

Prof. Grace McKenzie-Smith

Wesleyan University

Friday, October 23, 11:00 am. Osborne A204

The life and times of *Drosophila melanogaster*: Lessons on individuality and aging from the humble fruit fly



Animal behavior unfolds over many timescales, from sub-second motions to circadian cycles to the lifelong process of aging. We study this multi-timescale structure in order to understand the nature and evolution of individuality. Our work approaches this problem from two angles. From one side, we take extremely high resolution (~30 pixels/mm) recordings at high frame rate (100 frames per second) for the entire lifespan (3-8 weeks) of *Drosophila melanogaster* fruit flies. Using deep-learning-based postural estimation and unsupervised machine-learning behavioral classifications, we quantify the hourly, daily, and lifelong patterns of *Drosophila* behavior. We identify the hour after dawn as a behaviorally unique moment in the circadian pattern of *Drosophila*, and find that certain grooming behaviors are highly correlated with individuality and lifespan. We also study the behavioral effects of two longevity-promoting drugs, rapamycin and metformin, to determine if treated flies demonstrate youthful behaviors throughout their extended lives. From the other side, we examine the fine structure of behavior evolving on seconds- to hours- long timescales. We find that flies (and other organisms) can be distinguished by idiosyncratic leg sweeps during locomotion, but that a fly's particular leg pattern is not stable throughout its life, demonstrating enough drift over 4-7 days for a fly to be classified as "completely distinguishable" from its former self. Thus we find that individuality may be lifelong or fleeting, depending on the resolution and timescale at which it is measured.

Short Bio

Grace is an Assistant Professor of Physics at Wesleyan University. She completed her PhD and postdoc at Princeton University studying the physics of animal behavior in bumblebees and fruit flies. In addition to her teaching and research, she has authored a textbook chapter on scientific ethics (see Smith's *Experimental Physics: Principles and Practice for the Laboratory*). In her spare time she reads sci-fi, sings (mainly Bach and physics songs), and caters to the whims of her cat.