Modulation of the Navigational Strategy of Insects in Controlled Temperature Environments

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Modulation of the Navigational Strategy of *Drosophila* in Controlled Temperature Environments

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**Background Information**

**Why Drosophila Larvae?**
- Simple model organism
- ~10^4 neurons with a central brain
- Complex but quantifiable behavior
- Optical transparency
- Biological tools

**Objectives**
- Understand modulation of fundamental components of motion in variable temperature environment
- Decouple causes of behavioral changes

**Hypothesis**
- *Drosophila* will exhibit quantifiably different locomotion when experiencing different temperature stimuli
- Modulation of locomotion should depend on a (possibly linear) combination of physical changes and sensory inputs

**Method**
- Control temperature stimulus with one of the below metal platforms
- Allow larvae to freely navigate platforms and record trajectories
- Segment trajectories into components using computer vision and extract metrics using MATLAB

**Results**

**Temperature Insensitive Mutants**

**Analysis**

**Why the Similarities? Proprioceptive Feedback!**
- Faster with increasing temperature and older age
- Speed independent of temperature sensing
- Turn rate mostly independent of temperature sensing
- Feedback input ties together speed and turn rate

**Conclusion**

**Future Work**
- Incorporate moat design into all platforms
- Use spatially invariant experiments for function modeling
- Use temporally invariant experiments to analyze \( T vs \frac{dT}{dt} \)
- Use different temperature insensitive mutants

**Significance & Application**
- Develops methodology for decoupling previously unseparated factors that cause behavioral changes
- Can potentially be scaled up to more complex organisms
- Method by which more can be learned about brain function