# Jumping spider optics after viewing far and close objects

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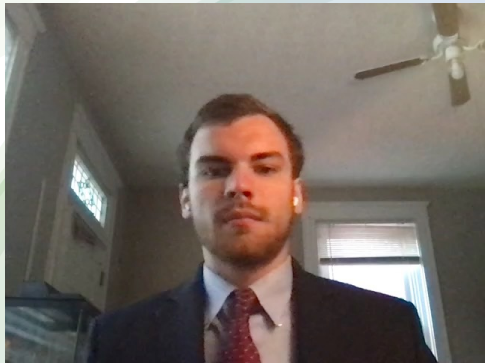


# Background

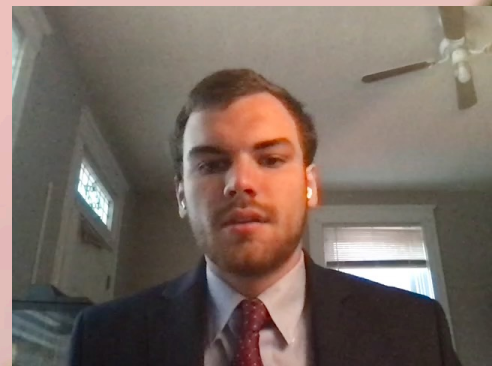
How Do Jumping spiders use their eyes to hunt their prey?

## Classical View:

Spider vision is static, image distance is assessed via the amount of image defocus in the AM eyes. (Nagata Et. Al.)

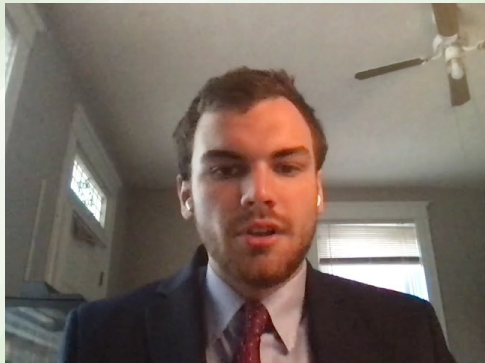
## Alternative View:

Preliminary Data suggests slight shift in focus when close or far objects are presented to spiders.



# Goal

- To assess whether the **classical view** or **alternative view** is more explanatory using the size of photoreceptors as an indication of focus

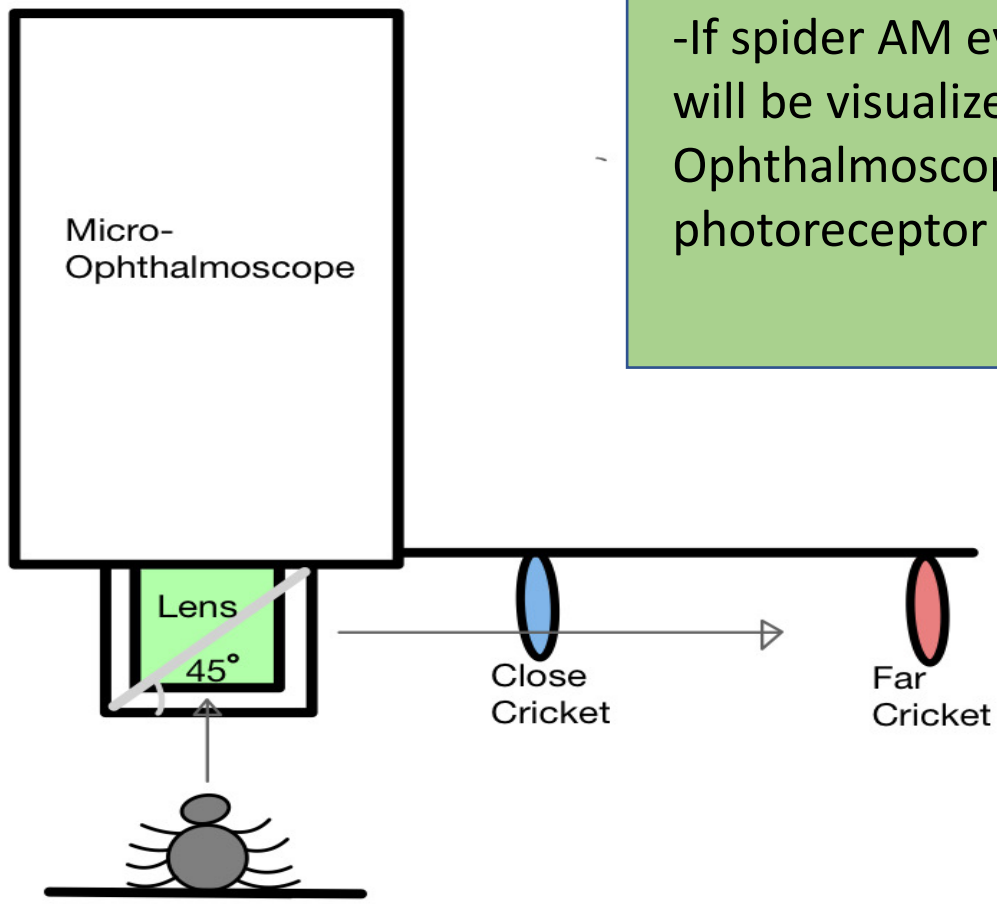


# Approach:

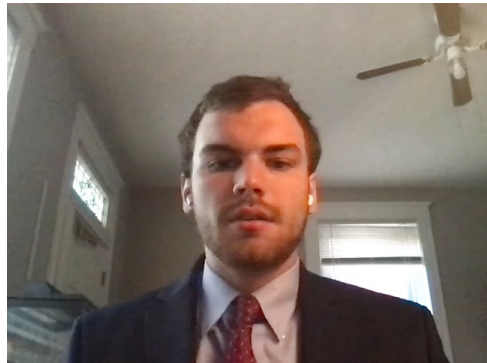
1. Project Close or Far Crickets to the spider through a semi-permeable mirror that is connected to the micro-ophthalmoscope (**Figure A)**

2. Once Spider responds to stimuli, immediately image their AM photoreceptors using the methods outlined in our lab. (Stowasser Et. Al).

**Figure A:**




-If spider AM eyes can focus then it will be visualized on the Micro-Ophthalmoscope as a change in AM photoreceptor size



# How will this approach be able to detect differences in Photoreceptor size?

If the spider can focus, then when a close cricket is projected to the eye, the spider will compensate by moving its retina back which in turn will make the image on our ophthalmoscope appear smaller.

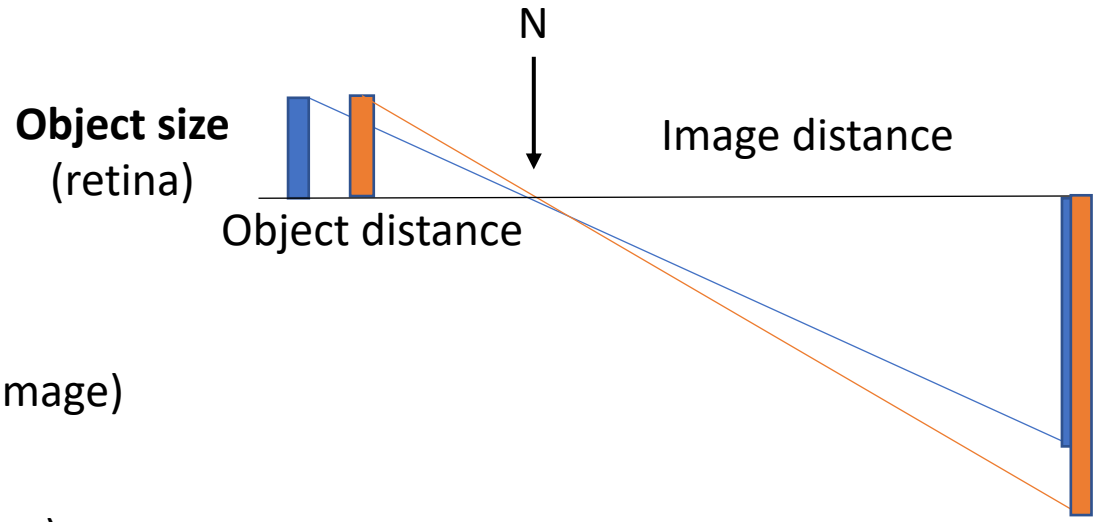
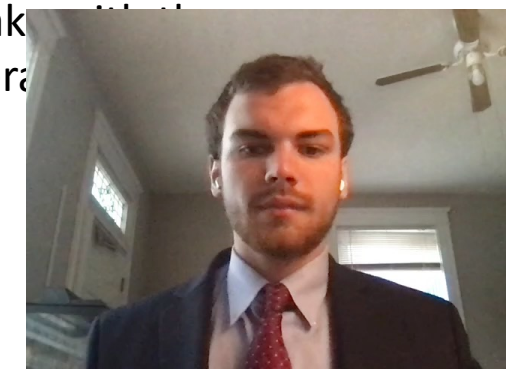



**Image size**
(size of the image of the retina that we tak
camera

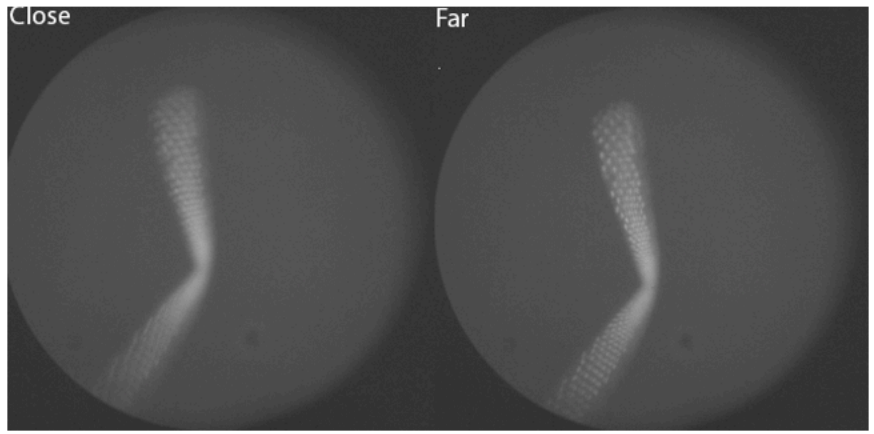
Close cricket (smaller retina image)

Far cricket (larger retina image)

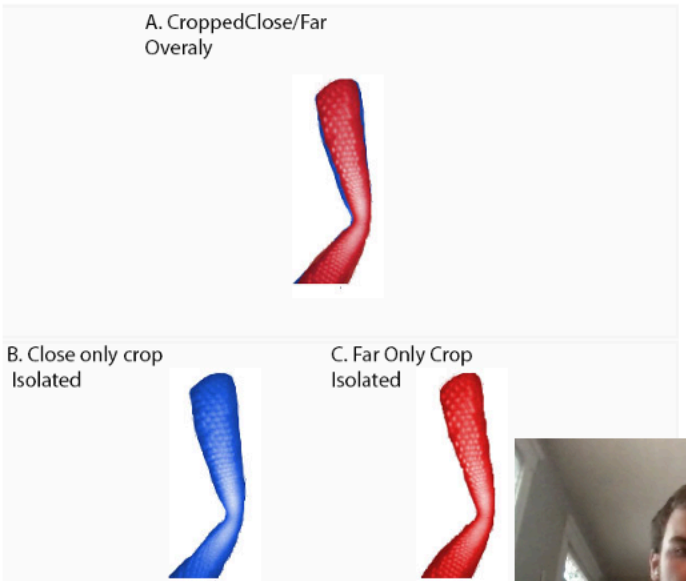


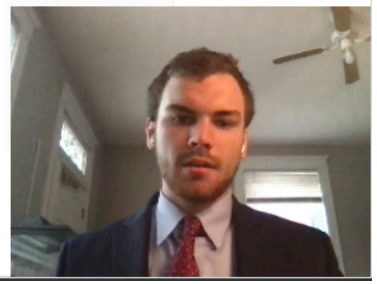
# Analysis

- Raw images were overlayed, and cropped **(Figure A),** and quantified as pixel density in photoshop




Raw Image's of AM photoreceptors taken on the Micro-Opthalmoscope



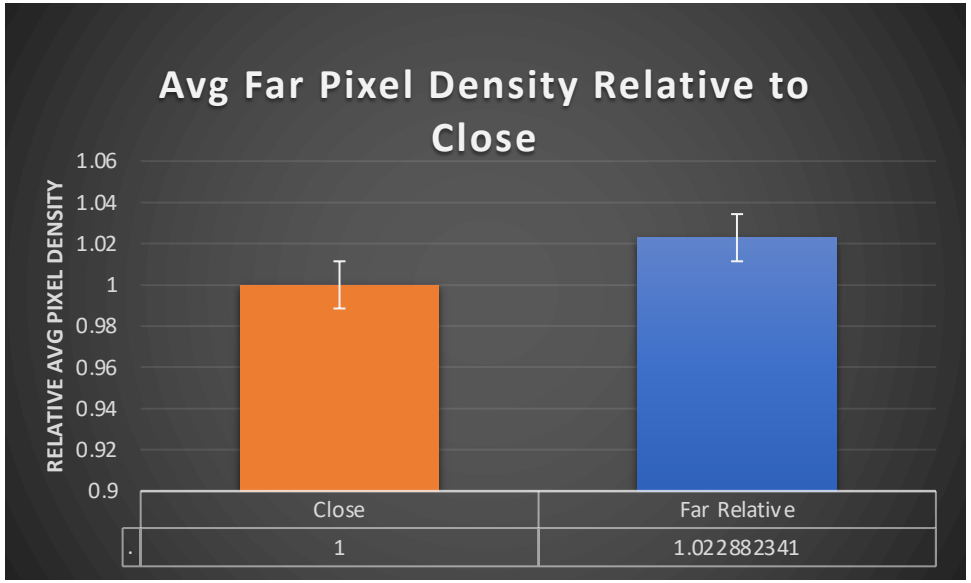



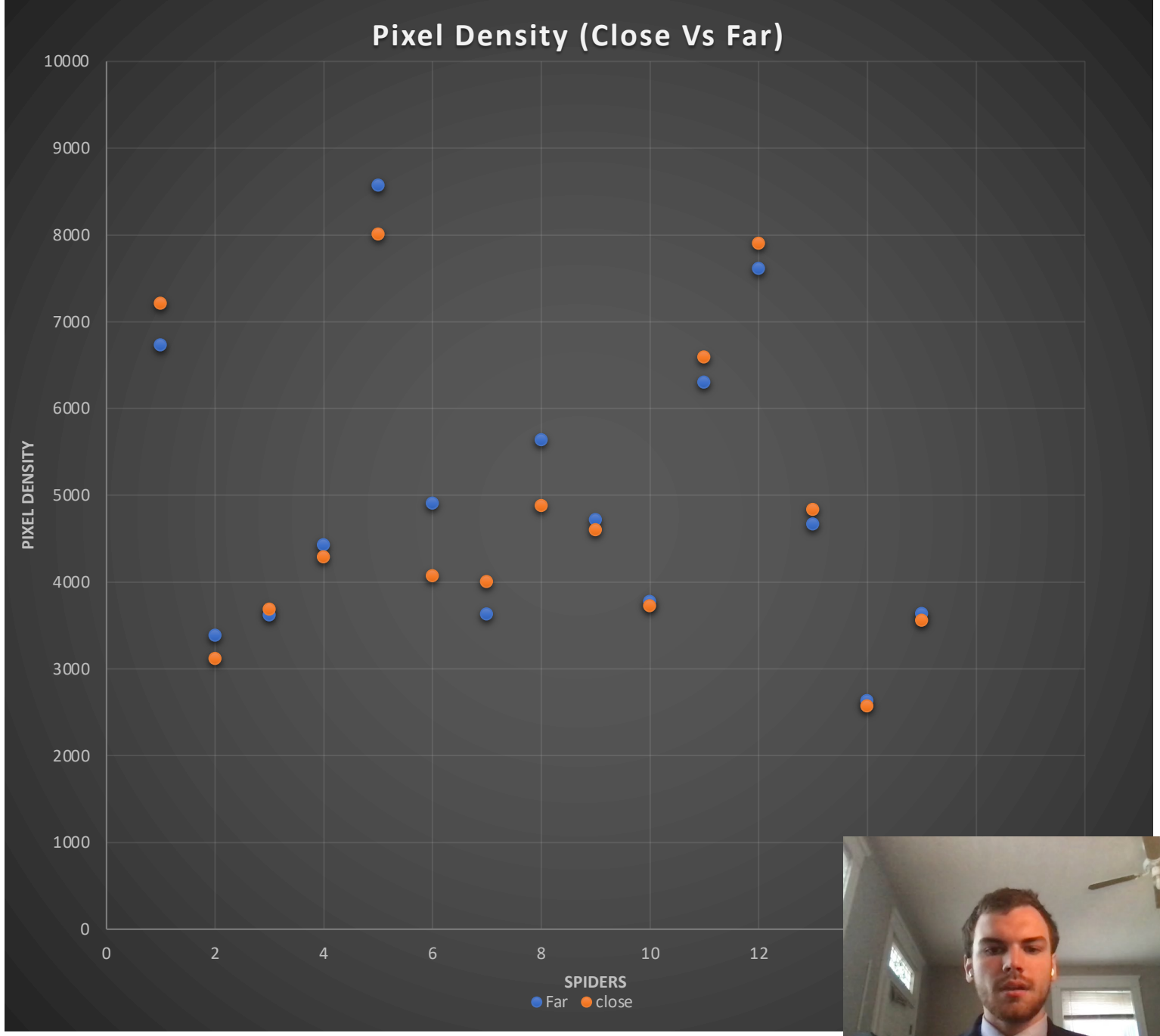
# Results

-N=9 Spiders (15 Total AM eyes)

-P>0.05**

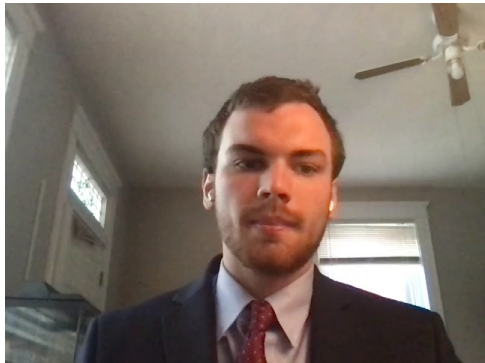
-Overall, data suggests there is NO statistically significant difference in photoreceptor size when viewing far vs close objects.



# Conclusion

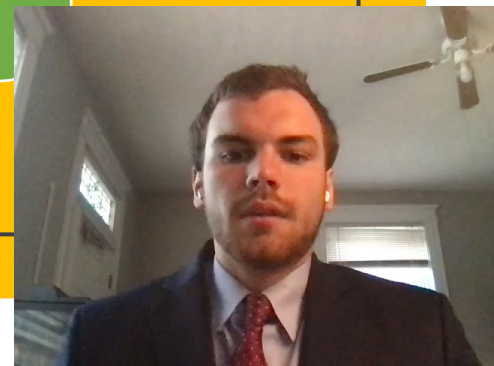
- P>0.05, showing insignificant changes in Photoreceptor size viewing far or close stimuli
- Results support **classical view** that arachnid vision is static.



# Limitations

Spider’s focus may be interfered with due to the flash of light required for photoreceptor imaging

The time frame for spiders to focus their eyes may be outside of the window of time to image their photoreceptors



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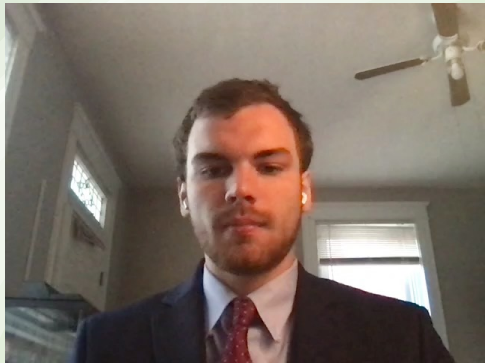

# Citations


- Nagata, T., Koyanagi, M., Tsukamoto, H., Saeki, S., Isono, K., Shichida, Y., . . . Terakita, A. (2012). Depth Perception from Image Defocus in a Jumping Spider. Science,335, 469-471.
- Stowasser, A., Owens, M., & Buschbeck, E. (2017). Giving invertebrates an eye exam: An ophthalmoscope that utilizes the autofluorescence of photoreceptors. Journal of Experimental Biology,4095-4100.