

# Abstract

A fundamentally important decision for all animals is whether to utilize a particular resource or to disperse elsewhere in search of potentially superior resources. Within this dissertation, I present results from laboratory experiments carried out using the experimental genetic workhorse, *Drosophila melanogaster*, to identify and quantify various causal factors contributing to an animal's decision to disperse from food.

With the set of experiments described within the second chapter, I studied the influence of mating experience on the movement priorities of *Drosophila*. From these experiments, I suggest that prior mating experience is a significant and likely an important factor modulating the dispersal of *Drosophila*, and that the change in dispersal results from a change in the fly's priorities rather than simply a change in the general levels of activity. In chapter three, using methods similar to those used to assess the modulatory effects of mating, I explored how the amount and accessibility of food affects the dispersal of hungry *Drosophila*. From these experiments, I suggest that the hunger state of flies can override the visual and olfactory cues from food, and I hypothesize that the observed increase in dispersal resulting from hunger is due to a qualitative change in locomotor behavior related to food search.

With a new machine-vision tracking strategy discussed within the fourth chapter, I studied the exploratory behaviors of individual flies within the environmental chambers discussed in Chapters 2 and 3. I introduced single flies that had recently consumed food

into chambers and tracked their walking and monitored their flying movements as they became hungry. In collaboration, I have attempted to use learning algorithms based on the statistics of each fly's behavior during short windows of time to predict the fly's behavior during the rest of their experimental trial.

I conclude with chapter five by describing a new experimental chamber that I have developed to complement machine-vision methods for tracking individuals within large groups. The motivation behind developing the chamber was to study the changes of social interaction, e.g., courtship and aggressive posturing, of flies near food.

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