

Principal Investigator

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PI Position Title

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N/A

Proposal Title

Building a custom high-speed microscope to capture real-time neuronal signaling in *Caenorhabditis elegans*

Proposal Description

Neurons signal to each other at an incredibly fast rate, allowing multicellular organisms to respond to a variety of external stimuli across their entire body. Capturing this communication between nerve cells is no easy feat as the electrical signal generated by a firing cell may last only a few milliseconds. This short window of time makes using conventional cameras attached to commercial microscopes ineffective in capturing nerve signaling. However, in collaboration with Dr. Shawn Lockery at University of Oregon we will be able to build a custom microscope which utilizes a high-speed camera to clearly capture the firing of neurons. Using our model organism, *Caenorhabditis elegans*, we have found that the neurotransmitter octopamine is released from sensory neurons to communicate information between neurons and regulates the innate immune response during pathogen infection. However, exactly how these signals are relayed between neurons or between neurons and other tissues remains unknown. With a custom high-speed microscope, we can label specific neurons with fluorescent tags, expose the tagged animals to a pathogen, and then monitor the activity of the neurons. We will be able to examine

the electrical discharge of the neurons and capture neuronal signaling patterns. Such signaling patterns can only be clearly obtained using the high-speed camera which captures more than 200 frames per second as opposed to more common cameras which capture 30 frames per second.

Building this custom microscope is no easy task. While we were able to obtain the necessary parts last year, we do not have the expertise and specific skill sets to assemble the machine. Dr. Shawn Lockery, on the other hand, is a world-renowned neuroscientist and microscopist who builds his own high-speed microscope to study how the nervous system controls behavior in *C. elegans*. He has more than 30 years of experience and expertise in neuroscience including experimental and theoretical approaches. Dr. Lockery has been our collaborator for the past 10 years. He was a co-investigator of my past NIH R21 grant and a consultant of my past NIH R35 grant. He is also a consultant for my current R35 grant. He is willing to train us on how to build and operate the custom high-speed microscope that we need for studying neuronal signaling. If funded with the travel funds, two of our lab members (one postdoc and one technician) will travel to the University of Oregon and get trained in the Lockery lab. After the training, we will assemble and operate our own microscope to capture signals traveling across neurons in real-time during their responses to pathogen infection. Such work will not only greatly enhance the existing collaboration between our lab and the Lockery lab, but also facilitate our dissection of neural signaling circuits and advance our understanding of how the nervous system regulates the immune system during pathogen infection. As dysregulated immune functions have been implicated in a myriad of human diseases, our studies will benefit the development of more effective treatments for immune disorders.

Budget

Airline fare 2x people = Delta \$700

Two lab members will be traveling to Eugene Oregon to train in Dr. Shawn Lockery's lab.

Hotel cost 2x people (five nights, four days) = \$840 at the Graduate Eugene

The average cost of a hotel within easy walking distance of the University of Oregon campus. Staying closer to campus allows travel to and from the training lab without the need for a rental car.

Food cost five days = \$288 per person following the guideline set out by U.S. General Services administration.

An estimated per diem for food while the lab members are away.

Airport transportation = \$200

The taxi fare for travel between the WSU Spokane campus to the Spokane international airport, and the Eugene airport to the Graduate Eugene Hotel.

Total budget = \$2,316

Certified Budget Administrator
Chris Nieuwenhuis

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