Gregg, T. G. and J. Day. Miami University. A further note on ovoviviparity in *Drosophila*.

It has been observed (King and Sang, DIS 32) that fertilization can, on rare occasion, take place in the ovariole in *melanogaster* females. It has also been observed (Gregg and Day, DIS 37) that there is considerable variation between strains in the extent to which adult, virgin *melanogaster* females retain and store mature oocytes.

King (DIS 38) has suggested that egg retention and ovariolar fertilization are two conditions that are necessary for the development of ovoviviparity. He further suggested that the interstrain variation in egg retention in *melanogaster* virgins gives some indication of the genotypes available in *Drosophila* for the establishment of high egg retention, and the development of ovoviviparity.

It may be pointed out that, indeed, not only are the genotypes available in *Drosophila* for the establishment of high egg retention, but that there is at least one species, *D. hydei*, where a type of egg retention has been established. Furthermore, this retention occurs not only in virgin females aged beyond the normal mating time, or in females under adverse conditions, but in mated, laying females as well. In *melanogaster* virgins egg retention results because the females abstain from laying while eggs continue to be produced. In *hydei*, a large species with a long life cycle, a large surplus of eggs is built up prior to the onset of laying while the female is maturing. After the onset of laying the rate of production of new eggs approximately equals the rate of oviposition. Thus, even in the ovaries of laying females there is a large number (100-150) of fully developed eggs. At the rate of oviposition generally encountered under optimum conditions in the laboratory (40-60 eggs/female/day) a newly produced mature oocyte will remain in the ovary, on the average, two to three days before it is laid. Under adverse conditions the retention time would undoubtedly be increased.

Thus far, ovariolar fertilization has not been observed in this species during the course of dissecting approximately 500 females.

The retention of eggs in *hydei* probably explains the capacity that these females have for laying prodigious numbers of eggs in short bursts, since retention would result in a reserve that could be drawn on in times of peak egg laying. It is easy to imagine that such a capacity would be selected for in a species where females routinely lay eggs in environments that are suboptimal for egg deposition, with occasional opportunities arising for the deposition of eggs in choice environments.

Most of the data on egg retention in *hydei* have been obtained from a mutant (w lt) lab stock, but a wild-type lab stock has also been checked. One hundred virgins (one day old) from the w lt stock were separated into two groups of fifty each, and individually placed in vials. The females in one group were mated (i.e. placed with males), and the females in the second group were not. Each females was transferred to a fresh vial every day, and the eggs laid on the previous day were counted. Also, each day several females in each group were sacrificed to determine the number of mature oocytes present in the ovaries, the number of ovarioles present, and whether the female had been inseminated. Females in the mated group were mated to males of approximately the same age, and insemination usually occurred on the seventh day after the eclosion of the female, but never sooner. There is some indication from other experiments that the use of older males can speed the process of insemination by a day or two.

An ovariole count of 148 ovaries of various ages showed an average of 21 ovarioles per ovary. There does not appear to be any increase or decrease in the number of ovarioles with age. The average number of mature oocytes present in a three day old female is about twelve. Mature oocytes continue to accumulate until the seventh day when each female contains an average of 125. The average number of eggs laid by twenty-nine females for an eight day period, from day seven to day fifteen, was 58 eggs/female/day. In seven day old females, even if they have been inseminated, most of the ovarioles contain three mature oocytes. However, some of the peripheral ones contain only two, while some of the central ones contain as many as six. The typical ovariole from an inseminated laying female from the ninth to the fifteenth day continues to contain two or three mature oocytes. The appearance of the ovarioles in the virgin females parallels very closely that in the mated females with the exception that since the virgins are laying very few eggs, there is no turnover of eggs in these ovaries after the initial accumulation. After fifteen days, the number of mature oocytes in the ovaries becomes more variable. The fact that the females were kept in separate vials makes it possible to assert with certainty that females that were laying fertile eggs were also retaining eggs. There appeared to be an inverse correlation between the number of eggs laid in a day and the number of mature oocytes present in the ovaries at the end of the day, but the data were not sufficient to establish this point. It may also be pointed out that the type of egg retention exhibited by hydei is not necessarily characteristic of large flies with long life cycles. In D. virilis which is very similar to hydei in these two respects, the number of mature oocytes in the ovaries of a seven day old virgin is very small, averaging less than one per ovariole.

Average egg retention for several kinds of hydei females are shown in the accompanying table.

Egg Retention in hydei females

	7 day old virgins	18 day old virgins	18 day old mated
w lt	103/female(34♀♀)	87/female(62♀♀)	127/female(62♀♀)
wild Type	124/female(47♀♀)		

Edwards, J. W. and J. R. Simmons. Utah State University. Optic asymmetry and the absence of somatic crossing-over in D. melanogaster.

A developmental problem in such D. melanogaster mutants as eyeless and eyes-reduced is the occurrence of structural optic asymmetry in otherwise bilaterally symmetrical organisms. Intra-organismal nuclear differentiation by means of somatic crossing-over was discovered by Stern in 1936. He found that the frequencies of mosaicism in heterozygotes varied from 0.0 to 6.0 percent in the head-thorax and from 4.6 to 20.0 percent in the abdomen. The presence of minute factors increased the frequencies by 0.0 to 22.3 percent in the head-thorax and by 8.0 to 36.6 percent in the abdomen.

DeMarinis (Genetics 44:1101-1111) reported that, barring the less common events such as somatic mutations and somatic crossing-over, the same genetic constitutions occurred on corresponding sides of bilaterally symmetrical organisms. He concluded that, consequently, asymmetry must have resulted from differences in external and internal environmental factors. Somatic crossing-over is an established phenomenon, however, and genetic factors have been shown to increase its frequency. Also Baron (J. Exp. Zool. 70:461-490) had stated that sets of modifiers were present on all chromosomes, particularly the second and third in flies homozygous for ey^2. Thus, it seemed desirable to test critically for the possible occurrence of the "less common" phenomenon of somatic crossing-over. If this were occurring, structural optic asymmetry would result from nuclear differentiation by means of somatic crossing-over. Further, although all nuclei were homozygous for the eyeless genes, the recombination of genetic modifiers in the second and third chromosomes (and in the X-chromosomes of females) would yield asymmetrical phenotypes.

To test this possibility, the second and third chromosomes were marked with bw and st genes. Six kinds of experimental crosses (all progeny were homozygous for ey^4) and two kinds of control crosses (progeny were ey^4/+ or +/+) were made. The following genotypes resulted: (1) bw/+;st/st;ey^4/ey^4 (2) bw/bw;st/+;ey^4/ey^4 (3) bw/+;st/+;ey^4/ey^4 (4) bw/+;st/+;ey^4/+ (5) bw/+;st/+;+/+. Only white ommatidia were scored.

The experimental crosses produced 2593 flies. Six had mottled pigmentation (white ommatidia) in one eye. Of a total of 1396 flies produced from the control crosses, one female was observed to have white ommatidia in one eye. Thus, the observed frequencies of mosacism in the experimental and control groups were 0.23 percent and 0.07 percent, respectively. No simple objective method for accurately measuring asymmetry has been devised; however, by using the frequency of flies with ommatidia only on one side of the head, a minimum estimate was possible. Of the 155 progeny so scored, 35 or 22.6 percent had asymmetrical eye structure. Consequently, the conclusion seems justified that somatic crossing-over probably does not play