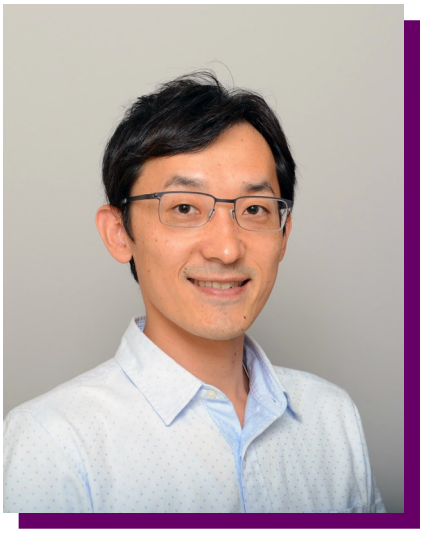
NC STATE UNIVERSITY

JOINT DEPARTMENT OF BIOMEDICAL ENGINEERING

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

Coulter Seminar Series Presents

"Development of rabies virus tools for elucidating structure and function of neural circuits "



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Professor Osakada graduated from Kyoto University, graduated from Kyoto University with a Ph.D. from the Department of Pharmacology, Graduate School of Pharmaceutical Sciences, Kyoto University, Kyota, Japan in 2007. Dr. Osakada has previously been a research scientist at RIKEN and a Research Associate at The Salk Institute for Biological Studies. He is currently an Associate Professor at Nagoya University, Japan. His research aims to understand fundamental principles of neural circuits by primarily focusing on the structure and function of the visual system. He employs genetic, viral, electrophysiological, imaging, and behavioral approaches in mice and non-human primates. To understand and ultimately treat diseases of the nervous system, he is also working on neural regeneration and plasticity with a special focus on drugs and cells that restore circuit function.

ABSTRACT

Understanding how neural circuits process information requires resolving connectivity with high resolution, correlating connectivity with function, and manipulating activity of defined circuit components. Recent advances in the development of molecular, genetic and viral based tools are now making this possible at the level of resolution of specific cell types and even single neurons. Rabies viruses infect neurons through axon terminals and spread transsynaptically in a retrograde direction in the nervous system. Rabies viruses whose glycoprotein (G) gene is deleted from the genome cannot spread across synapses. Transcomplementation of G, however, allows for labeling directly-connected, presynaptic neurons. Cre-dependent or bridge protein-mediated transduction via EnvA/TVA or EnvB/TVB systems allows cell-type-specific or single-cell-specific targeting of rabies viruses. Because the rabies virus leaves cells viable for weeks, it is possible to combine rabies labelling of connectionally-defined neuronal populations with studies monitoring or manipulating their activity. Combining the rabies virus systems with in vivo imaging and optogenetic methods, and/or inducible gene expression in transgenic animals, will facilitate experiments investigating neural circuit development, plasticity, and function.

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321 MacNider Hall (UNC), & East Carolina University (ECU)