marker stocks experienced the same temperature regimes. It is the position of ts-mutation that determines the crossover frequency: y ct is abundant in the case of ts155, since it results from a single exchange, but is absent in the case of ts398, where it would have emerged only after a triple exchange.

The data on temperature effects on the recombination itself was obtained using the "pupal system" of Grell (1973) which allows the registration of the consequences of heat-shocks experienced by the synchronous population of F_1 oocytes. According to the method y w ct females were mated to ts398 wy males and allowed to lay eggs for 4 hr and the egg samples were either set for development at constant temperatures 25°C and 29°C or given 24 hr heat-shocks at 29°C. The 1st shock covered the end of embryonic stage--the beginning of the 1st larval instar, the 2nd given between 120-144 hr after egg-laying, coincided with the premeiotic synthesis of DNA (Grell 1973). The development of F_b took place at 29°C. The obtained results (Table 3) have shown that in all variants except the permanent development at 29°C ts398 maps in the same position, while the maximal temperature-sensitivity shows the region ct-wy, which contains the ts-mutation, due to increase or decrease in double exchanges. When in the same experimental design ts398 wy is substituted for dy wy, neither dy-wy region, nor ct-wy region deviate from the standard map distances and no map expansion is observable (data to be published in detail elsewhere). Thus the phenomenon of map expansion seems to deserve more attention than a mere by-product of mapping experiments, since in the similar experiments in Kiger's group (Salz et al. 1982), they found the reduced recombination around the EMS-induced muation dunce^{M14}, which lead to the decreased activity of PDE-II. In the case of ts398, provided the mutation is in the structural gene coding for calmodulin, the enlarged recombination might have been the result of the high degree of internal homology revealed in the amino acid sequence of calmodulin (Cheung 1980). A gene coding for such a protein could facilitate conjugational conformations for an unequal crossing over. The structure of the gene affected by ts155 may be suspected to have high internal homology as well. The recombinational properties of dunce^{M14} and ts398, which affect learning ability, and of ts155, affecting locomotor activity, make the system of gene control of cAMP metabolism rather promising for further studies on genetic control of the second messengers functions important for cell regulation and neural plasticity.

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Serotonin affects locomotor activity in **Drosophila** via cAMP system.

Serotonin injected into 3-day old virgin Drosophila females was shown to produce the pronounced dosage-dependent increase in locomotor activity, the effect being maximal at the 3rd hour after the injection (Kamyshev etal. 1983). The study of the fate of H^3-serotonin in the Drosophila organism leads to the conclusion that the increase in locomotor activity results from the stimulatory action of serotonin itself, while the rather long latency is likely to be related to N-acetylserotonin effects. The latter metabolite was shown to be the only product of H^3-serotonin conversion, its production being mostly intensive immediately after H^3-serotonin injection and its excretion being rapid enough to make the substance undetectable by the end of the second hour when about 50% of injected serotonin was still present in Drosophila tissues.

It is well known that in many cases serotonin produces its effects via cyclic AMP system: the serotonin-sensitive adenylate cyclase is found in nervous tissue of various insects and its pharmacological properties are similar to those of serotonin receptors in mammals and molluscs (Evans 1980). This work was designed to test the possibility that the effects of serotonin on locomotor activity are mediated via cAMP.

cAMP content was measured in virgin 3-day old females (10 flies per sample) of wild-type strain Canton-S using standard cAMP determination kit (Amersham, England). Serotonin creatinine sulfate (Reanal, Hungary, 20 ng of serotonin-base in 0.2 µl of saline) was injected using the previously described technique (Kamyshev et al. 1983).

The dynamics of the increase in cAMP content following serotonin injection (Fig. 1) resembles the dynamics of the development of its effects on locomotor activity (Kamyshev et al. 1983), i.e., the pronounced effect becomes evident only after a rather long latency of about 2 hr. Thus, it seems likely that the changes in locomotor activity level result from the changes in cAMP content and this is in accordance with the data on positive correlation between cAMP content and locomotor activity in Drosophila ts-mutants with impaired cAMP metabolism (Savvateeva & Kamyshev 1981). The more complicated question is why both effects of serotonin have such a long latency. The intensive production of N-acetylserotonin following the injection of H^3-serotonin might have been responsible for the delay in the manifestation

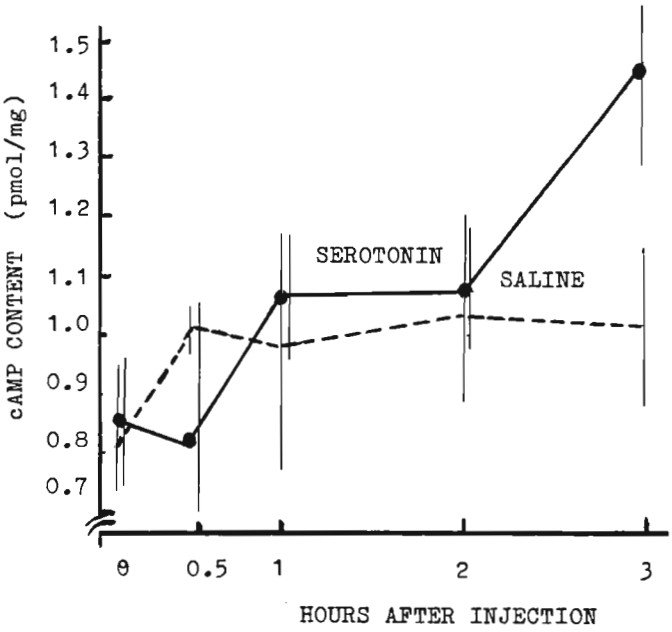

Figure 1. The dynamics of the increase in cAMP content following serotonin injection.

of serotonin effects on both the locomotor activity and cAMP content. N-acetylserotonin could either compete with serotonin for binding with the same receptor of serotonin-sensitive adenylate cyclase or affect any other factors involved into regulation of cAMP content. It is also possible that in our experimental design, when serotonin is injected into Drosophila abdomen, its effects could be amenable for registration only after 2 hr, since the substance has to be transported to the proper sites of its primary action.

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Apparent neutrality of amylase in **Drosophila pseudoobscura** grown on starch and maltose media.

In order to further understand the forces which affect genetic variability in natural populations, we have studied the amylase locus in **Drosophila pseudoobscura.** Amylase hydrolyzes starch to maltose. There are two common alleles at this locus in natural poulations, $Amy^{1.00}$ and $Amy^{.84}$. We previously found that the $Amy^{1.00}/Amy^{1.00}$ homozygote is significantly more viable when in direct competition with the other two genotypes under stressful conditions (25°C, low amount of starch) (Seager & Anderson, submitted to Evolution).

We used the same 40 lines with which we measured viability (20 independently derived lines of the two homozygotes, all homokaryotypic for the Arrowhead inversion) to establish two starch and two maltose population cages. For each set of cages initial frequencies of $Amy^{1.00}$ were near .90 or .15. In order to approximate the conditions under which viability differences had been found, the cages were kept at 25°C and we attempted to keep both starch and yeast amounts relatively low. The food contained 6% starch or maltose, 2% killed brewers yeast, 1.5% agar, and propionic acid.

The generations in the cages were discrete. Each generation we obtained adult and zygotic allele frequencies by electrophoresing 200 adult males and 200 adult females from the cages, and an equivalent number of adults raised under nearly optimal conditions from egg samples. The cages were continued for 10 generations with each generation lasting about a month. After generation 8 in the maltose cages and 7 in the starch cages, zygotic samples were no longer obtained. The starch cages were increasingly difficult to maintain and at generation 8 the population in starch cage I decreased substantially.

Table 1. Frequency of $Amy^{1.00}$ in population cages of **D.pseudoobscura** maintained on starch or maltose medium. The other allele present was $Amy^{.84}$. 800 alleles were sampled at each life stage in each generation. Z = zygotic frequency and A = adult frequency.

Generation	Maltose I		Maltose II		Starch I		Starch II	
	Z	A	Z	A	Z	A	Z	A
0		87.9		16.7		87.5		15.8
1	91.1	96.3	25.3	22.5	77.2	82.5	33.1	32.2
2	98.3	95.6	24.8	32.4	78.6	81.0	33.7	30.6
3	95.9	97.1	29.0	24.0	80.0	83.2	22.6	26.3
4	95.1	97.6	24.1	25.7	82.2	83.2	34.2	29.7
5	97.0	90.3	29.6	28.0	82.7	85.7	28.2	26.8
6	96.3	93.8	30.1	31.2	83.2	83.6	29.1	25.2
7	97.4	93.8	32.0	31.0	87.5	83.4	24.3	22.5
8	95.5	94.3	33.1	31.7		92.3*		24.7
9		92.9		33.0		93.8		15.7
10		91.5		38.3		96.7		21.6

* population size drastically reduced.