

DEPARTMENT OF BIOLOGICAL SCIENCES  
COLLEGE OF ARTS & SCIENCES

## SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN

FOR APPLICATION YEAR: 2021

PROJECT TITLE: Behavioral analysis of color vision in jumping spiders

Nathan Morehouse

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Associate Professor  
Department of Biological Sciences  
University of Cincinnati  
711H Rieveschl Hall  
Cincinnati, OH 45221-0006  
Office: (513) 556-9757  
[colorevolution@uc.edu](mailto:colorevolution@uc.edu)  
<https://homepages.uc.edu/~morehonn/>  
[@morehouselab](#)

**Project Description**

Every animal has a unique view of the world. There are billions of signals and streams of information in complex environments and animals need to make sense of them to be successful. Sensory systems evolve to be efficient and pragmatic; interpreting important information and filtering out noise. This creates many different realities based on what information is useful to different animals. Understanding how animals perceive the world is an important part of animal behavior, ecology, and neurobiology.

Most animals can see light to some extent, using this visual stimulus to construct their realities. While some animals can only interpret lightness or darkness, many animals can also see in color. The wavelength composition of light carries valuable information about an animal's surroundings. Color can help an animal distinguish objects from the background or identify a good quality mate. With a retina composed of photoreceptors expressing two visual pigments, maximally sensitive to different spectral regions, and a neural comparison between the output, it can be said that an animal has the potential for color vision. Behavioral testing allows researchers to determine how animals experience and use color to fill in their visual world.

This project will investigate color vision in jumping spiders. These complex and visual creatures were the inspiration for the visual system of the Mars rovers. Despite being very small, jumping spiders use their eight eyes to see the world as well as a cat. They hunt like cats as well, by stalking and pouncing on their prey. Jumping spiders also use bright colors and intricate patterns for courtship displays. Curious and cognitively complex, these tiny

animals are excellent for asking questions about how animals perceive, process, and use information.

We will use trackball and video playback experiments to ask jumping spiders how well they can distinguish different colors of light. Video stimuli will be displayed in front of spiders standing on a patterned ball supported on a stream of air. As objects move across the screen the spider will try to follow, thereby rotating the ball they hold. The movement of this ball is then recorded and plotted to describe the virtual path the spider would've executed. Experiments will include taking light measurements, programming computer simulations, handling live animals, and interpreting data. Findings from this project will inform a large body of research on color vision in invertebrates and the ecology of invertebrate signaling.