of this to the ovulatory process remains unclear[5]. I have found a large negative shift in FWPD and a reversible abolition of wall resistance on exposure to prostaglandin E_1. The ability to alter the FWPD with agents involved in the mechanism of ovulation suggests a possible significance for this PD in these processes. The change in resistance indicates that some resistive barrier to current flow exists in the follicle wall and that the functional characteristics of this structure can be reversibly altered pharmacologically. In other epithelia, specialized intercellular contacts (Zonulae occludentes) form such a resistive barrier and play an important role in the accumulation of fluid brought about by active ion transport[6].

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Negative phototaxis in *Drosophila* associated with a morphological change in the compound eye

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Summary. The ultrastructure of the compound eyes of several photonegative selection lines and their unselected photopositive controls of five species of the *melanogaster* subgroup was analyzed. A qualitative phenotypic change concerning the rhabdomeres in one of the photonegative selection lines of *D. mauritiana* could be detected. It was proved that this structural aberration of the rhabdomeres is caused by a parallel mutation of the mutant *ora (outer rhabdomeres absent)* of *D. melanogaster*.

Key words. Drosophila melanogaster subgroup; phototaxis, negative; eye, compound.

Numerous behavioral traits are accessible to selection but little is known about the structural basis related to the selection response, especially if polygenic systems are involved[1]. E.g., phototactic behavior could be influenced by changing the morphology of the eye or brain, by altering the neural connections or the information processing, by changing the motoric response, and/or by varying the biochemical reactions which participate in these processes[2,3]. In order to investigate altered phototactic behavior it seems obvious to look in a first step for morphological changes in the compound eye. Therefore, the ultrastructure of the eyes of several photopositive and photonegative strains of five *Drosophila* species was analyzed.

Materials and methods. Five species of the *Drosophila melanogaster* species subgroup were involved in the study: *D. melanogaster, D. simulans, D. mauritiana, D. yakuba,* and *D. erecta.* For each of these species there existed a photopositive control and two photonegative selection lines. Phototactic behavior was measured and selected in Hirsch-Hadler mazes (for a detailed description of these mazes see Köhler[4]). The selection had been carried out for 45 generations and had attained mean photoscores, i.e. number of light choices, of less than five in all negative lines, and greater than 11 in the positive lines (e.g. in *D. mauritiana,* fig. 1).

The preparation of the eyes for electron microscopy was as follows: fixation in glutaraldehyde and osmium tetroxide, dehydration in ethanol series, propylene oxide, and embedding in araldite.

Results and discussion. Except for one strain there exist neither remarkable changes in the eye structure in photopositive and negative flies nor distinct differences between species. In one of the negative lines of *D. mauritiana,* N316, the rhabdomeres are strongly degenerated in the distal area of an ommatidium (fig. 2). In the proximal parts of the ommatidium the degeneration of the rhabdomeres 1 to 6 increases until the rhabdomeres disappear completely.

The system of the rhabdomeres 7 and 8 remains intact and the structure is similar to that of the *D. melanogaster* mutants ora and rdgB[5,6]. Compared to the wildtype eye the mutant rhabdomeres 1 to 6 are much smaller and of irregular shape. The degree of degeneration between neighboring ommatidia and neighboring rhabdomeres within an ommatidium varies from slight to nearly complete absence. Degenerated rhabdomeres are found in each of the ommatidia of an eye. Females kept in light and dark adapted females express the trait. No diurnal rhythm was found (preparation at 05.30, 12.00 and 18.00 h) and the trait is expressed during the whole life (preparations from the day of eclosion to an age of 13 days).

Because of the phenotypic similarity of this structural aberration to the mutations *ora* and *rdgB* of *D. melanogaster* crosses were performed between these two mutants and the *D. mauritiana* negative and control lines. Crosses of *D. melanogaster* females and *D. mauritiana* males are possible and give rise to female offspring only. The F_1-hybrids of *D. melanogaster ora* females and males of the negative line N316 had the mutant trait, while the progeny of crosses of *D. melanogaster ora* females and males of control line of N316 looked normal. The mutation in *D. mauritiana* must be a parallel mutation to *ora.* It is highly probable that the mutation occurred spontaneously during selection. This hypothesis is supported twice: Firstly, there was no selection response in the negative direction in the

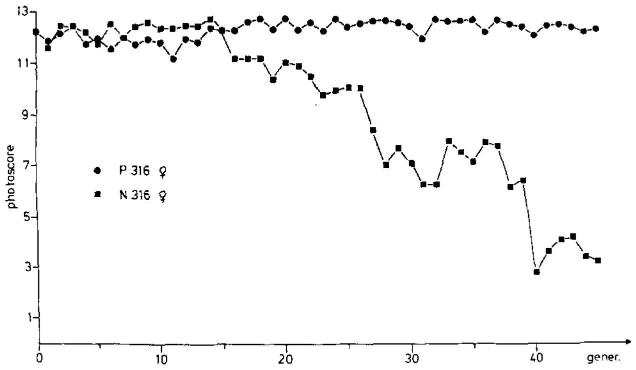
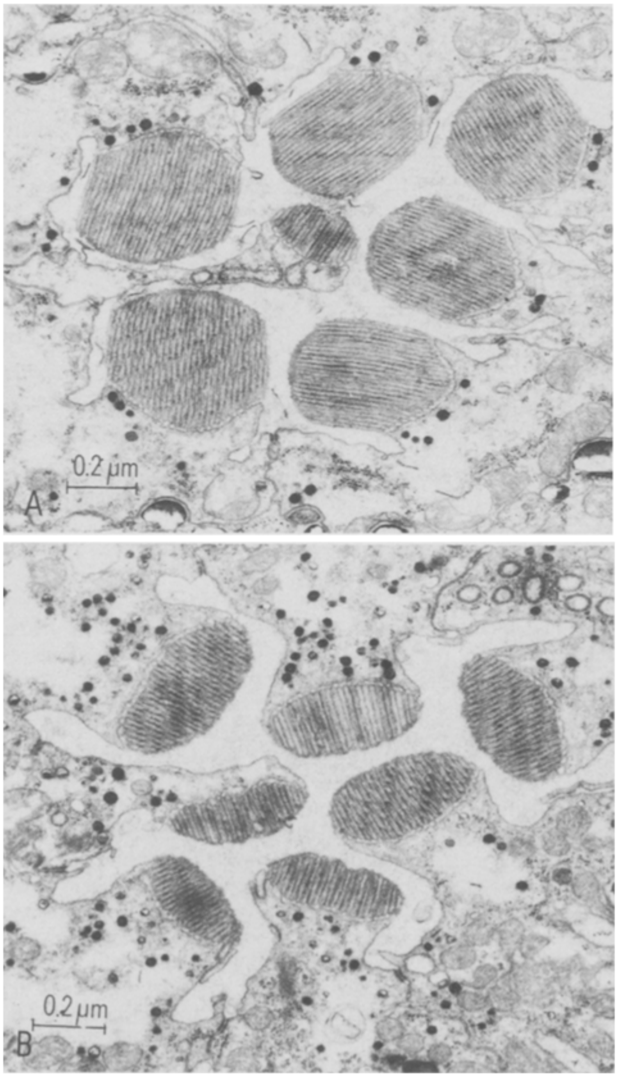


Figure 1. Selection response in *D. mauritiana* females, selected in Hirsch-Hadler mazes for positive (P316) and negative (N316) behavior. The mean number of light choices (photoscores) are plotted against the generations of selection.

first 16 generations at least, and afterwards photonegative behavior increased steadily (fig. 1). Secondly, no similar morphological change has occurred in the control line and in the simultaneously selected negative line, all derived from the same founder population. Our results demonstrate that a single gene mutation has spread out within the population and finally became fixed as a result of selection for photonegative behavior. This conjecture is supported by some results of developmental biologists and vision researchers: the mutation *ora* causes a retardation of the retinula cells R_{1-6} and these cells mediate several visually evoked behavior traits, e.g. the optomotoric responses are strongly reduced[6,7]. Furthermore, the mutation may perhaps put out of action the structural gene for the synthesis of certain photopigments[7,8], and the lack of screening pigments leads to an enhancement of photonegative behavior[4]. On the other hand, the remaining intact rhabdomeres R_7 and R_8 contribute to slow phototaxis[9] and we were able to demonstrate that flies showing photonegative behavior in Y-mazes will reproduce this behavior in a test apparatus for slow phototaxis[10]. However, whether this gene mutation causes the negative phototactic behavior directly or whether it serves as a basis to be modified by other genes acting on phototaxis is not yet known and needs further investigation.



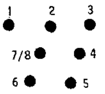


Figure 2. *A* Distal cross section through an ommatidium of the photopositive control line on *D.mauritiana*. *B* Comparable view of an ommatidium of the negative line N316. The rhabdomeres 1 to 6 are of irregular shape. The diagram illustrates the numbering of the rhabdomeres.

In single gene analysis usually new mutations are induced by a mutagen and these mostly qualitative variants of the behavioral trait in question are isolated by a certain test procedure for further analysis. On the contrary, we detect a single gene mutation with a qualitative morphological effect on the eye structure after selecting for photonegative behavior. Our experiments indicate that in natural populations selection for a behavioral trait leads to an increase of gene frequencies and at least to fixation of the behavioral mutants and their morphological correlates. Thus, our findings demonstrate a link between quantitative genetic analysis and single gene analysis in behavior genetics.

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Disruption of circadian rhythm of tissue respiration in *Channa striatus* by Metasystox®

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Summary. Oxygen consumption of gill, brain and muscle tissues of *Channa striatus* exhibits a clearcut circadian rhythm with a maximum uptake at 18.00 h. Metasystox exposure decreased the oxygen consumption of all tissues. Maximum reduction is noted in gill followed by brain and muscle. The peak period of oxygen consumption is also eliminated in the pesticide-treated fish.
Key words. Channa striatus; circadian rhythm; oxygen consumption; metasystox; pesticide.

Tissue oxygen (O_2) consumption (as an indicator of cellular metabolism) is a valuable parameter for assessing the toxic effects of pesticides[2]. Hiltibran[3] studied the effect of 16 insecticides on the in vivo O_2 uptake and phosphate metabolism of blue-gill liver mitochondria. In *Tilapia mossambica*[4], age-related changes in O_2 consumption of gill, brain and muscle