Reversible stocks differ from the unstable stock 1zA, which is their ancestor. These differences are especially distinct during pupariation and 48 h later. In the first stage of pupal development the activity of phenol oxidase is higher in reversible stocks in comparison with 1zA ($P > 0.999$) but 48 h later the enzymatic activity is higher in stock 1zA. The similar pattern of changes of the enzymatic activity in the reversible stock A+1 and Oregon R was established.

After microelectrophoretic investigations and densitometry we determined the ratio A_2/A_1 - fractions of phenol oxidase. The results are shown in Table 2. Stock Oregon R is characterized by the predominance of A_1 fraction (monophenol oxidase). The ratio $A_2/A1$ in this time is equal to 0.76 ± 0.07. Then (24 h after pupariation) the activity of the fraction A_2 (diphenol oxidase) is higher. The total enzymatic activity decreases in this period (see Table 1). Probably this process is caused mainly by the change of activity of monophenol oxidase. However, in the following stages of pupal development (48 h and 72 h after pupariation) the ratio A_2/A_1 decreases again. In this period the total enzymatic activity increases and we suggest that the activity of A_2 fraction is not changed and the activity of A_1 fraction increases. The activity of A2 fraction is twice that of A_1 at 96 h after pupariation. The total enzymatic activity is relatively low in this period. Probably the predominance of A_2 fraction is explained mainly by the decrease of activity of monphenol oxidase. It can be proposed that the changes of the enzymatic activity and the pattern of phenol oxidase isozymes is caused by the changes of the level of activity of monophenol oxidase.

Unstable stock 1z50 is characterized by the specific change of the pattern of isozymes of phenol oxidase during ontogenesis. In this stock diphenol oxidase is absent during puparium formation. Its activity is detected at 24 h after pupariation and is very high at this time (ratio A_2/A_1 is 3.7 ± 0.4). Monophenol and diphenol oxidases are present at 48 h after pupariation. However, the activity of A2 fraction sharply decreases at the end of pupa development. Diphenol oxidase is not detected at 96 h after pupariation. The activity of diphenol oxidase is not detected in the unstable stock 1zA during pupariation and 72 and 96 h after pupariation. The pattern of changes of the ratio A_2/A_1 in the unstable stock 1z50 is different from Oregon at this time, although the total activity of enzyme is similar. Unlike the Oregon R stock, 1z50 is characterized by the predominance of diphenol oxidase at 72 h after pupariation (ratio A_2/A_1 is 2.25 ± 0.3), but the activity of monophenol oxidase is higher at 96 h (A_2/A_1 is 0.61 ± 0.08). The ratio A_2/A_1 in this case at 72 h after pupariation is intermediate between Oregon and 1z50.

We conclude that the unstable stock A has some specific capacities in the pattern of changes of activity of phenol oxidase and pattern of isozymes of phenol oxidase during development and is different from the stable stock 1z50, reversible stocks and wild stock Oregon. Probably the instability of locus 1z is explained by the insertion and exclusion of a strange segment of DNA into the region of this locus. In this case the regulatory effect of locus 1z on the ratio A_2/A_1 is changed.

References: Korochkin, L. et al. 1977, Genetics of Isozymes, Nauka, Moscow (in Russian); Mitchell, H. 1966, J. Insect Physiol. 12:755.

Platt, S.A. Northern Michigan University, Marquette, Michigan and University of Illinois, Champaign, Illinois. Discrimination learning in individual D. melanogaster.

By using a unique methodology and a versatile series of choice points in two distinct apparatus, individual Drosophila were shown to possess the ability to learn (Platt, Holliday and Drudge 1980). This behavior can be controlled by a discriminative stimulus (substrate texture). Following a correct response in the presence of the discriminative stimulus at a horizontal choice point, D. melanogaster bred for negative geotaxis in a Hirsch-type geoselection maze were given the opportunity to ascend a vertical alley leading to another choice point. When cues were consistent reliable learning occurred. When cues were inconsistent learning did not occur. Cue reversal produced the classic temporary increase in "incorrect" responses.

The apparatus is inexpensive and versatile. It is described in a technical note herein (Platt and Holliday). We believe there are several factors responsible for our successful demonstration of discrimination learning in D. melanogaster. In general, we took an ethological perspective that the association of a discriminative stimulus with some response pattern would be possible if, and only if, we did not elicit tropistic or escape responses.

Lights and odors tend to elicit an automatic, stereotyped approach response highly resistent to modification. Noxious stimuli (e.g., shock, shaking, sudden movements, sudden strong light) inevitably elicit immediate, and apparently disruptive, flight (escape) responses. We, therefore, allowed the fly to progress from one trial to the next with a minimum of disruption and experimenter interference. Our "reinforcer" for the negative geotaxic strain, the opportunity to ascend a vertical tube, led to the next choice point. At the choice point the presence or absence of paper served as a substrate discriminative cue.

At each of 30 horizontal T-choice points, a correct response was recorded if the fly did not reach the end of the cul-de-sac arm and continued up the vertical alley at the end of the correct arm of the T. An incorrect response was recorded if the fly touched the end cap of the cul-de-sac. Learning was observed in individual flies as an increase in number of correct responses over the 30 choice points. Convincing evidence was noted when the consistent discriminative cue at the first 15 choice points (consistent presence or absence of paper in the arm leading to the next vertical alley) was reversed for the second 15 choice points. Many "incorrect" responses were noted as choice points 16-18 where the previously correct discriminative cue now led to the cul-de-sac.

Using this paradigm and apparatus we are currently attempting to selectively breed for a behavior change over trials--learning.

Reference: Platt, S.A., M. Holliday and O.W. Drudge 1980, J. Exp. Psych: Anim. Beh. Proc. 6(4):in press.

Polivanov, S. Catholic University of America, Washington, D.C. Possibly non-Mendelian factor for stimulation of egg deposition.

We reported recently (Polivanov et al. 1980) that lz^{63i} males of D. melanogaster stimulate egg deposition by lz^{63i}/M-5 females to a greater extent than M-5 males. The original mutant lozenge male was crossed to M-5 females approximately six years before our experiment began and since that time the lozenge mutant was maintained on M-5 background. Consequently, it is reasonable to assume that the genetic background of the lozenge and M-5 males was largely equalized, and that M-5 and lz males differed, on the average, from each other only in the X chromosomes. If this is so, then the genetic factor responsible for the increase in egg deposition should be associated with the X chromosomes, containing the mutant $lozenge^{63i}$. In our experiment populations were started with lz/M-5 females and with either lozenge or M-5 males. All populations were started with 100 pairs of flies and were maintained for one generation. Apparently overproduction of eggs in the lozenge-fathered populations led to overcrowding and extremely high larvae mortality. As a result of that, the average size of lozenge-fathered F_1 populations was 529, while that of the M-5 fathered ones was 1041. Checking my old records, I found that I performed a similar experiment in the past but that experiment was initiated for a completely different purpose (Polivanov, unpub.). In that experiment 8 populations were also started with 100 lz/M-5 females and with 100 either lozenge or M-5 males. In four of these populations the flies were derived from one subpopulation, while in the other four they were derived from the other subpopulation. These subpopulations were isolated from each other for approximately 12 generations. The total number of adult flies in the F_1 of the eight experimental populations was as follows:

Populations derived from subpopulation 1		Populations derived from subpopulation 2	
Pop. #	Total # of flies	Pop. #	Total # of flies
	lz-fathered		lz-fathered
1	821	5	782
2	848	6	851
	M-5 fathered		M-5 fathered
3	1286	7	838
4	1164	8	827

If the sizes of these populations reflect the stimulating effect of the males, it could be said that in the population derived from Subpopulation 1 there was a difference in the stimulating effects of lz and M-5 males, while none of such existed in the populations derived from Subpopulation 2. It is interesting to note that visible recombinants between lz and M-5 X chromosomes were almost completely absent. There was found one recombinant in three out of the eight populations.