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, June 18, 2025
17:00 – 18:35 JST (16:00 – 17:35 TST)

1st Speaker

Luke, Kun-Yang Lin, Ph.D.

Assistant Professor, Institute of Anatomy and Cell Biology,
National Yang Ming Chiao Tung University

Title

The Regulation of Cytoskeletal Dynamics in Quiescent Neural Stem Cells

2nd Speaker

Kentaro Abe, Ph.D.

Professor, Department of Developmental Neuroscience,
Tohoku University Graduate School of Life Sciences

Title

Analyzing avian communication to uncover the biological foundation of verbal and non-verbal communication

Registration (Access Zoom address will be sent after the registration)

Please contact NGP Office (neuroglobal@grp.tohoku.ac.jp)

Program

17:00 JST (16:00 TST) Opening Remarks (10mim)
17:10 (16:10) Lecture by **Luke, Kun-Yang Lin, Ph.D.**(35min)
17:45 (16:45) Q&A (5min)
17:50 (16:50) Lecture by **Kentaro Abe, 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: Prof. Ken-Ichiro TSUTSUI
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Speaker：**Luke Kun-Yang Lin (林 坤陽), Ph.D.**

Title：**The Regulation of Cytoskeletal Dynamics in Quiescent Neural Stem Cells**

Abstract: The transition between quiescence and proliferation in neural stem cells (NSCs) is essential for brain development, homeostasis, and regeneration. In mammals, impaired NSC reactivation is associated with neurodevelopmental disorders such as microcephaly and with age-related declines in neurogenesis. Drosophila larval NSCs offer a powerful in vivo model to study this transition, as they undergo synchronized quiescence and nutrient-dependent reactivation via evolutionarily conserved pathways. We show that quiescent Drosophila NSCs (qNSCs) extend specialized protrusions toward the neuropil, reminiscent of the basal processes of mammalian radial glial cells, which can regenerate following injury. These protrusions rely on coordinated cytoskeletal remodeling involving both filamentous actin (F-actin) and microtubules. F-actin dynamics promote activation of the transcription factor Mrtf, which is required for cell cycle re-entry and is regulated via GPCR signaling. In parallel, microtubule growth organized by the Golgi apparatus supports protrusion regeneration and re-establishment of NSC-neuropil contacts. Key regulators of this process include the actin polymerization factor Diaphanous and the Golgi-resident GTPase Arf1, which together coordinate cytoskeletal dynamics and adhesion molecule localization for qNSC reactivation. Together, our findings establish Drosophila qNSCs as a tractable model for studying stem cell regeneration and reactivation, and identify cytoskeletal remodeling as a key mechanism linking extrinsic signals to NSC activation.

Reference:

1. KY Lin, M. Gujar, J. Lin, WY Ding, J. Huang, Y. Gao, YS Tan, X. Teng, SC Low, P. Kanchanawong, Y. Toyama, H. Wang, Astrocytes control quiescent NSC reactivation via GPCR signaling-mediated F-actin remodeling, Science Advances, Vol 10(30):eadl4694. 2024

2. M. R Gujar, Y. Gao, X. Teng, Q. Deng, KY Lin, YS Tan, Y. Toyama, H. Wang, Golgi-dependent reactivation and regeneration of Drosophila quiescent neural stem cells, Developmental Cell, Vol 58(19),1933-1949. 2023

Profile:

Field of interest: Developmental Neurobiology

- Quiescent transition of neural stem cells
- Neural stem cells and its niche
- Neurodevelopmental disorders

Dr. Kun-Yang Lin is an Assistant Professor at the School of Medicine, National Yang Ming Chiao Tung University (NYCU), Taiwan, where he began his faculty position in February 2025. He received his Ph.D. from Academia Sinica, Taiwan, and completed his postdoctoral training at Duke-NUS Medical School in Singapore .Dr. Lin's research focuses on elucidating the molecular mechanisms that regulate the transition of neural stem cells (NSCs) from quiescence to activation, particularly in the context of brain development and neurodevelopmental disorders such as autism spectrum disorder (ASD). His laboratory employs both *Drosophila* models and human cerebral organoids to investigate how NSCs are regulated intrinsically and through their niche environment, with a special emphasis on astrocyte-derived signals. To achieve this, his lab integrates a range of techniques including genetics, confocal microscopy, live-cell imaging, and single-cell transcriptomics. His long-term goal is to uncover the fundamental mechanisms governing NSC regulation in brain homeostasis and to develop novel therapeutic strategies for treating developmental brain disorders.

Speaker ：Kentaro Abe (安部 健太郎), Ph.D

Title : Analyzing avian communication to uncover the biological foundation of verbal and non-verbal communication

Abstract:
Interindividual communication is fundamentally structured around three key aspects: information, utterance, and understanding, distinguishing it from uni-directional information transfer. However, due to the inherent subjectivity of this process and the scarcity of non-human species exhibiting complex verbal communication comparable to that of humans, the precise neural mechanisms enabling successive communication have yet to be fully elucidated. To investigate the biological foundation of communication, we have been employing birds as animal models. Recently, we developed a virtual reality assisted framework of analyzing interindividual communication among songbirds. Using this system, we demonstrated that songbirds dynamically modulate their vocalization in a goal directed manner, adapting their content to contextual changes. Furthermore, we successfully established a generative language model for birdsongs, which effectively captures the hierarchical structure governing vocal elements within vocal sequences. A reverse engineering approach further revealed the impact of computational and neural manipulations on language model performance, providing insights into the underlying mechanisms. These frameworks offer powerful tools for advancing our understanding of the computational principles driving information processing and comprehension in both artificial intelligence and the brain.

Reference:
1. Kobayashi K, Matsuzaki K, Taniguchi M, Sakaguchi K, Inui K, Abe K*. FinchGPT: a Transformer based language model for birdsong analysis. ***arXiv***, (2025).
2. Fujibayashi M, Abe K*. A behavioral analysis system MCFBM enables objective inference of songbirds' attention during social interactions. ***Cell Reports Methods***, 100844, (2024).
3. Kawaji T, Fujibayashi M, Abe K*. Goal-directed and flexible modulation of syllable sequence within birdsong. ***Nature Communications*** 15(1): 3419, (2024).

Profile:
Field of interest: Social Neuroscience
- Mechanism of verbal and non-verbal communication
- Artificial intelligence and neural computation
- Mechanism of Learning and memory
- Molecular mechanism underlying Lifestyle and Disease related change in the brain

Dr. Kentaro Abe is a professor at the Brain Development Laboratory, Graduate School of Life Sciences, Tohoku University, Japan. He earned his Ph.D. in 2007 from Kyoto University under the supervision of Professor Masatoshi Takeichi, specializing in cell and developmental biology. From 2007 to 2017, he served as an Assistant Professor at the Graduate School of Biostudies, Kyoto University, and later as a Lecturer at Graduate School of Medicine in Professor Dai Watanabe's laboratory, where he began his research on songbirds. Since moving to Tohoku University in 2017, he has been investigating the molecular mechanism underlying brain changes in response to various postnatal experiences, including development, learning, social interaction and disease. In parallel, by incorporating information science and artificial intelligence, he has continued to study the mechanism of social communication using songbird models, aiming to understand the neural basis of language computation.