which are lethal unless covered by the Y in the $Y^S \cdot X \cdot Y^L$ chromosome. Since these are nearly half of the small sample of flies tested cytologically, we conclude that most if not all of the doubling in rate of the double losses is due to these normally lethal ring Y chromosomes being transmitted in the special cross. This illustrates one problem of germinal selection even at low induced rates.

Keller, E. C. Jr., H. E. Keller and E. Liner. University of Maryland, College Park, Maryland. Heterosis in xanthine dehydrogenase activity levels.

Males of ten highly inbred wild-type strains of D. melanogaster and their F_1 interstrain hybrid progeny were tested for their respective levels of xanthine dehydrogenase (XDH) activity. The ten strains were collected in 1954 from the same locality and have been previously classified as within the "normal" XDH activity range (Keller, 1964). The method of assay was the fluorometric technique similar to that described by Keller and Glassman (1964). Progeny from the two genetic types (F_1 interstrain progeny and parents) were reared at two temperatures (18°C and 26°C) with the same parents being used for both temperature experiments. The total sample size of the balanced experiment was 604 flies.

Table. Average Xanthine Dehydrogenase Activity Levels and Variances for Ten Wild Type Inbred Strains and Their F_1 Progeny.

Genetic Type	TEMPERATURE				Average
	18°C		26°C		
	Average	Variance	Average	Variance	
Inbred Parents	4.03	0.542	3.16	1.463	3.59
F_1 Progeny	4.22	0.802	3.86	1.608	4.04
Average	4.12	------	3.51	------	3.82

The Table shows the mean XDH activity levels and their respective variances (for the experimental groups only) over the two temperature conditions for the two genetic types. On the average, the F_1 progeny showed significantly greater XDH activity than their parents (at both temperatures). Also, there was a greater activity differential between the F_1's and their parents at 26°C than at 18°C. One-tailed unpaired "t" tests were used, within temperatures, to complete the statistical tests. Preliminary tests showed that the F_1 progeny always had greater XDH activity levels than their inbred parents. The "t" value for the difference between the means of the parents and their offspring was 3.74 (285 d.f.) at 26°C and "t" = 1.75 (314 d.f.) in the 18°C experiment. The former "t" value is significant beyond the 0.1% probability level, the latter "t" value is significant beyond the 5% probability level. Examination of the average XDH activity levels at different temperatures revealed that flies reared at 18°C showed significantly greater enzyme activity than those

flies reared at 26°C. This difference could be due to the significant average size difference that exists between the different temperature-reared flies (similar to that XDH activity sex difference that exists in D. melanogaster, Keller, 1964). This temperature difference could also be due to certain developmental homeostatic mechanisms.

Within the temperatures there was a very strong familial association of the XDH activity levels (specific combining abilities) however, the data as reported here completely confound these family differences and only the overall averages are reported. A complete diallel analysis is currently being completed and will be reported later.

As seen in the Table the variances of the XDH activities among the 18°C reared flies (within genetic type) were significantly lower than those of the 26°C reared flies for both the inbred parent and the F_1 progeny groups. The variance ratios (F values) for the differences between the variances of the temperature groups were F = 2.702 (significant beyond the 1% probability level) for the inbred parents and F = 2.005 (significant beyond the 1% probability level) for the two F_1 groups. Further, the variances of the F_1 progeny, at both temperatures, might have been greater than the variances of the parents. In this experiment, the differences between the variances of the XDH activity of the parents were not significantly different from the variances of the F_1 progeny, at either temperature.

The significance of these findings include: first, that there are significant average "heterotic" effects in XDH activity among the F_1 progeny of certain inbred strains of D. melanogaster. Secondly, there appears to be a developmental homeostatic phenomenon that is highly associated with developmental speed (or temperature). Thirdly, the variation among the XDH activity of F_1 progeny of inbred strains might be greater than that variation present among the inbred parents. Of specific interest in this respect is the fact that the variances in the F_1 progeny were not less than that of the parents. However, this could be a simple consequence of the greater average XDH activity of F_1 progeny which might have been predicted under the theory of genetic homeostasis. (Supported by USAF/OSR Contract #AF 49(638)-1603).

Waldner-Stiefelmeier, R. and P. S. Chen.
University of Zürich, Switzerland. Proteolytic digestive enzymes in D. mel.

In connection with our studies on the biochemical effects of lethal factors in Drosophila, analyses have been carried out on the proteolytic digestive enzymes in both the wild type and lethal mutants. Using azocasein as substrate at an assay temperature of 38°C, maximum digestion was found to occur in the alkaline range at pH 8.3. When azoalbumin and haemoglobin were used instead of azoacasein, no enzyme activity could be detected in the acid range from pH 1.0 to pH 5.8. Extracts of wild type midgut from 4-day-old larvae show the highest value, but homogenates of whole larvae indicate a distinct drop from the 3rd to 4th day, apparently due to the rapid increase of unspecific proteins in the haemolymph and tissues at this later period of larval life. With the beginning of pupation the activity rapidly declines to a hardly detectable low level, but rises again shortly before adult emergence. Thus the enzyme activity during pupal development follows a U-shaped curve. In female adult flies maximum digestion has been observed at about 24 hrs. after emergence, corresponding to the period of intensive ovarian growth. The maximum for male flies also occurs at about the same time, but the absolute values amount to only 30% of those for females. Furthermore, we found that after a starvation period of 6 and 8 hrs. the enzyme activity was reduced to 75-89% of the normal level in fully grown larvae, and to 45% in the 3-day-old females flies. However, it seems that starvation has no effect on the digestive ability of adult males at similar ages.

In order to analyse the individual proteolytic components, midgut extracts from 4-day-old wild-type larvae were incubated with various synthetic substrates. The presence of trypsin is suggested by the hydrolysis of N-benzoyl-L-arginine ethylester. Since L-tyrosine ethylester is not attacked, chymotrypsin is probably absent. Likewise the hydrolysis of both N-carbobenzoxyglycyl-L-phenylalanine and L-leucine-β-naphthyl-amide demonstrates the occurrence of carboxypeptidase A and aminopeptidase respectively, whereas the lack of activity for N-benzoylglycyl-L-lysine indicates that carboxypeptidase B is not involved. By means of polyacryl-amide gel electrophoresis we found that the mobility of the tryptic component in Drosophila differs from that of bovine trypsin, suggesting that the structure of this insect enzyme is not the same as that of vertebrates. These results provide evidence that the