CeNeuro2016

Nagoya BNC Joint Meeting

C. elegans Topic Meeting:

NEURONAL DEVELOPMENT,
SYNAPTIC FUNCTION & BEHAVIOR

July 27-30, 2016

Toyoda Auditorium,
Nagoya University, Nagoya, Japan

CeNeuro2016

CeNeuro2016 & Nagoya BNC Joint Meeting Program & Abstracts

July 27 (Wed) - July 30 (Sat), 2016
Toyoda Auditorium, Nagoya University

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For the sake of holding meetings like CeNeuro2016 to stimulate discussions and collaborations based on unpublished results, we organizers shall execute a right to prohibit anyone who violates any of these rules from attending the meeting or from entering to the venue.

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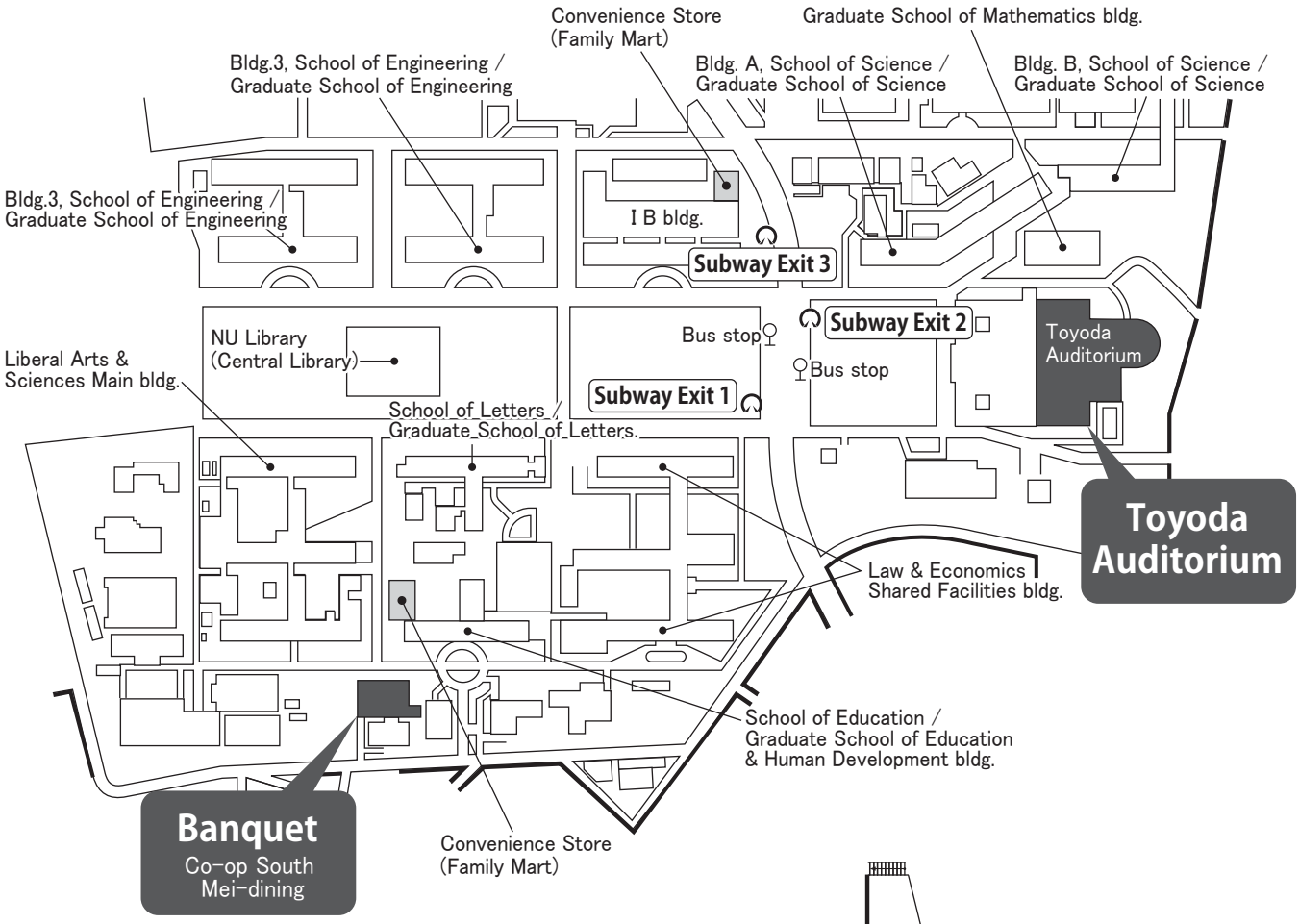
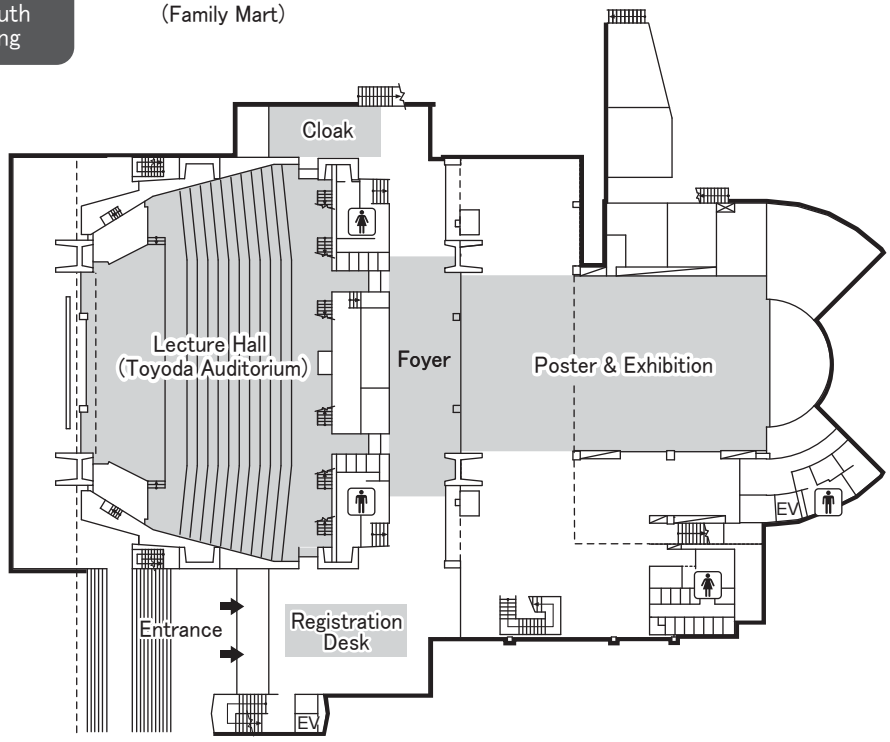
Nagoya University Campus Map



Toyoda Auditorium



Information for Participants

Registration (at Toyoda Auditorium)

Please show up at the Registration Desk on the first day of your attendance and pick up your meeting material at Toyoda Auditorium

〈Open Hours of Registration Desk〉

July 27	12:00-17:00
July 28, 29	8:30-17:00
July 30	8:30-12:00

*Registration Desk is also available for general inquiries about the meeting.

Opening Ceremony (July. 27, 17:45-18:00 at Toyoda Auditorium)

Enjoy Koto & Shakuhachi performance by Korei Hogakukai !

Opening Mixer (July. 27, 18:00-19:00 at Toyoda Auditorium)

Welcome to the Conference ! This will be an ideal opportunity to catch up with your international colleagues in a casual atmosphere.

Banquet (July 29, 19:30-20:30 at Nagoya Univ. Co-op South Mei-dining)

*see page 1 for map

Enjoy local foods in Nagoya called Nagoya Meshi , such as Misokatsu (pork cutlet with miso sauce), Hitsumabushi (chopped kabayaki eel on rice), Kishimen (flat noodle), Tenmusu (Rice Balls with Tempura inside), etc.

Nagoya BNC Symposium Opening Concert (July. 30, 13:15-13:45 at Toyoda Auditorium)

Ariko Matsuzaki (Vc)　Hitomi Narukawa (Pf)

Lunch & Dinner

Lunches (for July 28, 29 & 30) and Dinner (for July 28) will be served at Toyoda Auditorium.

Note: Lunch of the final day will be a take-out lunch.

Drink Service

Coffee and Tea will be available at coffee breaks.

Internet Access & Electricity

Wi-Fi is available at the meeting site. ID and Password for Wi-Fi are enclosed in a congress bag.

Convenience store（FamilyMart）

*see page 1 for map

There are 2 convenience stores on the campus of Nagoya Univ. for the purchase of beverages, snacks, bread, rice balls, etc. ;copying / faxing are also available. Open hours are 7:00am to 23:00pm. (Not open 24 hours a day)

PROGRAM

July 27 (Wed), 2016

14:00-17:30 **Plenary 1** Plasticity and modulation of sensory neural circuits

Chairs: Queelim Ch'ng, Kang Shen

14:00 **Keynote** **Circuit mechanisms underlying olfactory learning**
Yun Zhang

14:30 **O-01** **Gonadal maturation changes chemotaxis behavior and neural processing in the olfactory circuit of *C. elegans***
Manabi Fujiwara

14:45 **O-02** **Sexual modulation of sensory function guides behavioral choice in *C. elegans* adults**
Kelli A. Fagan

15:00 **O-03** **The novel components regulating forgetting of the olfactory adaptation at the downstream of the TIR-1/JNK-1 pathway**
Tomohiro Kitazono

15:15 **O-04** **The Role of the CREB-1 homolog, CRH-1, in associative learning in *Caenorhabditis elegans***
Yogesh Dahiya

15:30-16:00 **Coffee Break**

16:00 **O-05** **A neural circuit for experience-dependent salt chemotaxis in *C. elegans***
Hirofumi Sato

16:15 **O-06** **Diacylglycerol encodes differences between past and current stimulus intensity**
Hayao Ohno

16:30 **O-07** **Genetic switch between redundancy and synergy in a multicellular gene expression code**
QueeLim Ch'ng

16:45 **O-08** **A Neuron Circuit of *Caenorhabditis elegans* Generates Memory-Dependent Behaviors in Na^+ Chemotaxis**
Lifang Wang

17:00 **O-09** **AFD-specific receptor guanylyl cyclases confer thermosensory responses**
Asuka Takeishi

17:15 **O-10** **Epilepsy-related mutations in SLO-2 BK potassium channel slow down a behavior change in *C. elegans***
Ichiro Aoki

17:30-19:00 **Opening Mixer**

17:45-18:00 **Opening Ceremony** "Koto & Shakuhachi performance by Korei Hogakukai"

19:00-20:30 **Poster Session 1**

July 28 (Thu), 2016

9:00-12:30 **Plenary 2** Connections, maps and new tools Chairs: Hang Lu, Alexander Gottschalk

9:00 **Keynote** **Map making in *C. elegans*: Charting the nervous system**
Oliver Hobert

9:30 **O-11** **WormGUIDES: Making Neural Development Visible and Accessible**
Anthony Santella

9:45 **O-12** **The multilayer connectome of *C. elegans***
William R Schafer

10:00 **O-13** **Mapping *C. elegans* neuropeptide-receptor interactions by unbiased reverse pharmacology**
Isabel Beets

10:15 **O-14** **Light induced transport to study neuronal polarity**
Martin Harterink

10:30-11:00 **Coffee Break**

11:00 **O-15** ***In actio* optophysiological analyses reveal functional diversification of dopaminergic neurons in the nematode *C. elegans***
Yuki Tanimoto

11:15 **O-16** **Reverse-Correlation Analysis of Mechanosensory Circuit Dynamics Using Optogenetics and Behavior Analysis**
Daniel A Porto

11:30 **O-17** **Microfluidics for neuronal functional imaging of multi-modal stimulation**
Yongmin Cho

11:45 **O-18** **Whole-brain calcium imaging with cellular resolution in freely behaving *Caenorhabditis elegans***
Jeffrey P Nguyen

12:00 **O-19** **3D Tracking of Neurons for Global Brain Imaging in Awake *C. elegans* with Point Registration**
Charles L Zhao

093C **cGAL, a Temperature-Robust GAL4-UAS System for Controlling Gene Expression in *C. elegans***
Han Wang

094A **Behavioral phenotyping of neuropeptidergic mutants in experience-dependent salt chemotaxis**
Jan Watteyne

095B **BKIP-2, a G protein-coupled receptor, is required for the function of BK channel in vivo**
Zhao-Wen Wang

096C **Identification of RIA interneuron-mediated behavioral components essential for thermotaxis**
Linghuan Xu

097A **Dissecting the motor circuit that drives forward locomotion in *Caenorhabditis elegans***
Tianqi Xu

098B **Towards identifying neuropeptide signaling that regulates repulsive odor learning**
Ayaka Yamaguchi

099C **A metabotropic glutamate receptor MGL-2 regulates repulsive olfactory learning.**
Shuhei Yamazaki

100A ***trp-1* and *trp-2* TRPC channels modulate locomotive behavior of *C. elegans***
Jihye Yeon

101B **The Developmental Decision of L2/L2d Affected by Sensing Environmental Uncertainty**
Hyunsoo Yim

102C **Appetite Control: To eat or Not to eat, that is the question**
Young-Jai You

103A **A neuropeptide mediated integration of habituation and sensitization to repeated optogenetic stimulation promotes escape**
Alex Yu

104B **The molecular mechanisms underlying synapse growth by extracellular matrix proteins in *C. elegans***
Yurong Zhou

Keynote
Workshop
Nagoya BNC Symposium
Abstract

Keynote-1

Circuit mechanisms underlying olfactory learning

Yun Zhang

Department of Organismic and Evolutionary Biology, Center for Brain Science, Harvard University, Cambridge, MA 02138, USA

Olfaction is a fundamental sense that guides behavior in many animals. Experience profoundly shapes the representation of an odor to an animal. However, how learning modulates olfaction-guided behavior is not fully understood, partly due to our limited understanding of the underlying neural circuits. Using a form of olfactory learning in Caenorhabditis elegans that is analogous to the Garcia effect, we systematically pursue the circuit mechanisms of learning. We have functionally mapped a neuronal network, from sensory neurons to motor neurons, that encodes both the naive and learned olfactory behaviors, revealing organizational principles for neural circuits of learning. We have characterized physiological property of each tier of the circuits and correlated the neuronal attributes with behavior. Particularly, we have found that the key interneuron of the learning circuit encodes motor outputs with compartmentalized axonal activity and sensory inputs with synchronized activity. We now show that these two activity patterns interact to integrate sensory and motor information, directing odor-guided chemotactic movements. Learning modulates the sensorimotor integration to generate experience-dependent changes in behavioral response. Meanwhile, our studies have also revealed a critical role of neuromodulators in shaping the state of the learning circuit. We are currently addressing how neuromodulators coordinate the activity of the learning circuit with whole animal physiology to regulate learning in a context-dependent manner. Together, our findings provide mechanistic insights into the neural circuits of learning at all levels from sensory perception to motor execution.

Oral Presentation Abstract

O-01 Gonadal maturation changes chemotaxis behavior and neural processing in the olfactory circuit of *C. elegans*

Manabi Fujiwara, Itaru Aoyama, Takahiro Hino, Takayuki Teramoto, Takeshi Ishihara

Department of Biology, Faculty of Science, Kyushu University, Japan

keyword: chemotaxis, larva, germline, daf-16

Many animal species change their behavior depending on their stage of development. However, the mechanisms involved in translating their developmental stage into the modifications of the neuronal circuits that underlie these behavioral changes remain unknown. Here, we show that *Caenorhabditis elegans* changes its olfactory preferences during development. Larvae exhibit a weak chemotactic response to the food-associated odor diacetyl, while adults exhibit a strong response. We show that germline loss, caused either by laser ablation of germline precursor cells or by mutations, results in a diacetyl-specific chemotactic defect in adult animals. These results suggest that germline cells, which proliferate dramatically during the larval stages, enhance chemotaxis to diacetyl. Removal experiment of specific neurons suggested that AWA olfactory neurons and their downstream interneurons, AIA and AIB, are required for germline-dependent chemotactic enhancement. Calcium imaging in animals lacking germline cells indicates that the neural responses of AWA and AIB to diacetyl stimuli are decreased compared with animals with an intact germline. These changes in neural activities may at least partly explain the behavioral change of animals lacking germline cells. Furthermore, this chemotactic change depends on the transcription factor DAF-16/FOXO. We find that organismal behavior changes through development by integrating information about physiological status from internal tissues to modify a simple sensory circuit.

Poster Presentation Abstract

001A Axotomy-induced HIF-serotonin signalling axis promotes axon regeneration in *C. elegans*

Tanimul Alam[1)], Hiroki Maruyama[1)], Chun Li[1)], Strahil Pastuhov[1)], Paola Nix[2)], Michael Bastiani[2)], Naoki Hisamoto[1)], Kunihiro Matsumoto[1)]

1) Division of Biological Science Graduate School of Science Nagoya University
2) Department of Biology, University of Utah

keyword: hif-1, serotonin, rho-1, axon, regeneration

The molecular mechanisms underlying the ability of axons to regenerate after injury remain poorly understood. Here we show that in Caenorhabditis elegans, axotomy induces ectopic expression of serotonin (5-HT) in axotomized non-serotonergic neurons via HIF-1, a hypoxia-inducible transcription factor, and that 5-HT subsequently promotes axon regeneration by autocrine signalling through the SER-7 5-HT receptor. Furthermore, we identify the rhgf-1 and rga-5 genes, encoding homologues of RhoGEF and RhoGAP, respectively, as regulators of axon regeneration. We demonstrate that one pathway initiated by SER-7 acts upstream of the C. elegans RhoA homolog RHO-1 in neuron regeneration, which functions via G12α and RHGF-1. In this pathway, RHO-1 inhibits diacylglycerol kinase, resulting in an increase in diacylglycerol. SER-7 also promotes axon regeneration by activating the cyclic AMP (cAMP) signalling pathway. Thus, HIF-1-mediated activation of 5-HT signalling promotes axon regeneration by activating both the RhoA and cAMP pathways.

104B The molecular mechanisms underlying synapse growth by extracellular matrix proteins in *C. elegans*

Yurong Zhou[1)2)], Jianzhen Qin[1)2)], Congcong Cao[1)2)], Mei Ding[1)]

1) Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, Beijing, China
2) University of the Chinese Academy of Sciences, Beijing, China

keyword: synapse, extracellular matrix proteins, type IV collagen, type XVIII collagen

In the mature nervous system, a significant fraction of synapses are structurally stable over a long time scale. However, the mechanisms that restrict synaptic growth within a confined region are poorly understood. We previously identified that in the *C. elegans* neuromuscular junction (NMJ), collagens type IV and XVIII are critical for growth restriction of presynaptic boutons. Without these components, ectopic boutons progressively invade into non-synaptic region. The growth constraint of presynaptic boutons correlates with the integrity of the extracellular matrix basal lamina or basement membrane (BM), which surrounds chemical synapses. Fragmented BM appears in the region where ectopic boutons emerge. To further understand the signaling mechanisms underlying synapse restriction, we performed a suppressor screen and identified six mutants which significantly suppress the collagen type IV and XVIII double mutant phenotype. Hence, we may reveal the molecular apparatus responsible for synapse growth regulation.

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CeNeuro2016 Program at a glance