

Submit your application to Dr. Bradley Winters

Project Title: Literature review of cellular diversity in the lateral superior olive

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Abstract: The superior olivary complex (SOC) in the brainstem of mammals integrates information from the two ears enabling sound localization. This ability underlies selective auditory attention and is disrupted by hearing loss and in children with central auditory processing disorder (CAPD). Principal neurons of the lateral superior olive (LSO PNs) are critical for these functions. The classical view of the LSO is a homogeneous block of cells that extracts ongoing interaural level differences (ILDs), however, LSO is increasingly implicated in encoding interaural time differences (ITDs) for broadband transients and amplitude modulations. Cellular properties are fundamental to how neurons extract and encode information. ILD/ITD processing places disparate demands on neuronal properties and there is cellular diversity in the LSO that is not well-understood. It is also critical to understand how different types of information may be organized in higher processing centers of the inferior colliculus (IC).

We found that LSO PNs consist of inhibitory and excitatory cell types with different projection patterns, intrinsic membrane properties, and morphology. The student project will be to work with the PI in accessing and consolidating scientific literature on cellular diversity in the lateral superior olive.

Significance: Our overarching hypothesis is that LSO PN cellular diversity supports both ILD and ITD coding and neurotransmitter system, intrinsic excitability, and projection pattern provide means to organize differentially extracted information in the IC. This project will consolidate knowledge about the cellular diversity of the LSO.

Goals and Objectives: The student will amass a comprehensive list of scientific papers associated with the LSO and catalog findings related to cellular diversity. The student will also draft a synthesis of this information in collaboration with the PI.

Methods: Online database research.

Data analysis: Scientific literature will be cataloged and analyzed for aspects of cellular diversity in the LSO.

Anticipated Findings: The anticipated findings are a comprehensive annotated bibliography and a draft synthesis of consistent and contradictory results.

Student Fellow Training/Mentoring Plan: The student will meet regularly with the PI and attend weekly lab meetings to better understand the type of research we do. The Winters lab is part of the close-knit NEOMED Hearing Research Group which the student will have the opportunity to interact with.