Subject: Thesis Defense - Shivani Dia Makkar, MS Biology
Date: Tuesday, July 14, 2026 at 3:20:09 PM Eastern Daylight Time
From: SSB Faculty List on behalf of Diane St. Germain
To: SSB-FACULTY-LIST-L@LISTSERV.GMU.EDU

Thesis Defense Announcement
To: The George Mason University Community

Candidate: Shivani Dia Makkar

Program: M.S. in Biology

Date: July 29, 2026

Time: 2:00 PM Eastern Time (US and Canada)

Location:
Join Zoom Meeting
https://gmu.zoom.us/j/98839839671?pwd=6n0uHwoS5bhUNwhbyequtbU4Nxf6NK.1

Meeting ID: 988 3983 9671
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+13017158592,,98839839671#,,,,*512928# US (Washington DC)
+12678310333,,98839839671#,,,,*512928# US (Philadelphia)

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+1 267 831 0333 US (Philadelphia)
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Passcode: 512928
Find your local number: https://gmu.zoom.us/u/asnKP30Mq

Committee Chair: Dr. Theodore Dumas

Committee members: Dr. Alessandra Luchini, Dr. Dmitri Klimov

Title: Expression of the Tetracycline Transactivator in Parvalbumin-positive Interneurons in the Hippocampus Through the Creation of Novel Adenoassociated Viral Vectors

Abstract:

Schizophrenia is a neuropsychiatric disorder characterized by cognitive deficits, including impaired hippocampus-dependent spatial memory, as demonstrated by reference memory and delayed matching-to-place tasks that reveal disrupted hippocampal processing. At the circuit level, hippocampal function depends on coordinated theta and slow gamma oscillations, with slow gamma, driven by CA3–CA1 inputs, supporting memory retrieval through interactions between pyramidal neurons and parvalbumin-positive (PV+) interneurons. N-methyl-D-aspartate receptor (NMDAR) dysfunction has been implicated in schizophrenia because reduced signalling disrupts theta–gamma coupling and weakens slow gamma oscillations. Previous studies using chimeric GluN2 subunits show that GluN2B C-terminal signalling enhances hippocampus-dependent memory, but this work has largely focused on excitatory neurons. Because NMDARs are expressed in both excitatory and inhibitory cells, cell-type–specific approaches are needed. The purpose of this study was to generate and validate an adeno-associated virus (AAV) construct capable of selectively expressing the tetracycline transactivator (tTA) in PV+ interneurons by inserting the tTA sequence into the pAAV_S5E2_dTomato vector, complementing existing CaMKII-based AAVs in TRE_GluN2 chimera mice. The successful creation of this construct will enable future studies of how cell-type–specific NMDAR signalling regulates slow gamma oscillations and memory.

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