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# Targeting of central nucleus projections to extramodular zones of the lateral cortex of the inferior colliculus in developing mouse

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Targeting of Central Nucleus Projections to Extramodular Zones of the Lateral Cortex of the  
Inferior Colliculus in Developing Mouse

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An Honors College Project Presented to  
the Faculty of the Undergraduate  
College of Science and Mathematics  
James Madison University

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by Isabel De Jesús Lamb-Echegaray

May 2018

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Accepted by the faculty of the Department of Biology, James Madison University, in partial fulfillment of the requirements for the Honors College.

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PUBLIC PRESENTATION

This work is accepted for presentation, in part or in full, at the Association for Research in Otolaryngology 41st Annual Midwinter Meeting on February 3rd, 2018 and at the Central Virginia Chapter of the Society for Neuroscience on March 24th, 2018.

## **Abstract**

The multimodal lateral cortex of the inferior colliculus (LCIC) exhibits a modular-extramodular micro-organization that is evident early in development. In addition to a set of neurochemical markers that reliably highlight its modular-extramodular organization, mature projection patterns in a variety of adult species suggest that major LCIC afferents also recognize and adhere to such a framework. This patch-matrix-like arrangement appears to segregate into distinct afferent streams, with somatosensory inputs targeting LCIC modules and auditory inputs targeting surrounding extramodular zones. Currently lacking is a detailed understanding of the development and shaping of multimodal LCIC afferents with respect to its modular-extramodular framework. The present study examines the ontogeny of one auditory input to the LCIC, that arising from the central nucleus of the inferior colliculus (CNIC), with respect to the neurochemical framework; and suggests an early specificity of patterned inputs to the LCIC that exhibit discrete modular-extramodular mapping characteristics. Projection adherence to the LCIC extramodular framework becomes increasingly clear over the early postnatal period, and readily apparent by hearing onset. Double-labeling studies confirm that bilateral projections from CNIC to LCIC occupy extramodular domains that surround LCIC glutamic acid decarboxylase (GAD)-positive layer 2 modules by hearing onset. Biocytin-labeled CNIC axons in living slice preparations avoid LCIC modules, terminating heavily in calretinin (CR)-positive extramodular zones. Determining how these emerging multimodal LCIC input arrays may interface with each other, as well as how they align with and are potentially influenced by similarly configured Eph-ephrin guidance patterns, is discussed.