The sense of humidity in the common fruit fly and the effect of temperature on it

Around the world countless organisms are using different senses to navigate their environment. They can be highly specialized to their needs and surroundings. For example, some bats use echolocation for navigation, which comes in handy when hunting in the dark. Even more exotic are animals using magnetic fields as cues for navigation. One of the underexplored types of senses is the sense of humidity, hygrosensation.

Many insects are highly sensitive to humidity. Their low volume leaves little room for water reserves. Combined with their large surface leaving them prone to dry out, they are highly reliant on their environment to control their water balance. A lot of animals can sense a difference in humidity. For instance, you as a human can feel a difference when you are in a desert environment or by the sea. The difference is that some insects have specialized sensory neurons that are for sensing shifts in humidity, while we humans use other senses for it. These sensory neurons make them able to sense very small differences in humidity.

In this project we worked with the common fruit fly, a very common model organism in research. Their humidity sense consists of three different sensory neurons: one dry neuron, one wet neuron, and a temperature neuron.

The motivating factor for this thesis work is that hygrosensation is one of few senses that are still not fully understood. The aim of this research is to see the effect different temperatures have on how flies behave in different humidities. We built an experimental setup to see how the flies behave in different levels of humidity. The flies were placed in a thin plastic arena, leaving them room to walk, but not fly. During the experiment we pumped in air of different levels of humidity and tracked the flies' movements using a camera. Their movement was later analysed to see if any patterns of behaviour emerged.

The results of the experiments showed that the flies were significantly more active during the dry air than the humid air stimuli. Our interpretation of this behavior is that the flies find the lower humidity unpleasant, and therefore move around more, looking for a higher humidity level.