

tracer, pour chaque concentration de TNa, la droite théorique passant par les points  $\pm 100\%$  et  $\pm 0\%$  d'activité résiduelle. Pour chaque temps de mesure on peut calculer ainsi le pourcentage d'activité résiduelle théorique, et comparer ce dernier au pourcentage déterminé expérimentalement. L'expérience montre que la correspondance entre ces pourcentages est très satisfaisante, et que dans tous les cas examinés les points expérimentaux se distribuent sur une droite de la forme:  $y = -ax + b$ .

La différence de comportement que nous enregistrons entre les divers peptides ne peut, à notre avis, s'expliquer que dans le cadre général des relations entre structure et activité hormonale correspondante. De ce fait, on peut admettre que c'est la présence du résidu basique (arginine) dans l'AVT qui est déterminante dans la vitesse de réaction, alors que les résidus neutres (leucine, isoleucine, sérine) de l'ocytocine et de l'ICT sont incapables d'influencer la réaction, tout au moins dans des proportions comparables.

**Summary.** A kinetic study of hormonal inactivation in the presence of sodium thioglycolate was carried out using the rat uterus bioassay. In all cases we observed a total inactivation of the hormonal activities, whether the uterine horn is in the presence or not of magnesium. The hormones under consideration divide into 2 groups: the arginine-vasotocin group (rapidly inactivated), and the ichtyotocin and oxytocin group (more slowly inactivated). But, in all cases the rate of inactivation is linear.

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## The Visual Component in the Courtship of *Drosophila melanogaster*

Much of the research on ethological isolation between species of the genus *Drosophila* has been directed towards evaluating the importance of light for successful courtship and mating. Broadly there appear to be four principal ways in which visual factors may influence mating behaviour. 1. Differences in phototaxis and responsiveness to light may lead to assortative mating through the differential association of flies in light gradients. This could also be a factor involved in habitat selection. 2. Males may perceive females visually and therefore need light for efficient courtship. This does not imply that such flies cannot court successfully, but that their success is reduced in the absence of visual information. 3. Females may employ visual cues for species recognition, and require visual stimulation to become sexually excited by the courting male. 4. Light may have a general effect on the activity of the flies which could in turn have consequences for their readiness to court and to copulate.

Visual stimuli form an important element linked to a more complex sequence of orientated movements in the courtship of certain species such as *D. subobscura*<sup>1,2</sup>. GROSSFIELD<sup>3</sup> has offered a classification of *Drosophila* species with respect to the effect of light on their mating behaviour. The system divides the various species into one of 3 classes. Class I comprises species which mate equally well in light or dark. In Class II courtship is merely inhibited by darkness. Class III consists of species in which mating is blocked by darkness. The dependence of some species upon visual stimulation, which is implied by the findings on mating success in light and dark, suggests several possibilities. In the case of the male visual infor-

mation may be involved in the initiation of courtship, and successful location of a female, or in the release of a specific motor pattern at certain points in the courtship sequence. In a study of three races of *D. auraria* GROSSFIELD<sup>4</sup> reported evidence indicating that males of one of these strains fail to detect an important signal from the female in the absence of light. Females of certain species may need to perceive a visual signal from the male before accepting copulation.

It has been established that *D. melanogaster* can mate in darkness<sup>5</sup>, which has led GROSSFIELD<sup>3</sup> to place them in his class I (light independent). Evidence from studies on mutants, however, casts doubt upon this conclusion. There is a marked attenuation of visual acuity in phenotypically white eyed flies which lack the screening pigments serving to isolate the ommatidia of the compound eye. Such flies are effectively blind to movement in the environment<sup>6</sup>. CONNOLLY, BURNET and SEWELL<sup>7</sup> showed that males of a double mutant, white eyed *vermilion*; *brown* stock were at a marked disadvantage in a competitive mating situation when compared with flies having pigmented eyes. In a detailed analysis of the courtship this mating disadvantage was shown to be due to the male's difficulty in establishing and maintaining contact with the female. These observations suggest that visual information regarding the female is important to the male and consequently plays a significant role in the reproductive behaviour of this species.

Such a conclusion is supported by the results of a population cage experiment illustrated in the Figure. Flies of an inbred, phenotypically white eyed, double mutant *vermi-*

		♂♂	
		white	red
♀♀	white	7	44
	red	7	42
		14	86
			100

The phenotypes of pairs of flies which copulated in a multiple choice mating situation.

<sup>1</sup> U. PHILIP, J. M. RENDEL, H. SPURWAY and J. B. S. HALDANE, *Nature*, Lond. 154, 260 (1944).

<sup>2</sup> J. GROSSFIELD, *Am. Nat.* 104, 307 (1970).

<sup>3</sup> J. GROSSFIELD, *Proc. natl. Acad. Sci., USA* 68, 2669 (1971).

<sup>4</sup> J. GROSSFIELD, *J. Heredity* 62, 117 (1971).

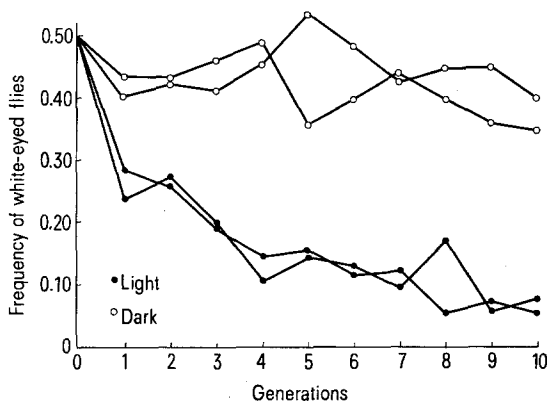
<sup>5</sup> H. T. SPIETH and T. C. HSU, *Evolution* 4, 316 (1950).

<sup>6</sup> B. BURNET, K. CONNOLLY and J. BECK, *J. Insect. Physiol.* 14, 855 (1968).

<sup>7</sup> K. CONNOLLY, B. BURNET and D. SEWELL, *Evolution* 23, 548 (1969).

*lion*; brown strain were crossed to a single mutant *vermilion* strain. Heterozygous  $F_1$  females were then backcrossed to males of the parental inbred *v*; *bw* strain and the process repeated for a further 6 generations. The progeny of the final backcross were transferred before eclosion from the pupa to each of 4 replicate population cages in which they hatched to form the founder population (generation 0) which was allowed to mate at random. Two population cages were maintained in continuous light, and two cages in continuous darkness, in the same constant temperature room at 25°C. Under a system of random mating each population contained two phenotype groups: a) white eyed *v*; *bw* and b) red eyed *v*; + and *v*; +/*bw*. In continuous darkness the frequency of white eyed flies fluctuated around a mean of 43% over 10 generations. The absence of a significant change in gene frequency over this period shows that the white eyed double mutant flies are not at any marked physiological disadvantage under these conditions. In constant light the situation is quite different. The frequency of white eyed flies declined steadily and substantially over 10 generations indicating that they are at a competitive disadvantage relative to red eyed flies in the random mating population.

The disadvantage to the white eyed flies in the light is confirmed by the data summarized in the Table. Four



Change in frequency of phenotypically white eyed mutant *v*; *bw* flies in random mating populations maintained in continuous light or in continuous darkness. The initial frequency is 50% in each cage. Since the mutant *v* is fixed in the population the frequency of white eyed flies depends only on the frequency of the *bw* allele.

replicate trials on flies drawn from the cage populations were set up in which 50 pairs of virgin flies of each of the two phenotype groups were placed in a 10 × 10 × 0.5 cm perspex box. The phenotype of the partners making up the first 25 matings was recorded for each trial. There were no significant differences between trials, for which the pooled result is shown. There is no significant difference between phenotype groups with respect to females, but white eyed males are clearly at a marked competitive disadvantage relative to red eyed males in the multiple choice situation ( $p < 0.001$ ). These results confirm our previous findings<sup>7</sup> using 1 ♀ + 2 ♂ and 2 ♀ + 1 ♂ competition experiments in small mating cells. The origin of the competitive disadvantage of white eyed males is, as previously shown, their reduced efficiency in establishing and maintaining contact with the female. Males of both phenotype groups compete equally in darkness, since neither are able to use visual cues during orientation. Wild type flies will mate in darkness but they take substantially longer to achieve copulation than in the light. Visual information, whilst not essential for courtship nor for attainment of copulation in this species is important to the extent that flies which are unable to use visual cues during courtship have a lower fitness than those which are able to do so. GROSSFIELD's classification scheme is thus too simple in that it does not take account of relative mating success in relation to light. Within that scheme however *D. melanogaster* are more appropriately placed in class II of facultative dark mating species. This class we believe could be usefully subdivided to take account of the nature of the mating 'inhibition' caused by absence of light.

*Zusammenfassung.* Untersuchungen an Mutanten von *Drosophila melanogaster* mit fehlendem Schutzpigment im Komplexauge und mit verminderter Sehkraft deuten darauf hin, dass es sich bei *Drosophila* um eine vom Licht abhängige, im Dunkeln paarende Art handelt.

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## Chromosome Complements of Three Species of Mugilidae (Pisces, Perciformes)

Of the Teleosts, the Mugilidae have always interested ichthyologists, not solely from the practical point of view, but also because of the evolutionary, and consequently systematic, problems they pose. In fact, although the Mugilidae family is per se a homogeneous taxonomic entity, its arrangement at the level of the order is a much-debated question.

To mention only some of the most recent revisions, BERG<sup>1</sup> and BERTIN and ARAMBOURG<sup>2</sup> ascribe the Mugilidae, together with the Atherinidae and Sphirenidae families, to a separate order, Mugiliformes, while NORMAN<sup>3</sup>, GOSLINE<sup>4</sup>, BINI<sup>5</sup> and, very recently, TORTONESE<sup>6</sup> disagree with this systematic arrangement into such a high-order taxon ascribing the families to the suborder Mugiloidae in the large Perciformes order.

Moreover, Atherinidae were removed from this taxon by ROSEN<sup>7</sup> in order to constitute, along with Belontiiformes, Esocetidae and Cyprinodontiformes, the new order Atheriniformes.

There are also some authors<sup>6,8</sup> who recommend revision of the old genus *Mugil*, Linnaeus 1758, contending that this taxon is so heterogeneous as to warrant its dismemberment into several genera as *Mugil*, *Liza*, *Chelon* and *Oedalechilus*, to mention only the Mediterranean genera.

These taxonomic rearrangements are based essentially on morphological arguments (MCALLISTER<sup>9</sup>) and cytotoxic evaluation has never been attempted for the interpretation of this systematic and evolutionary problem. In fact no karyological data exist for Mugilidae.