with the 31.1 MRF, which was found in the same population. Moreover, it is still obscure whether the above mentioned population is polymorphic as regards the male recombination elements. New experiments are needed before jumping to conclusions. Our investigation is still in progress.

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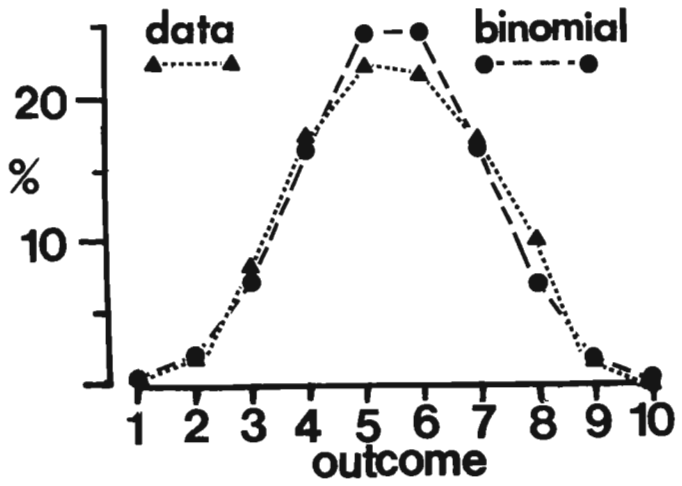
Stark, W.S., K.G. Hu and R.B. Srygley. The Johns Hopkins University, Baltimore, Maryland. Comparisons of phototaxis properties in differing mazes.

The purpose of this communication is to dramatize the dependence of phototactic behavior in D. melanogaster upon the conditions of the experiment. Specifically, we have found flies to be photoneutral in a 10-outcome Hirsch-Hadler (Hadler 1964) classification maze at an illumination wavelength and intensity to which flies are highly phototactic in our straight and Y-shaped arenas (Hu and Stark 1977). The accompanying figure plots the outcome placements in the Hirsch-Hadler classification maze of white-eyed cn bw D. melanogaster (N = 339) under medium intensity (6.3 x 10^{13} quanta/cm^2.s) blue-violet light (from a GE ribbon filament bulb, 6V 18A, with Corning filters CS-5-57 and CS-3-75 transmitting from 400 to 500 nm). Outcome 10 is towards light. Under these conditions, unselected flies were photoneutral (mean score = 5.51), consistent with a slight photonegativity greatly lessened by lack of eye color pigment (see Markow and Scavarda, 1977 recently). Even though the subject number, N = 339, is summed from 7 runs of 26 to 87 flies, the data show a slight flattening from the expected binomial distribution, perhpas due to crowding at early central decision points. On the other hand, the same Drosophila are highly positively phototactic in our straight (and Y) arenas: they go in increasing numbers to the brighter side in a choice. This is expressed as a high correlation coefficient (typically r = 0.9) in the function relating proportion of flies on one side with the log of the intensity on that side for 7 intensity levels spanning 2 log units. At these illumination levels, phototaxis was found to be dominated by compound eye receptor cells R 7/8 (see Hu and Stark 1977).



The discrepancies in phototactic behavior among different experimental situations are rarely discussed (except see Rockwell and Sieger 1973; Markow and Merriam 1977). Polygenic selection experiments using the classification maze find unselected flies photoneutral while in most studies emphasizing function of compound eye receptors, Drosophila are photopositive (Bertholf 1932; Schümperli 1973; Heisenberg and Buchner 1977; Hu and Stark 1977; Jacob et al. 1977). In this study, we compared the same fly strain under similar illumination conditions to reduce the number of variables which differ between most straight, Y or T arena vs. Hirsch-Hadler maze experiments. To this end, we used much dimmer monochromatic light, typical of the receptor input experiments conducted at specific receptor thresholds, rather than bright white fluorescent lighting used in genetic-selection experiments. Even so, flies were photoneutral. Lewontin (1959) has reported that agitation can increase phototaxis. This could account in part for the clear distinction of phototactic flies from nonphototactic mutants using Benzer's (1967) counter current device (see also Markow and Merriam 1977). Clearly, flies meandering through a classification maze overnight are unagitated. But in some of the receptor-input studies cited (Schümperli 1973; Heisenberg and Buchner 1977; Jacob et al. 1977) flies were also unagitated. Our experiments using straight or Y arenas, as well as the classification maze, would minimize the contribution of the predominant photoreceptor type R1-6, by

adaptation (see Hu and Stark 1977 for arguments), resulting in behavior dominated by R7/8. At lower intensities, selected to be near R1-6 electrophysiological and behavioral thresholds, flies are photoneutral in our straight or Y arena experiments. In these arenas, reasonably light-adapted flies are shaken and given 30 s for a choice. In experiments with less agitated, dark-adapted flies orienting to extremely dim lights at their leisure, flies show strong photopositive phototaxis probably mediated by the sensitive R1-6 photoreceptor system (Schümperli 1973; Jacob et al. 1977). These differing conditions operationally define additional phototaxis variables, namely fast vs. slow phototaxis (see Heisenberg and Götz 1975). In straight, T or Y arenas, R1-6 may mediate positive slow phototaxis near R1-6 threshold while R7/8 mediates fast phototaxis at R7/8 threshold. Phototaxis in a Hirsch-Hadler maze is obviously different. Clearly, numerous variables affect phototaxis under the differing conditions of straight, T or Y arenas vs. Hirsch-Hadler mazes; we have shown that fly strain or illumination condition cannot completely account for these discrepancies.

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Stark, W.S., R.B. Srygley and R.M. Greenberg. The Johns Hopkins University, Baltimore, Maryland. Analysis of a compound eye mosaic of outer rhabdomeres absent marked with cardinal.

Drosophila with mutant compound eye receptors have been investigated by developmental biologists and vision researchers. Harris, Stark and Walker (1976) introduced characterizations of 3 such mutants, frequently studied since. Two of these mutants, rdgB and sev (causing degeneration of retinula cells R1-6 and nonformation of R7 respectively) were shown to be cell autonomous by mosaic studies. The third mutant, ora^{JK84}, was not studied by mosaic means at that time because its third chromosome location (65.3) made mosaic induction and combination with autonomous markers more difficult. Outer rhabdomeres absent, ora, discovered and mapped by Koenig and Merriam (1977) causes nonformation of R1-6 rhabdomeres, i.e., the microvillar photopigment-containing organelles. Here we present a mosaic study of ora.

An ora stock with eye color markers, bw; ora cd, was constructed with the aid of microscopic optical techniques and histology (see Harris, Stark and Walker 1976). Brown (bw) blocks and red drosopterin synthesis while cardinal (cd) is an eye-autonomous mutant lowering brown ommochromes to about 15%; cd (3-75.7) is near ora on the right arm of chromosome 3 (see Lindsley and Grell 1968). The bw and bw; ora cd stocks were crossed to produce heterozygotes which were irradiated at 24 to 75 hours after egg laying (rearing at 24°C) with 1200 r of gamma rays (from ^{137}Cs source, Gammator) to induce somatic crossing over. Several eyes mosaic for eye color were found. Heads were fixed shortly after eclosion with a hypertonic aldehyde fixative followed by osmium tetroxide (see Stark and Clark 1973) and embedded in Spur, a low viscosity epoxy. One large right eye mosaic was serial sectioned at 1 micron and examined (without staining to enhance eye color pigment contrast) for reconstruction.

The accompanying figure shows reconstruction of much of this large mosaic. The trapezoidally arranged R1-6 rhabdomeres were scored for their presence or absence. The central R7/8 rhabdomeres, not affected by ora, were always present and are thus always drawn in. Secondary pigment cells (SPC's), 6 of which surround an ommatidium and are shared between ommatidia, were scored for presence (dark) or absence (clear) of brown pigment granules. Primarily pigment cells (PPC's), 2 of which surround the distal light-focusing pseudocone in each ommatidium, were scored for the presence (dark) or absence (clear) of conspicuous large brown pigment granules. The mosaic patch is located at the eye's equator (shown by a line and arrows).