

USRA Project Description: Professor C. Bergervin

Hearing is one of our most basic senses and plays a critical role in our daily lives. For example, consider the ubiquity of speech communication and listening to music. As such, hearing impairment (e.g., difficulty detecting sounds and/or following conversations in noisy environments) is a major factor affecting the quality of life for a significant fraction of people in Canada and all around the world. The situation is further exacerbated by the current COVID-19 pandemic, such as mask coverings making communication more difficult for those with hearing loss, as well as emerging views on cochlear synaptopathy, where the connections between sensory cells and auditory neurons are idiosyncratically degraded.

Healthy ears exhibit remarkable functionality in terms of being both sensitive and selective to sound. To achieve this, the ear appears to be active in that it metabolically uses energy to affect its response, such as amplifying sound-induced motions to boost detection. As a consequence, healthy ears generate sounds that are measurable in the ear canal with a sensitive microphone. These signals are known as otoacoustic emissions (OAEs) and provide valuable clinical diagnostics (e.g., newborn hearing screening) and scientific insight into the active ear. However, much remains unknown about their generation mechanisms due to the morphological complexity and fragility of the mammalian cochlea.

Outline of the student's role

Student will work in the lab to help establish electrophysiological measurements in lizards to assess different aspects of auditory function and compare data back to theoretical models. In working towards the program objectives, I expect students will acquire a wide range of valuable skills: programming, signal processing, electronics, & computational modeling.

Expected quality of the training to be received

Pursuing the proposed Aims will allow students to develop into the next generation of neurophysiologists, biophysicists, and biomedical engineers. They will not only gain skills, but in turn develop new techniques and approaches of their own. Along the way, I anticipate that students in the lab will contribute to the body of scientific literature, create opportunities to distinguish themselves (with my support), and pursue outreach and serve as role models.