

Jun Nagai, Ph.D.

Team Leader, Laboratory for Glia-Neuron Circuit Dynamics
RIKEN Center for Brain Science, Japan

📍 S602 Central Building, 2-1 Hirosawa, Wako, Saitama, 351-0198, Japan

☎ +81 (48) 467-6896

✉ jun.nagai@riken.jp

I run my lab for researching if, when and how brain cells dynamically interact with each other and causally influence animal behavior. Besides neuronal cells, I have a strong interest in the other half of the brain; glial cells. A key perspective to tease apart how the brain functions and malfunctions is to explicate molecular dialogues among diverse cells. The lab aims to deliver new insights on how the brain, an unprecedented sophistication, shapes the self and society, thereby helping develop new therapeutics for brain disorders.

Professional Experience

- 2020.11 - present **Team Leader, Glia-Neuron Circuit Dynamics**, RIKEN Center for Brain Science, Tokyo Japan
- 2016.04 - 2020.10 **Postdoctoral Scholar**, UCLA, USA
- 2018.04 - 2019.03 **The Uehara Memorial Foundation Postdoctoral Fellow**, UCLA, USA
- 2016.04 - 2018.03 **JSPS Overseas Postdoctoral Fellow**, UCLA, USA
- 2015.10 - 2016.03 **JSPS Research Fellow PD**, Waseda U., Japan
- 2013.04 - 2015.09 **JSPS Research Fellow DC1**, Waseda U., Japan

Education

Waseda University, Department of Life Science & Medical Bioscience, Tokyo, Japan

- 2013.04 - 2015.09 **Ph.D. in Science**
Advisor - Toshio Ohshima, M.D., Ph.D.
Thesis - Functional Analysis of CRMP4 in Recovery after Neural Injury
- 2011.04 - 2013.03 **Master in Science, valedictorian**
- 2007.04 - 2011.03 **Bachelor in Science**

Experimental Skills

- Molecular biology Histological staining & analysis, Western blotting, DNA cloning and RNA-seq
- Mouse surgeries Intracranial microinjection (viruses and axon tracers), Retro-orbital intravenous injection, Head-bar surgery for in vivo recording, Spinal cord injury, and Optic nerve crush
- Physiology Whole-cell patch clamp electrophysiology in slice, Silicon probe microelectrodes electrophysiology from awake mice, [Ca²⁺]_i imaging in slice and from awake, behaving mice, and Circuit and cell specific in vivo manipulation using chemogenetics and optogenetics
- Animal behavior Tests related to motor functions, innate behaviors, attention and cognition

Honors & Awards

- Sept 10, 2020 **The Award for Young Investigator**, Japanese Society for Neurochemistry
- Feb 5, 2020 **Chancellor's Award for Postdoctoral Research**, UCLA
- Jul 2019 **Nabeshima Award**, The Japanese Society for Neurochemistry
- May 23, 2019 **Pearl Cohen Poster Award**, UCLA Bioscience Innovation Day
- Jul 21, 2018 **Ben Barres Memorial Award, and Keynote Speaker**, Cold Spring Harbor Laboratory
- Mar 24, 2016 **The Azusa Ono Memorial Award**, Waseda University
- Dec 4, 2015 **Young Scientist Award for the Best Oral Presentation**, The Molecular Biology Society of Japan and The Japanese Biochemical Society
- Sept 21, 2015 **Accelerated completion of Ph.D. program**
- Sept 11, 2015 **Best Oral Presentation Award**, The Japanese Society for Neurochemistry
- Jul 26, 2014 **Young Investigator Award**, The Physiological Society of Japan, Associates of Young Researchers of Physiology

Funding

- 2018.04 - 2019.03 **The Uehara Memorial Foundation Postdoctoral Fellowship** (JPY 4,100,000)
- 2016.04 - 2018.03 **JSPS Overseas Postdoctoral Fellowship** (JPY10,764,000)
- 2013.04 - 2016.03 **Grant-in-Aid for JSPS Fellows (25-5321)** (JPY 3,200,000)
- 2015.10 - 2016.03 **JSPS Research Fellowship for Young Scientists PD** (JPY 2,172,000)
- 2013.04 - 2015.09 **JSPS Research Fellowship for Young Scientists DC1** (JPY 6,000,000)
- 2014.01 - 2014.03 **Global COE for Practical Chemical Wisdom Research Grant** (JPY 400,000)
- 2012.09 **JASSO Student Exchange Support Program Scholarship** (JPY 80,000)
- 2011.07 - 2011.09 **JASSO Student Exchange Support Program Scholarship** (JPY 240,000)
- 2011.07 - 2011.09 **UCLA CSST Program Fellowship** (USD 9,934)
- 2011.04 - 2013.03 **JASSO Class 1 Scholarship** (JPY 2,112,000, exemption from return of subsidy)

Invited Talks

- Jun 17, 2020 **Yamanashi Univ.** YiBIC seminar series
- Date TBD **Osaka Univ., Institute of Scientific and Industrial Research.** Osaka, Japan
- Feb 18, 2020 **Univ. Tokyo, School of Pharmacological Science.** Tokyo, Japan.
- Jul 29, 2019 **National Center of Neurology and Psychiatry (NCNP).** Tokyo, Japan.
- Apr 24, 2019 **RIKEN Center for Brain Science.** Saitama, Japan.
- April 25, 2019 **TWIns** (the Tokyo Women's Medical University - Waseda University Joint Institution for Advanced Biomedical Sciences). Tokyo, Japan.
- Nov 30, 2018 **UCLA Learning & Behavior Seminar Series.** Los Angeles, CA, USA.
- Jul 21, 2018 **Keynote Lecture in Cold Spring Harbor Meeting Glia.** Cold Spring Harbor, NY, USA.

Publications

UCLA

Prof. Baljit Khakh's lab

2016.04 - 2020.10

*Nagai, J., *Yu, X., Papouin, T., Cheong, E., Freeman, M.R., Monk, K.R., Hastings, M.H., Haydon, P.G., Rowitch, D., Shaham, S., Khakh, B.S. Behaviorally consequential astrocytic regulation of neural circuits. *Neuron* (Review), in press. *Co-first authors.

*Yu, X., *Nagai, J., Marti, M., Coppola, G., Babu, M. M., Khakh, B.S. Context-specific astrocyte molecular responses are phenotypically exploitable. *Neuron* (Article), in press. *Co-first authors.

*Yu, X., *Nagai, J., Khakh, B.S. Improved tools to study astrocytes. *Nature Reviews Neurosci* (Review) 21:121-138. *Cover of the issue*. *Co-first authors.

Nagai, J., Rajbhandari, A.K., Gangwani, M.R., Hachisuka, A., Coppola, G., Masmanidis, S.C., Fanselow, M.S., Khakh, B.S. (2019) Hyperactivity with disrupted attention induced by activation of an astrocyte synaptogenic cue. *Cell* (Article), 177(5):1280-92. Highlighted at *Cell* (2019) 177(5):1091-93, *Nature* (2019) 571(7763):43-44, *Cell Calcium* (2019) 82:102062 and *Faculty of 1000*.

Nagai, J. (2019) Glial involvement in psychiatric phenotypes. *Jikken Igaku (Experimental Medicine)* (Review), Zoukan, Vol. 37, No. 17: Chapter 4-4.

Lobas, M., Tao, R., Nagai, J., Kronschlager, M.T., Borden, P., Marvin, J.S., Looger, L.L., Khakh, B.S. (2019) A genetically encoded single-wavelength sensor for imaging cytosolic and cell surface ATP. *Nature Commun* (Article), 10:711. Highlighted in *Editors' choice*.

Yu, X., Taylor, A.M.W., Nagai, J., Golshani, P., Evans, C.J., Khakh, B.S. (2018) Reducing astrocyte calcium signaling in vivo alters striatal microcircuits and causes repetitive behavior. *Neuron* (Article), 99(6):1170-87. Highlighted at *Science Transl Med*.

Waseda University

Prof. Toshio Ohshima's lab

2010.02 - 2016.03

Yamazaki, Y., Nagai, J., Akinaga, S., Koga, Y., Hasegawa, M., Yamashita, Y., Kolattukudy, P., Goshima, Y., Ohshima, T. (2020) Phosphorylation of CRMP2 is required for migration and positioning of Purkinje cells: redundant roles of CRMP1 and CRMP4. *Brain Res*, 1736:146762.

*Togashi, K., *Hasegata, M., Nagai, J., Kotaka, K., Yazawa, A., Takahashi, M., Masukawa, D., Goshima, Y., Hensley, K., Ohshima, T. (2020) Lanthionine ketimine ester improves outcome in an MPTP-induced mouse model of Parkinson's disease via suppressions of CRMP2 phosphorylation and microglial activation. *J Neurol Sci*, 413:116802. *Co-first authors.

Kinoshita, Y., Kondo, S., Takahashi, K., Nagai, J., Wakatsuki, S., Araki, T., Goshima, Y., Ohshima, T. (2019) Genetic inhibition of CRMP2 phosphorylation delays Wallerian degeneration after optic nerve injury. *Biochem Biophys Res Commun*, 514(4):1037-1039.

Kondo, S., Takahashi, K., Kinoshita, Y., Nagai, J., Wakatsuki, S., Araki, T., Goshima, Y., Ohshima, T. (2019) Genetic inhibition of CRMP2 phosphorylation at serine 522 promotes axonal regeneration after optic nerve injury. *Sci Rep*, 9(1):7188.

Togashi, K., Hasegata, M., Nagai, J., Tonouchi, A., Masukawa, D., Hensley, K., Goshima, Y., Ohshima, T. (2019) Genetic suppression of CRMP2 phosphorylation improves outcome in MPTP-induced Parkinson's model mice. *Genes to Cells*, 24(1):31-40.

Nagai, J., Baba, R., Ohshima, T. (2017) CRMPs function in neurons and glial cells: a potential therapeutic target for neurodegenerative disease and CNS injury. *Mol Neurobiol*, 54(6):4243-42.

Publications (cont'd)

Waseda University

Prof. Toshio Ohshima's
lab

2010.02 - 2016.03

(cont'd)

Kotaka, K., Nagai, J., Hensley, K., Ohshima, T. (2017) Lanthionine ketimine ester promotes locomotor recovery after spinal cord injury by reducing neuroinflammation and promoting axon growth. *Biochem Biophys Res Commun*, 483(1):759-764.

Takaya, R., **Nagai, J.**, Piao, W., Niisato, E., Nakamura, F., Yamashita, N., Kolattukudy, P., Goshima, Y., Ohshima, T. (2017) CRMP1 and CRMP4 are required for proper orientation of dendrites of cerebral pyramidal neurons in the developing mouse brain. *Brain Res*, 1655:161-167.

Sasamoto, K., **Nagai, J.**, Nakabayashi, T., He, X., Ohshima, T. (2017) Cdk5 is required for the positioning and survival of GABAergic neurons in developing mouse striatum. *Dev Neurobiol*. 77(4):483-492.

Nagai, J., Takaya, R., Piao, W., Goshima, Y., Ohshima, T. (2016) Deletion of Crmp4 attenuates CSPG-induced inhibition of axonal growth and induces nociceptive recovery after spinal cord injury. *Mol Cell Neurosci*, 17;74:42-48.

Tonouchi, A., **Nagai, J.**, Togashi, K., Goshima, Y., Ohshima, T. (2016) Loss of CRMP4 suppresses dopaminergic neuron death in an MPTP-induced mouse model of Parkinson's disease. *J Neurochem*, 137(5):795-805.

Nagai, J., Owada, K., Kitamura, Y., Goshima, Y., Ohshima, T. (2016) Inhibition of CRMP2 phosphorylation repairs CNS by regulating neurotrophic and inhibitory responses. *Exp Neurol*, 277:283-95.

*Jin, X., *Sasamoto, K., **Nagai, J.**, Yamazaki, Y., Saito, K., Goshima, Y., Inoue, T. and Ohshima, T. (2016) Phosphorylation of CRMP2 by Cdk5 regulates dendritic spine development of cortical neuron in the mouse hippocampus. *Neural Plast*, 752435. *Co-first authors.

Nagai, J., Kitamura, Y., Owada, K., Yamashita, N., Takei, K., Goshima, Y., Ohshima, T. (2015) Crmp4 deletion promotes recovery from spinal cord injury by neuroprotection and limited scar formation. *Sci Rep*, 5:8269. Selected as a featured article of *natureasia.com*.

Niisato, E., **Nagai, J.**, Yamashita, N., Nakamura, F., Goshima, Y., Ohshima, T. (2013) Phosphorylation of CRMP2 is involved in proper bifurcation of the apical dendrite of hippocampal CA1 pyramidal neurons. *Dev Neurobiol*, 73(2):142-51.

Nagai, J., Goshima, Y., Ohshima, T. (2012) CRMP4 mediates MAG-induced inhibition of axonal outgrowth and protection against Vincristine-induced axonal degeneration. *Neurosci Lett*, 519: 56-61.

Niisato, E., **Nagai, J.**, Yamashita, N., Abe, T., Kiyonari, H., Goshima, Y., Ohshima, T. (2012) CRMP4 suppresses apical dendrite bifurcation of CA1 pyramidal neurons in the mouse hippocampus. *Dev Neurobiol*, 72(11):1447-5.

References

- Postdoc Advisor **Baljit S. Khakh, Ph.D. Professor of Physiology and Neurobiology**
David Geffen School of Medicine, University of California, Los Angeles
address: CHS 53-359, 10833 Le Conte Avenue, Los Angeles, CA 90095-1751. USA.
phone: +1 310 825 6258
email: bkhakh@mednet.ucla.edu
- Ph.D. Advisor **Toshio Ohshima, M.D. Ph.D, Professor of Department of Life Science and Medical Biocience**
School of Advanced Science and Engineering, Waseda University
address: TWIns 02C221, 2-2 Wakamatu-cho, Shinjuku, Tokyo 162-8480. Japan.
phone: +81 3 5369 7321
email: ohshima@waseda.jp
- Postdoc
Collaboartor **Sotiris C. Masmanidis, Ph.D. Associate Professor of Neurobiology and California**
Nanosystems Institute, University of California, Los Angeles
address: 10833 Le Conte Avenue Los Angeles, CA 90095-1751. USA.
phone: +1 310 794 5625
email: smasmanidis@ucla.edu
- Ph.D. Co-mentor **Takafumi Inoue, Ph.D. Professor of Department of Life Science and Medical Biocience**
School of Advanced Science and Engineering, Waseda University
address: TWIns, 2-2 Wakamatu-cho, Shinjuku, Tokyo 162-8480. Japan.
email: inoue.t@waseda.jp