Tohoku-NYCU Online Seminar for Neuroscience

Organized by :
Tohoku University, Graduate School of Medicine,
National Yang Ming Chiao Tung University, College of Medicine
Endorsed by :
Tohoku University [Neuro Global International Joint Graduate program,
Tohoku University Brain Science Center

Date

Wednesday, April 22, 2026, 17:00 – 18:35 JST
(16:00 – 17:35 TST)

1st Speaker

Tsai-Wen Chen, Ph.D.

Associate Professor, Institute of Neuroscience, National Yang Ming Chiao Tung University

Title

Seeing the Brain Think: New Ways to Watch Neurons' Electrical Signals

2nd Speaker

Sherif Rashad, MD, Ph.D.

Associate Professor, Graduate School of Biomedical Engineering, Tohoku University.

Title

When Synonymous Codons Matter: Translational Reprogramming by Codon Bias and tRNA Modifications in Cancer

Program

17:00 JST (16:00 TST) Opening Remarks (10mim)
17:10 (16:10) Lecture by **Tsai-Wen Chen, Ph. D.** (35min)
17:45 (16:45) Q&A (5min)
17:50 (16:50) Lecture by **Sherif Rashad, MD, Ph.D.** (35min)
18:25 (17:25) Q &A (5min)
18:30 (17:30) Closing Remarks (5min)

【脳科学セミナーシリーズEx, 先進脳科学セミナーシリーズEx】【[Advanced] brain science seminar series Ex】1 point
【医学系研究科・医学履修課程】国際交流セミナー【Medical Science Doctoral Course】 International Interchange Seminar 1 attendance
【生命科学研究科・単位認定セミナー】【Credit-granted seminar】2 points

Contact: Ken-Ichiro TSUTSUI
[tsutsui@tohoku.ac.jp]

Speaker：**Tsai-Wen Chen, PhD**

Title: Seeing the Brain Think: New Ways to Watch Neurons' Electrical Signals

Abstract:

Every thought, memory, and movement in the brain depends on tiny electrical signals generated by neurons. But despite their importance, these signals are surprisingly hard to observe in the living brain. Measuring them directly has traditionally required the painstaking insertion of microelectrodes, while imaging many cells at once has been limited by blur, noise, and the sheer speed of the signals themselves. In this talk, I will describe new methods that let us watch the brain's electrical activity in far greater detail than before. By combining modern fluorescent voltage sensors with new imaging and analysis strategies, we can begin to track the fast activity of hundreds of neurons at once in living animals. I will discuss how these tools work, why they matter, and what they are starting to reveal about the collective behavior of brain cells. Together, these advances are bringing us closer to a long-standing goal in neuroscience: understanding how activity across many individual neurons gives rise to brain function.

Reference:

1. Chen T-W, Huang X-B, Plutkis S, Holland K, Lavis L, Lin B-J (2025) Imaging neuronal voltage beyond the scattering limit, Nature Methods, 22 (1366-1375)

2. Huang Y-C, Chen H-C, Lin Y-T, Lin S-T, Zheng Q, Abdelfattah A, Lavis L, Schreiter E, Lin B-J, Chen T-W (2024) Dynamic assemblies of parvalbumin interneurons in brain oscillations, Neuron, 112 (2600-2613)

3. Chen T-W, Wardill T, Sun Y, Pulver S, Renninger S, Baohan A, Schreiter E, Kerr R, Orger M, Jayaraman V, Looger LL, Svoboda K, Kim D (2013) Ultrasensitive fluorescent proteins for imaging neuronal activity. Nature, 499 (7458) 295-300

Profile:

Dr. Tsai-Wen Chen is an Associate Professor at the Institute of Neuroscience, National Yang Ming Chiao Tung University. His research focuses on developing new ways to study brain activity in living animals, especially the fast electrical signals of neurons. His earlier work led to the development of GCaMP6, a calcium indicator now widely used in neuroscience research. His current research explores how large groups of neurons work together during sensory processing, changes in brain state, and rhythmic brain activity, with the goal of understanding how these collective dynamics shape perception and behavior.

Speaker：**Sherif Rashad, MD, Ph.D.**

Title: **When Synonymous Codons Matter: Translational Reprogramming by Codon Bias and tRNA Modifications in Cancer**

Abstract:

The genetic code is often viewed as fixed, but growing evidence suggests that how cells *use* synonymous codons can profoundly shape protein expression and cell behavior. In this seminar, I will present two complementary projects that uncover codon bias as an active regulatory layer in human biology and cancer. First, using comparative genomics together with large-scale human tissue and cancer proteomics, we show that G/C-ending and A/T-ending codons are not used randomly, but instead define distinct biological programs. G/C-ending codons are linked to neuronal and differentiation-related functions, whereas A/T-ending codons are associated with proliferation and oncogenic pathways. We further find striking discordance between RNA-level and protein-level codon patterns, revealing a major role for translational regulation, and identify a global A/T-ending shift as a common feature of many human cancers.

I will then present a mechanistic study in glioma showing how this principle is implemented through tRNA modification. We identify the tRNA dioxygenase ALKBH1 as a key regulator of wobble cytidine oxidation that drives codon-biased translation in glioma. By reshaping decoding of specific leucine codons and imposing a broader A/T-ending translational program, ALKBH1 promotes stem-like and neuronal-like tumor states, intratumoral heterogeneity, extracellular matrix remodeling, and immune-evasive microenvironmental signaling. Together, these studies position codon bias and tRNA chemistry as central determinants of translational plasticity, with broad implications for cancer biology, biomarker discovery, and future therapeutic targeting.