



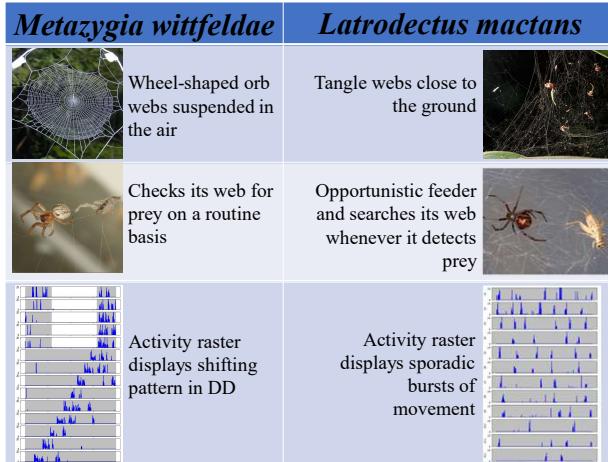
# Modeling Spider Circadian Rhythms Through Gene Expression and Modeling

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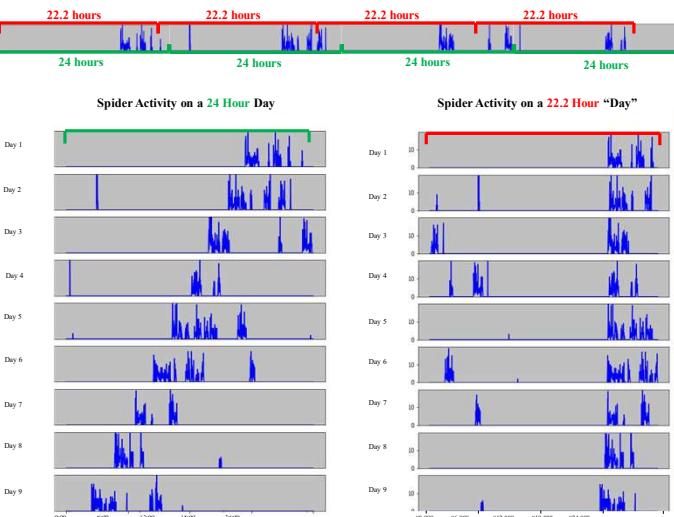
## Goals

- Determine if there is a trend in activity data within a species using locomotor activity to indicate circadian entrainment
- Compare the activity trends of different species to determine if there is a relationship between behavior patterns and circadian rhythms



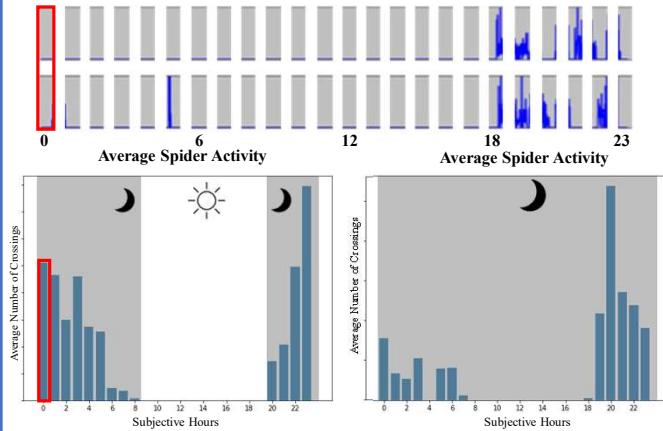
## Free Running Periods

The length of the spider's new day was calculated using the Lomb-Scargle statistical model. This new period was used to make a new raster plot.



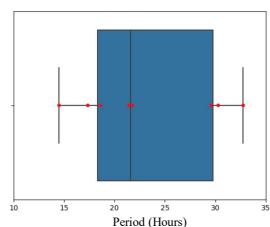
## Consistent Activity Pattern

Next, the plot was split into 24 equal segments to compare the average activity in the DD cycle to the LD cycle. The average activity was graphed, and both graphs show similar trends

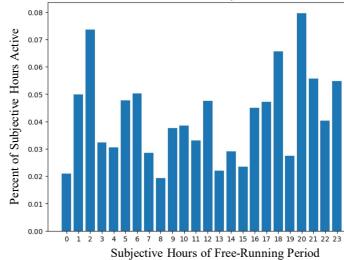


## Black Widow vs. Orb Weaver

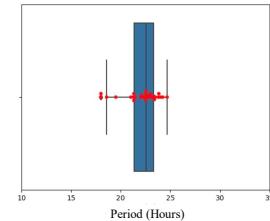
*Latrodectus mactans* DD Period Distribution



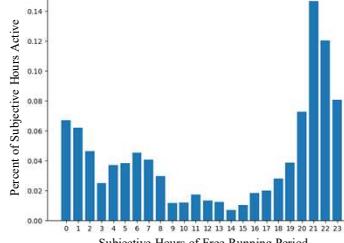
Average *Latrodectus mactans* Activity



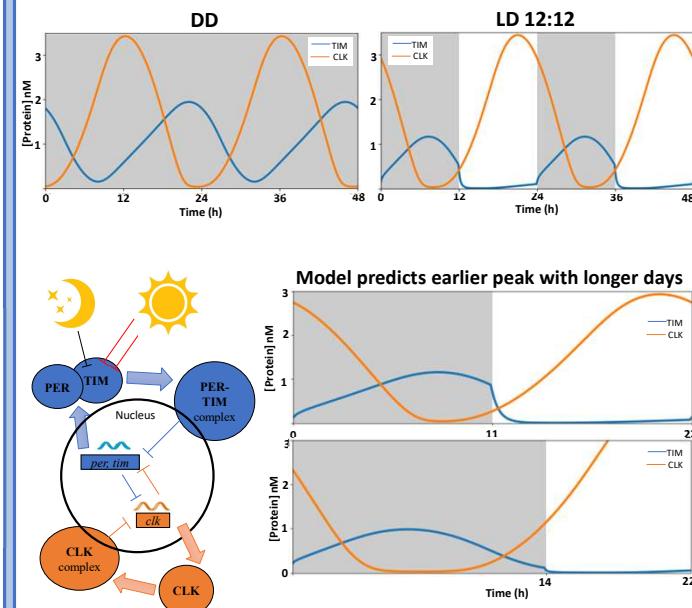
*Metazygia wittfeldae* DD Period Distribution



Average *Metazygia wittfeldae* Activity



## Modeling<sup>[1]</sup> Predictions



## Conclusion

- There existed a pattern in *Metazygia wittfeldae* despite the wide range of free running periods
- The activity of each species reflected their feeding patterns
  - Latrodectus mactans* had sporadic activity
  - Metazygia wittfeldae* displayed a clear pattern reflective of its ritual feeding

## Next Steps

- We will conduct a similar analysis on more species to investigate whether this trend hold true across multiple species
- We plan to analyze the genetic processes of spider circadian cycles to determine what factors allow spider rhythms to be so adaptable

## Acknowledgements

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- GRNT0157 NSF CR/RUI: Extraordinary circadian clocks in araneoid spiders

Works Cited:  
LOCOMOTOR AS CIRC RHYTHM  
SPIDER BEHAVIOR

[1]: Ueda, H. R., Hagiwara, M., & Kitano, H. (2001). Robust oscillations within the interlocked feedback model of Drosophila circadian rhythm. *Journal of theoretical biology*, 210(4), 401–406. <https://doi.org/10.1006/jtbi.2000.2226>