Robertson, F. W. Institute of Animal Genetics, Edinburgh, Scotland.
Adaptation and sexual isolation.

Populations of D. melanogaster, derived from the cage Pacific population, have been adapted to a new diet containing the chelating agent, EDTA, which reduces growth and survival with increasing concentration (Steffensen 1957). The adapted strains survive perfectly at levels of EDTA which are lethal for the original population. Chromosome analysis suggests that a number of loci are involved and also reveals striking epistatic interaction. Under optimal conditions, the original population and the populations adapted to EDTA, grow at similar rates, but under crowded, competitive condition, the performance of the foundation population is superior to that of the others. The F_1 of crosses is roughly intermediate and therefore does not grow as well as either the original population under crowded conditions, or the EDTA-adapted population on the EDTA medium. Since the relative fitness of foundation and adapted populations is influenced by the diet, we have suitable material for discovering whether sexual isolation will develop, with different levels of gene flow between populations living in two environments to which they are particularly adapted. Accordingly replicate pairs of cages, supplied with either the ordinary medium, (lacking the usual dried yeast component), or the EDTA medium were joined by glass tubes of different diameters. Flies of either the original or an adapted population were introduced into the appropriate cage and the populations have been allowed to run for 30-40 generations. At intervals samples were withdrawn from either cage of each combination to test for performance on alternative diets and also for sexual isolation. Differences in growth on alternative diets became progressively less and cannot now be detected. The rate of approach to this similarity was correlated with the tube diameter, which clearly influenced gene flow. Originally there was no evidence of sexual isolation between the control and the EDTA population, nor has there been the least evidence of such isolation in any of the experimental series. In addition, selection for positive assortative mating, in conditions in which flies of the original and the EDTA-adapted population are given an equal chance of mating, has failed, after 15 generations, to provide any evidence of sexual isolation. Statements occur in the literature to the effect that restricted gene flow between populations of Drosophila adapted to different environments is sufficient to promote effective sexual isolation. These data suggest, however, that such assertions are merely speculative.

Reference: Steffensen, D., 1957, Nature 180:300.

Hackman, R. and S. Lakovaara. University of Helsinki, Finland.
The temperature sensitive period of ommatidium determination in rolled mutants of D. melanogaster.

In a paper dealing with the effect of the rolled (rl) locus in D. melanogaster, one of the authors (Lakovaara 1963, Ann. Acad. Sci. Fenn. A, IV, 73:1-58) established that incubation at temperatures above 18°C has a detrimental effect on size and structure of the compound eye. The size of the eye reached a minimum at 26°C with rl in a hemizygous condition. Making use of this sensitivity to rearing temperature it was attempted to elucidate at what stage of development the mutant rl allele influences eye formation.

In the parent crossing the stocks rl/rl and Cy/Df(2)rl^{10a} lt cn were used. The fertilized females were allowed to lay eggs for a short period in culture bottles. The cultures were incubated at 26°C, but every 24 hours a number of them were transferred to 18°C and left there, allowing the flies to complete their development. When the flies emerged, the rl/Df(2)rl^{10a} lt cn individuals were collected, and the mean basal surface of the eyes in each transfer group determined and plotted graphically as a function of developing time.

The graph so obtained indicated that flies reared at 26°C reach their temperature sensitive period (T.S.P.) 36 hours after hatching from the eggs, and that the T.S.P. ends at 96 hours after hatching, coincident with puparium formation. The greatest sensitivity was found at about 60 hours after hatching, when the flies were in the beginning of their third larval instar. At this stage the cells of the eye disk are apparently starting to differentiate (Bodenstein, D. 1950, Biology of Drosophila, ed. M. Demerec). Accordingly it seems reasonable to suppose that the mutant rl allele acts by a temperature sensitive enzyme or other mediator directly on the differentiation and/or growth of the cells forming the ommatidia.