal microflora were apparently nontoxic to the penguins. Preliminary tests in mice indicated that 700 mg of sodium acrylate per kilogram of body weight, injected intramuscularly, were well tolerated. However, *Phaeocystis* blooms which foul herring nets in the North Atlantic Ocean were believed to exclude herring (*4*), and the mucilaginous colonial form of *P. pouchetii* in culture has been observed to be toxic for herring fry (*5*).

The natural occurrence of appreciable amounts of acrylic acid in *Phaeocystis* raises some very interesting questions about its precursor, its function in the algae, its mode of antibacterial action, and its effect on the physiological ecology of the marine habitat. Apparently the only reports on the natural occurrence of acrylic acid in marine plants concern investigations of the precursor of dimethyl sulfide (*6*) in the epiphytic intertidal alga, *Polysiphonia lanosa*. Dimethylpropiothetin, which occurred in considerable amounts, was easily cleaved with heat or alkali (*7*) or by an enzyme (*8*) to form dimethyl sulfide and acrylic acid. Preliminary attempts to show the presence of this precursor or dimethyl sulfide in *Phaeocytis* were inconclusive. The mucilaginous substances in the colonial form of *Phaeocystis* may be acrylic polymers. Although substituted acrylates have been tested for their antibacterial activity (*9*) the activity of the parent compound has evidently not been reported. Possible modes of antibacterial action may be the inhibition of D-amino acid oxidase (*10*) or propionate oxidation (*11*). Acrylic acid may have antialgal properties, since *Phaeocystis* replaced the diatoms in certain areas to become the predominant form. Acrylic acid apparently affects green plants (*12*) and may inhibit photosynthesis. Studies are in progress to further elucidate the role of acrylates in the physiological ecology of the Antarctic marine habitat (*13*).

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Completion of Meiosis in Uninseminated Eggs of Drosophila melanogaster

Abstract. Contrary to earlier statements, meiosis goes to completion in "unfertilized" eggs of *Drosophila melanogaster*. Evidence suggests that this is not only characteristic of the strain examined but of the species as a whole and of other *Drosophila* species as well.

The earliest reference to meiotic figures in the "unfertilized" (that is, uninseminated) eggs of *Drosophila melanogaster* is that of Huettner, who stated, ". . . maturation does not take place unless the egg is fertilized" (*1*). No evidence was presented in support of this statement, and yet the idea that meiosis does not continue beyond metaphase of the first division unless sperm enter the egg has become incorporated into the literature (*2*). The situation has been examined by analysis of eggs laid by virgin females (*3*, for preliminary report).

Eggs collected at half-hour intervals from individual virgins of an Oregon-R strain were aged from ½ to 2 hours at 25°C, sectioned, and stained with Heidenhain's hematoxylin. As an extra precaution, egg samples were collected prior to and after those used for sectioning and were incubated to make certain that none of them hatched.

Cytological details were studied in 93 sectioned eggs. In every case meiosis had gone to completion, contrary to views expressed in the literature. In 20 of these eggs, four interphase or

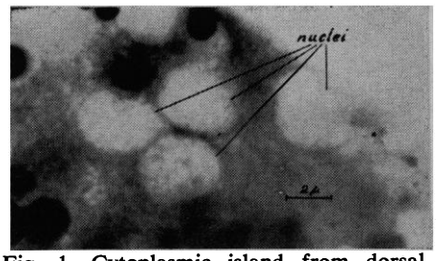

Fig. 1. Cytoplasmic island from dorsal anterior region of uninseminated egg with the four nuclear products of meiosis.

prophase nuclei were found and identified as the products of maturation (Fig. 1). The remaining eggs contained one, two, or three groups of metaphase chromosomes whose appearance often resembled the polar body chromosomal groups described in fertilized eggs (*4*), with spindle elements usually discernible.

The sequence of events following maturation varies, depending upon which of the meiotic products fuse with one another. Counts made of the number of chromosomes in various groups indicate that two, three, or even four nuclei may come together and fuse. The innermost or outermost chromosomal group, or both, appear to be omitted from the fusion product when it involves only two or three nuclei. With the completion of meiosis, a cytoplasmic extension forms, along which the female pronucleus, or metaphase fusion product, may or may not pass to the center of the egg, even though sperm have not entered. It seems probable that the fusion product in older degenerating eggs is the figure assumed to represent the first meiotic division in previous papers.

The possibility exists that the completion of meiosis in uninseminated eggs is a feature peculiar to the Oregon-R strain examined. However, other evidence supports the view that it is a more general phenomenon and probably represents the rule rather than the exception in *Drosophila*. First, a somewhat similar description of "unfertilized" eggs has been given for *D. funebris* (*5*), although no systematic investigation of the situation was reported. Second, Guyénot and Naville (*6*) noted an occasional first meiotic division anaphase spindle, as well as second division spindles in "unfertilized" eggs of *D. melanogaster*. Further support comes from recent studies of parthenogenesis in *Drosophila*. Genetic (*7*) and cytological (*8*) evidence has been presented for the fusion of haploid nuclei after the completion of meiosis in *D. parthenogenetica*. In this species, continuation of meiosis beyond Meiosis I has been described (*8*) in "unfertilized" eggs of a uniparental parthenogenetic line and also in some eggs from a biparental line. Cytologi-

cal events leading to parthenogenesis in *D. mangabeirai* have also been reported (*9*). The evidence again points to an automictic type with fusion of haploid nuclei following the completion of maturation divisions.

Completion of maturation in the "unfertilized" eggs of other insect genera is not always associated with parthenogenesis. For instance, in the grasshopper, *Melanoplus,* maturation divisions proceed in essentially the same way as in eggs which receive sperm (*10*). Here the stimulus for eggs to develop beyond metaphase of the first division evidently acts during the process of egg laying. This also may be true of *D. melanogaster* (*11*).

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Regeneration of Hydra from the Endoderm

Abstract. The endoderm of hydra, when cultured independently, can differentiate so that the total animal is reconstituted. Reconstitution or regeneration, or both, occurs without the demonstrable aid of the interstitial cells.

Two theories are held concerning the regeneration of hydra. One states that interstitial cells must be present for regeneration to take place and that the interstitial cells differentiate into the new cells of the regenerate (*1*). Papenfuss and Bokenham (*2*) claimed that the constituents of both cell layers were necessary. Brien and Reniers-Decoen (*3*) and Chapman and Tilney (*4*) have followed the differentiation of the interstitial cells and concluded that they function to form gametes and nematocysts.

However, Kanajew (*5*), employing histological techniques, traced vitally stained cells in the regenerates and concluded that endoderm may be formed solely from pre-existing endodermal cells without the aid of the interstitial cells. Tokin and Gorbunowa (*6*) and von Bertalanffy and Rella (*7*) demonstrated that total regeneration of hydra can take place from a reaggregated mass of cells obtained from the pedal disc. Histologically, only endodermal and ectodermal cells are present in the pedal disc. In addition, Brien and Reniers-Decoen (*8*) showed that regeneration could proceed after the destruction of the interstitial cells by x-radiation. The same authors, by means of vital staining and grafting experiments, observed that an individual cell is labile, and found that it goes through several histological changes during its life cycle. In 1958 Zwilling (*9*) reported that total reconstitution of *Cordylophora* can be obtained from the ectoderm.

This is a preliminary report on experiments to show that total regeneration or reconstitution, or both, of hydra can develop from the endoderm alone.

The animals, *Pelmatohydra oligactis,* were collected and then cultured under simulated natural conditions. The procedure consisted first of the removal of the anterior end of the animal; then the remainder of the animal was treated with a buffered mixture of saturated solutions of pancreatin and amylase at room temperature, to digest the mesogleal layer. When the mesoglea was sufficiently digested, the two cellular layers of the animal were mechanically separated. The isolated endoderm and ectoderm were cultured separately in a saturated solution of sulfadiazine in filtered "pond" water at approximately 15° to 20°C. Within a few hours the endoderm formed a smooth-surfaced solid ball. Under optimum conditions, between 18 and 24 hours later, the ball formed an elongated hollow mass. At the end of 2 days of culture the elongated mass developed the ability to contract both longitudinally and circumferentially when gently stimulated mechanically. By the end of 3 days at least one tentacular nub could be seen. Between days 5 and 6 three short tentacles, complete with batteries of nematocysts, formed around a definable hypostomial region. The tentacles had the ability to elongate and contract. On the 7th day microcrustacea were introduced into the culture medium as food. The capture and utilization of food by the newly reconstituted animals were used as the criteria of their complete reconstitution.

In no case did the separated ectodermal layer reconstitute, although the cells often remained together for a few hours. Then they would either separate and disintegrate, or the whole mass would flatten on the bottom of the culture dish and disintegrate.

Stained preparations of the separated ectodermal and endodermal cell masses have shown that no histologically recognizable interstitial cells were included with the endoderm in these regeneration experiments. However, interstitial cells and all stages of their development into nematocysts were recognized in the ectodermal preparations.

Work is presently in progress to refine the procedures used to obtain the endoderm and to describe cytologically the events that take place during the reconstitution or regeneration of hydra from the endodermal layer.

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