**Project proposal**

**Yihang Park**

**Introduction**

Male *Schizocosa* wolf spiders are known to produce complex courtship displays that that consist of multiple components of either the same or different modalities linked in either space or time, the latter being referred to as multimodal signals (Stratton 2005) . Historically, investigations of *Schizocosa* multimodal courtship displays have often involved an examination of their constituent components in isolation through the use of signal masking/ablating techniques (Hebets and Uetz 1999; Uetz and Roberts 2002; Gibson and Uetz 2008), to determine which modality of signals is more important in terms of eliciting female receptivity. This approach primarily focuses on examining efficacy-based selection regarding multimodal signals, which pertains to how effectively the signal propagates through the environment and is received and processed by its intended target. Nevertheless, comprehending content-based selection in multimodal signals, which pertains to how signals are chosen to encode the information required for assessment by the receiving animal, in other words, how signal traits leverage or reflect information pertinent to the receiver (such as signaler size, condition, and motivational state), is crucial for a comprehensive understanding of the sources of selection that have influenced the evolution and function of the components of multimodal signals. Previous study that involved manipulating the diets of both male and female spiders have also discovered evidence indicating that certain aspects of male courtship are condition-dependent and are therefore likely to undergo selection based on signal content (Hebets et al. 2021).

This study seeks to explore the interplay between content-based and efficacy-based selection in the evolution of complex multimodal signals in *Schizocosa mccooki*. It employs an experimental design that manipulates both the signaling environment and the spiders' body condition (specifically, their foraging history).

**Objectives**

1. To learn to acquire proficiency in conducting appropriate statistical analyses in R using the provided datasets. Statistical analyses encompass: **paired t-tests, nominal logistic regression,** and **linear mixed-effects model**.
2. Create high-quality graphs suitable for publication using **only** the R programming language.

**Methods**

Data on simultaneous mate choice tests of female wolf spider *Schizocosa mccooki* that were originally collected by Aaron Rundus in 2007 is available. All individuals, both female and male, were randomly assigned to one of two diet treatments: 1) Low-quantity diet (LD)- one cricket (Acheta domesticus) once every two weeks and 2) High-quantity diet (HD)- one cricket twice per week. Simultaneous (1 female and 2 male constitues of low vs high-diet male) mate choice trials utilized a fully crossed 2 x 2 experimental design with a visual treatment of light versus dark (visual signal present/absent) and a seismic treatment of filter paper substratum versus granite substratum (seismic signal present/absent).

On the day of the trials, both male and female spiders were weighed. The females were then introduced into their respective arenas and given 5 minutes to acclimate. After this brief acclimation period, two male spiders—one HD and one LD—were placed in each testing arena, with each one positioned on opposite sides under inverted glass vials. The trials began with the simultaneous removal of these vials, allowing all three individuals in each arena to interact for a duration of 45 minutes. During the trials, various events were recorded, including male courtship, copulation, cannibalism, and male attempted mounts. Additionally, 5-minutes periodic sampling were performed to observe the behavior of each male, and recorded the times at which each male initiated courtship and copulation.

**References**

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