Jun Nagai, Ph.D.

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

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I run my lab for reseraching 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 (PI), Glia-Neuron Circuit Dynamics,** RIKEN CBS, Tokyo Japan
2021.04 - present	**Visiting Associate Professor,** Waseda U, Tokyo Japan
2016.04 - 2020.10	**Postdoctoral Scholor,** 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, The Ono Azusa Awardee** 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	Mouse genetics, Histological analysis, Immunoblotting, 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

April 11, 2021	**UJA Paper Award,** United Japanese Researchers Around the World, Cheiron Initiative
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

2021.04 - 2024.03	**JSPS Grant-in-Aid for Scientific Research (B)** (JPY 13,400,000)
2021.04 - 2023.03	**JSPS Grant-in-Aid for Scientific Research on Innovative Areas** (JPY 6,000,000)
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)

Publications

UCLA
Prof. Baljit Khakh's lab

2016.04 - 2020.10

Nagai, J., Bellafard, A., Qu, Z., Yu, X., Ollivier, M., Gangwani, M.R., Diaz-Castro, B., Coppola, G., Schumacher, S.M., Golshani, P., Gradinaru, V., Khakh, B.S. Specific and behaviourally consequential astrocyte Gq GPCR signaling attenuation in vivo with ibARK. ***Neuron*** (Article) in press.

*Wang, W., *Schuette, P.F., **Nagai, J.,** Tobias, B.C., Reis, F.M.C.V., LaVu, M.Q., Pereira, S.M., Lin, L., Ji, S., Severino, A., Cahill, C., Evans, C.J., Canteras, N.S., Khakh, B.S., Kao, J.C., Adhikari, A. Coordination of escape and spatial navigation circuits orchestrates versatile flight from threats. ***Neuron*** (Article), 109(11):1848-1860. *Co-first authors.

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), 109(4):576-596. *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), 108(6):1146-1162. *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. (20190 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.

Publications (cont'd)

Waseda University
Prof. Toshio Ohshima's lab

2010.02 - 2016.03

(cont'd)

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.

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 pyramicdal 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.