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

pattern of proteases in Drosophila is heterogeneous, and at least 3 components contribute to the total proteolytic activity observed.

Based on azocasein hydrolysis the proteinase activity in the lethal lme/lme larvae aged 3-4 days has been determined to be only 48-58% of that in the wild type of corresponding ages. This is in agreement with our previous findings from both in vitro experiments (Chen and Hadorn 1955) and histo-chemical analyses (Meyer-Taplick and Chen 1960). On the other hand, the enzyme activity in 4-day-old homozygous larvae of the lethal mutant ltr has been found to be as high as 95% of the normal value. This indicates that the deficiency of proteolytic digestive activity of the mutant lme is probably locus-specific.

Shima, T., A. Kaneko and E. Momma.
Hokkaido University, Sapporo, Japan.

On some aspects of the copulation, insemination reaction and sperm storage in two species of quinaria group.

The first mating between virgin females and males of D. brachynephros and of D. unispina were observed during the period from the 4th day to the 12th day after the emergence, at the temperature of 20°C. Mating occurred in most cases on the 8th day. Copulation times were recorded for 100 pairs in the two species. The average time was 9 minutes and 36 seconds (ranged 5' 10" - 11' 42") for D. unispina, and 5 minutes and 6 seconds (ranged 3' 43" - 6' 51") for D. brachynephros. The reproductive organ was dissected out in a saline solution under the binocular microscope. A total of 998 females (478 for D. unispina and 420 for D. brachynephros) was dissected at varying times, starting immediately after copulation and extending through for about 40 days. The results of insemination reaction and sperm storage are summarized in the table. The evidence presented suggests that both species belong to a group of species which develops a large insemination reaction in homogamic matings (Wheeler, 1947).

Table 1. Insemination reaction and survival of sperm within the storage organs of females in D. unispina and D. brachynephros.

	D. unispina					D. brachynephros				
		Sperm storage					Sperm storage			
Time of dissection	insemination reaction	uterus	seminal receptical	spermathecae	remarks	insemination reaction	uterus	seminal receptical	spermathecae	remarks
immediate	a	+++	-	-	A	a	+++	-	+	A
2-minutes	b	+++	+	+	B	b	+++	+	+	B
10-minutes	c	++	+	++		c	++	+	++	
1-hour	d	+	+++	+++	C	d	+	+++	+++	C
3-hours		+	+++	+++			+	+++	+++	
6-hours	e	-	+++	+++			+	+++	+++	
7-hours		-	+++	+++	D	e	-	+++	+++	
9-hours		-	+++	+++			-	+++	+++	D
5-days		-	++	++	F		-	+++	+++	E
10-days		-	++	++			-	++	++	F
20-days		-	++	++			-	+	+	G
30-days		-	+	+	G		-	-	+	I
40-days		-	+	+	H		-	-	-	J

+++: large amount of sperm. ++: less sperm. +: few sperm. -: no sperm. a: beginning to enlarge. b: reaction mass in uterus c: small mass opaque. d: maximum size. e: mass reduced. A: end of coitus. B: highly motile sperm. C: both organs full of sperm. D: uterus normal. E: sperm few reduced in both organs. F: sperm reduced in both organs. G: sperm more reduced in both organs. H: very few sperm in both organs. I: no sperm seminal receptable. J: all gone.