

# Fall 2025 Colloquium

## Materials Department

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Oak Ridge National Laboratory

Friday, December 5, 2025

11:00 am | ESB 1001



### Is the neuronal plasma membrane's lipid bilayer a new drug target?

Understanding the molecular mechanisms underlying learning and memory remains a central challenge in the treatment of dementia. Using droplet interface bilayers (DIBs), we have recently shown that membrane plasticity, the ability of a membrane to adapt its structure and/or composition in response to electrical stimuli, can modulate the conductivity of membrane ion channels. This suggests that learning does not solely depend on the energetically costly synthesis of new proteins to maintain altered synaptic states—a central tenet in neurobiology. Instead, voltage-dependent membrane restructuring can dynamically modulate ion channel conductance. In today's seminar, I will discuss that in addition to synaptic plasticity that involves changes to the number of ion channels, our recent findings suggest that composition-dependent membrane restructuring is another mechanism capable of controlling biological synaptic plasticity—I will also present recent lithium data and explain how this recently acquitted data is related Alzheimer's disease and bipolar disorder. Finally, the idea that the neuronal plasma membrane plays an integral part in learning and memory raises the possibility that its lipid bilayer can also be used as a therapeutic target for brain diseases that do not respond to current drugs targeting proteins.

### Bio

John Katsaras received his BA and BSc degrees from Concordia University, and MSc and PhD degrees from the University of Guelph. After postdoctoral studies at McMaster University and the Centre National de la Recherche Scientifique (CNRS), he returned to Canada to take up a research scientist position at Atomic Energy of Canada Limited and then at the National Research Council of Canada. In 2010, he moved to Oak Ridge National Laboratory as Distinguished Research and Development staff in the Neutron Sciences Directorate. John is a fellow of the American Institute for Medical and Biological Engineering and the Neutron Scattering Society of America (NSSA). In 2022, he was awarded the NSSA's Sustained Research Prize.

<https://www.ornl.gov/staff-profile/john-katsaras>

Hosted by Raphaële Clément.