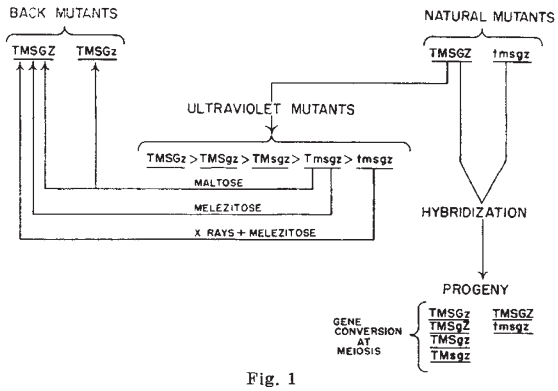

Fig. 1

occur in an orderly manner[3]. This view was further supported by the relative frequencies of the different types of mutants induced by ultra-violet radiation.

Back mutation of the gene occurred from 'recessive' to 'dominant' when the ultra-violet-induced mutants (*tmsgz* excluded) were exposed to substrate which they could not utilize. The gene *tmsgz* had proved refractory to back mutation by substrate alone (or by ultra-violet and substrate). Mutations of *tmsgz* back to *TMSGZ* were induced by the combined action of X-rays and substrate[4]. The linear mutation–dose-response curve for X-ray-melezitose induced back mutants, and the failure to detect intermediate variations of the gene indicates that the mutation from *tmsgz* to *TMSGZ* is a single event (Pittman, D., Lewis, C. H., and Lindegren, C. C., in preparation). The synergistic effect of X-rays and melezitose being necessary to induce the single event suggests that X-rays render the gene mutable and melezitose specifies the mutation. The five traits of the back mutant are transmitted as a single gene in hybrids. The cleavage-rate of melezitose by X-ray-induced back mutants was lower than that of a wild type strain, indicating that the 'new' gene was not so potent functionally as the 'original' gene.

Fig. 1 is a diagram of the various manifestations of the gene and the effect of various agents upon them. Ultra-violet radiation effects the degradation of *TMSGZ* to produce five different genes with the relative frequencies: $TMSGz > TMSgz > TMsgz > Tmsgz > tmsgz$. Each of the 'degraded' genes is characterized by the inability of the mutant to respond adaptively to one or more of the inducing substrates by the induction of the enzyme melezitase. The fact that only five of 31 possible genes are produced by ultra-violet radiation of *TMSGZ* supports the view that the degradation of the gene is an orderly process, and that the gene is limited in the number of its manifestations. The 'intermediate' genes respond to substrate alone (without the mediation of radiation) by back mutation. Back mutation of *Tmsgz* on melezitose produced only *TMSGZ* while back mutation of *Tmsgz* on maltose produced both *TMSGZ* and *TMSGZ*, indicating that substrate specifies the back mutation to a limited extent. The fact that back mutation from those induced by ultra-violet radiation can occur led to the inference that the phenotypes of the intermediate genes do not result from deletion but rather from alteration of the gene. The gene *tmsgz*, which is incapable of responding as an inducer to any of the substrates, is incapable of reverse mutation by exposure to substrate only. Although *tmsgz* cultures are refractory to back mutation when plated on the five substrates, if exposure to substrate is preceded by X-irradiation, back mutation occurs. It is inferred that X-rays and the substrate act synergistically and that X-rays render the gene mutable and substrate specifies the mutation which shall occur. In the absence of either X-rays or substrate, mutations occur at a very low rate. The X-ray-substrate back mutants are of two types—either the totipotent *TMSGZ* or *TM'SG"Z'*, the latter being variable in their capacity to respond to the inducers maltose, methyl-α-D-glucopyranoside and melezitose. The variable mutants may be originally *TMSGZ* but may lose some recently acquired capacities rather readily. The stability of *S* may mean that a mutation at another locus (*SU*) had occurred. These variable mutants are under further investigation to determine the nature of the instability induced by radiation. The reconstituted *TMSGZ* gene is functionally less active than the original gene. These 'restorative' mutations resemble the repair of a damaged locus rather than the construction of a 'new' gene. A capacity not found in the genus might be introduced by exploitation of the combined effects of unequal crossing and the synergistic effects of substrate and radiation.

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Abundance of Pogonophora

A previous communication[1] reported the occurrence of Pogonophora in the Atlantic. Since then another cruise has been made on R.V. *Sarsia*, and more preserved material examined. Species of *Siboglinum* have now been taken at six stations along the continental slope between lat. 47° 56′ N., long. 7° 56′ W. and lat. 48° 32′ N., long. 10° 11′ W. at depths ranging from 300 to 710 fathoms, and specimens of at least three of them brought back alive to the laboratory. Species of the same genus have also been found in bottom samples taken by Mr. N. A. Holme in 1956 at depths of only 80–90 fathoms off Dingle Bay on the west coast of Ireland.

Clearly, these interesting relatives of the chordates must be widely distributed in communities on muddy bottoms, and not only in deep water. It is surprising that they have escaped previous notice, as the areas where they have now been found were among the first to be dredged and trawled over by marine zoologists. No doubt the superficial resemblance of the tubes to the fibres used in dredge and trawl netting has hindered earlier recognition.

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