

Reese Gartly

Biology

Thesis

Abstract

My thesis is investigating how changes in body morphology may impact spider vibration perception. Spiders use vibrations in order to sense their surroundings because their other senses such as sight are not as well developed. The way that spiders sense these vibrations is by minute cracks all along their exoskeleton which are called slit sensillae. These slits are also condensed at the joints of the legs into lyriform organs. These slits are strain sensors and essentially when the leg of a spider moves due to external stimulus such as a vibration, the slits are stimulated and the spider senses this movement. Every object also has a natural frequency and how an object interacts with external energy will be impacted by this natural frequency. The shape of an object is known to impact its natural frequency, so therefore we hypothesize that the body morphology of a spider may impact its natural frequency and how it senses vibrations. To study this, we have built multi-body models of three spider species (the garden spider, the black widow and the cellar spider) and are using the number of vibrational modes each spider has as a proxy for how they are sensing vibrations. A vibrational mode is the shape the object takes on when interacting with a vibration. We predict that as the leg length to body width of the spider increases, the number of modes predicted will increase, and more modes will enable the spider to sense different vibrations.

How enjoyable was using an integrated approach?

I really enjoyed the computer science aspect of this project and building the models (much more than I anticipated!)

Were there any difficulties integrating sciences?

The main difficulty was learning MATLAB (which is what I used to build my models)

Any advice for future students?

Just keep an open mind to what science can entail and do not be afraid to ask anyone questions!